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Innovation and Production Management: Lessons from Algerian Industries

*A thesis submitted for the degree of Doctor of Philosophy in
Economic Engineering and Enterprise*

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المخلص

يساهم هذا البحث في دراسة تأثير الابتكار على نتائج إدارة الإنتاج القائمة على إدارة المعرفة في الشركات الجزائرية. تركز الدراسة على العلاقة بين المفاهيم المختلفة لجوانب الابتكار. إدارة الإنتاج وإدارة المعرفة في السوق الجزائري.

أثبتت العديد من الأبحاث أهمية دور إدارة المعرفة والابتكار في المؤسسة. نظرًا لأن كلا المفهومين يهيمن على غالبية اتجاهات البحث وفيما يتعلق بالتأثير القيم على نظام المؤسسة المختلفة، ولكن يمكننا ملاحظة أن معظم دراسات نموذج إدارة الإنتاج لا تأخذ في الاعتبار كلا المفهومين بالإضافة إلى التسويق مفهوم. من الصعب للغاية تحديد نموذج شامل للإنتاج فيما يتعلق بالتغيرات المتطرفة في السوق، خاصة مع أزمة Covid-19. في مثل هذه حالة، يكون التنبؤ بالظروف والمخاطر المستقبلية مستحيلًا للغاية.

يجب على الشركات الجزائرية مضاعفة جهودها للبقاء في هذه البيئة المعقدة وعليها تطوير المزيد من الابتكار ونظام إدارة المعرفة لتعزيز إدارة الإنتاج وتحسين علاقتها مع عملائها.

الكلمات المفتاحية: الابتكار، إدارة المعرفة، إدارة الإنتاج، COVID-19، المستهلك الجزائري.

Abstract

The contribution of this thesis focuses on the study of the influence of Production Management on Innovation results based on Knowledge Management in the Algerian companies. We study the relationship between the different aspects of Innovation concepts; Production Management and Knowledge Management in the Algerian market. The importance of Knowledge Management and Innovation in the enterprise has been proved by many research. As both of the concepts are dominated by the majority of research trends and regarding the valuable influence on the different enterprise systems, we can notice that most production management model studies do not consider both concepts and the marketing concept. Defining a holistic production model is very hard regarding the extreme changes in the market, especially with the Covid-19 crisis. In such a situation, predicting the future circumstances and risk is impossible. The Algerian enterprises must double their efforts to survive in this complex environment. They have to develop more innovation and knowledge management systems to enhance production management and improve their relationship with their customers.

Keywords: Innovation; knowledge Management; Production Management; COVID-19; Algerian Consumer.

Résumé

La contribution de cette thèse porte sur l'étude de l'influence de la gestion de la production sur les résultats de l'innovation basée sur la gestion des connaissances dans les entreprises algériennes. Nous étudions la relation entre les différents aspects des concepts d'innovation ; la gestion de la production et la gestion des connaissances dans le marché algérien. L'importance de la gestion des connaissances et de l'innovation dans l'entreprise a été prouvée par de nombreuses recherches. Comme les deux concepts sont dominés par la majorité des tendances de recherche et en ce qui concerne l'influence précieuse sur les différents systèmes d'entreprise, nous pouvons remarquer que la plupart des études de modèles de gestion de la production ne prennent pas en compte les deux concepts et le concept de marketing. Définir un modèle de production holistique est très difficile au regard des changements extrêmes du marché, notamment avec la crise de Covid-19. Dans une telle situation, il est impossible de prédire les circonstances et les risques futurs. Les entreprises algériennes doivent redoubler d'efforts pour survivre dans cet environnement complexe. Elles doivent développer plus d'innovation et de systèmes de gestion des connaissances pour améliorer la gestion de la production et améliorer leur relation avec leurs clients.

Mots clés : Innovation ; gestion des connaissances ; gestion de la production ; COVID-19 ; consommateur algérien.

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General Introduction

General Introduction

As long as innovation policy is defined as learning from experiences of interactions between actors, the emergence of collaboration between the South and North or developed and underdeveloped regions can facilitate exchanges of knowledge and experience and thus facilitate contingent policies. For example, in terms of knowledge, the academic field places more importance on the emergence of innovation across nations through international organisations, innovation of knowledge. The network's main objective is to stimulate innovation research among academicians, which has been inspired by the network. It connects researchers working on the development of innovation for African pay. In addition, the Triple Helix Network analyses the relationship between the university, government and industry. Furthermore, the European Forum for Policy Studies on Research and Innovation allows researchers to focus on the interdisciplinary dimensions of policy and governance in the domain of creativity and innovation.

The selected policies of innovation are an important step in the decision process. There is a clear demand for an appropriate policy for innovation based on economic growth. Recently, the topic has been of interest to researchers who combine innovation and innovation policy with development (Iizuka et al., 2012; Katz, 2015; Andersen, 2012; Dantas et al., 2011; Dutrénit et al., 2014; Morris et al., 2013).

However, several initiatives have been taken at the international level to measure innovation, such as the Frascati Manual (OECD, 2002), which is a standard practice in the experimental innovation field. In addition, the Oslo Manual (Bloch, 2007), which shows the steps and tools in the collection of innovation data, and the OECD (Frascati, 2002), which measures science and technology activities.

Concerning innovation policy, this is a broad concept that has been imposed and used only as a tool by public administration (Lerner et al., 2019; Amdaoud, 2017; Borrás et al., 2019; Kuhlmann et al., 2017). Moreover, technological science and innovation policies can help improve the behaviour of economic agents, articulate the supply of and demand for knowledge, stimulate the development of sectors and promote new sectors of competitiveness (Kuhlmann et al., 2017). Innovation policy is interpreted as a complex phenomenon (OECD, 2005). In this case, the concept of an innovation system is the appropriation of the phenomenon of support or progression of regional or national systems. The National Innovation System can be defined as *"an open, evolving and complex system that encompasses economic institutions and structures"* (Lundvall, 1992). The relationship between these concepts and their qualities determines the dynamics and trends of innovation and capacity detection to innovation from a combination of learning based on scientific experience.

On the other hand, policymakers have a diplomatic interest in how to import knowledge through collaboration among nations. As far as international collaboration is concerned, emerging countries more affected by the experience of the countries are emerging, with bodies such as the twinning programme, which is a community instrument for institutional cooperation between the public administrations of the European Union of the partner countries. The eight Millennium Development Goals (MDG, 2015) for development, aim to reduce half of the poverty rates and achieve universal primary education.

Nevertheless, collaborations allow the transfer of basic concepts, in terms of support for decision-making in countries in crisis. The main interest of these initiatives is to understand and analyse how innovation policy should be conceived from the exchange of experiences between developing and developed countries. However, innovation policy has not yet been well defined. Innovation policy is still characterised by general and macroeconomic concepts (Djeflat et al., 2007). Developing countries tend to fail or fail innovation policies despite their

development efforts (Kuhlmann et al., 2017) because awareness towards a search for an appropriate innovation policy is increasing.

The understanding and approach to innovation policy through the national innovation system have been largely undertaken by researchers (Barre, 1996; Freeman, 1987; Nelson, 1993). At the same time, other theories have been developed to deepen the issue of innovation by considering the predominant innovation model in the region (Mas-Verdu, et al., 2010). However, each model or approach was taken into consideration based on specific countries' contexts. In addition, other models have emerged from the concept of the national innovation system such as the regional and even local level (Bergman et al., 1991; Gomez, et al., 1997) and the work of Breschi and Malerba (1997), combining the national, sectoral and technological dimensions.

The question of when and how to develop an innovation policy could be undertaken by several alternatives. This is why the selection of innovation policy remains a controversial issue (Kuhlmann et al., 2017). Issues such as the evaluation and measurement of innovation or the relationship between actors, the knowledge creation and transfer, or the innovation system theories and the triple helix, receive the attention of researchers.

While the different theories and models are applicable in developed countries, their applications in developing or poor countries seem complicated. Most theories have focused on the input of innovation instead of the output of innovation from which the cause of the failure of innovation policy originates (Djeflat, 2006).

The current situation of the corona pandemic has led to a high degree of uncertainty, due to the speed of the pandemic evolution and the lack in the availability of data at right time (Baker et al., 2020).

According to Ebersberger and Kuckertz (2021), *"...the COVID-19 crisis is unique, we can base our reasoning about innovation in situations of crises on experiences and research in the context of another previous crisis"* (Ebersberger and Kuckertz, 2021).

On the other side, the effect of the COVID-19 crisis on the economy can be summarised as: *"A modern economy is a complex web of interconnected parties: employees, firms, suppliers, consumers, and financial intermediaries. Everyone is someone else's employee, customer, lender, ...etc."* (Gourinchas, 2020).

Furthermore, crises can hold the potential to meet new needs through innovative solutions (Archibugi et al., 2013; Ebersberger et al., 2021).

Research Question

Through this research, the candidate will develop and explore the following research problematic:

" How can a new Production Management model be defined based on Knowledge Management and Innovation System through both producers and customers' perspectives?"

On the other side, we try to investigate the main contemporary concepts that identify a new model of production management through the literature reviews and the Algerian industries, including the consumer aspect.

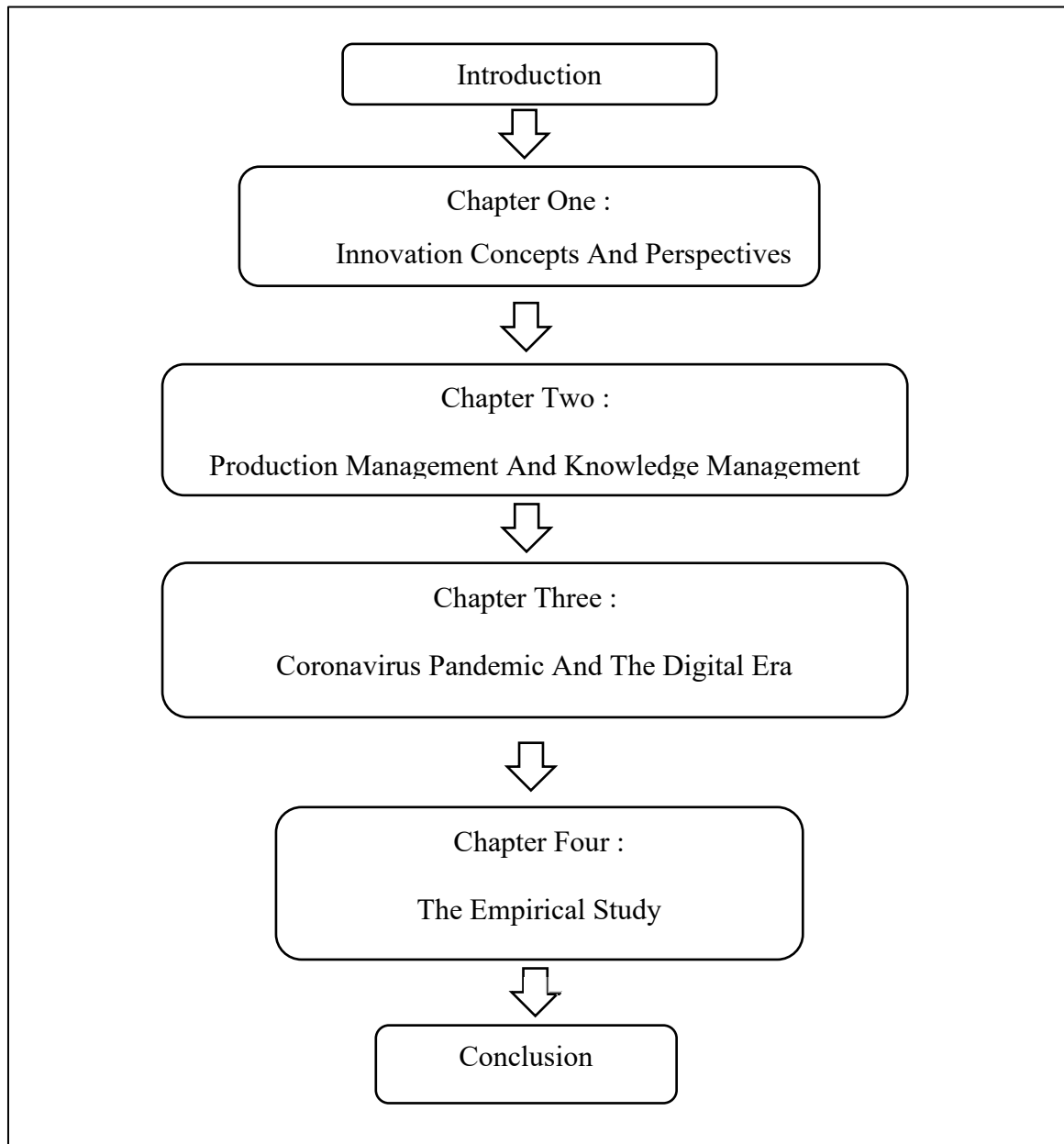
Several questions can help to explain the research problem more:

- What are the key concepts that can help to compose new production management?
- How can the digital concept enhance the production and improve the relationships with the customers?

- How can the Algerian consumer react to a new innovative product before and during the Covid-19 crises?

The structure of the work

This research has been articulated in four following chapters:



Chapter One :
Innovation Concepts And Perspectives

Introduction

In a market dominated by technological development and dynamic competitiveness, Innovation has become a major strategic issue for enterprises. Besides, increasingly, the rapid changes in production technologies and consumer demands, have made the innovation process more complex and its potential outputs more uncertain. In this difficult situation, many enterprises have to face these challenges and offer competitive products to the market by varying production techniques.

In this chapter, we will discuss general Innovation concepts and perspectives. On one side, we aim to present different definitions cited in the literature review to get deep into the meaning of the Innovation concept and we will note the determining factors of innovation. And from the other side, we will present some various types of Innovation, and finally, we will introduce the six generations or models of Innovation.

1 Innovation Definition

The definition of the Innovation concept can depend on very various terms. The main global comprehension of the Innovation practice is represented as a mathematical equation by “Ed Roberts” in 1988. He represents Innovation as a sum of Invention and Commercialisation:

$$\left\{ \begin{array}{l} \mathbf{Innovation = Invention + Commercialization} \\ \mathbf{with:} \\ \mathbf{Innovation \neq Invention,} \\ \mathbf{Innovation \neq Commercialization.} \end{array} \right.$$

*(Developed by Researcher)

Mathematically, this equation is not correct. If Invention or Commercialisation equals zero; so, the conditions are not verified. A new definition was adapted by “Aulet Bill” (2013) from MIT, giving us more vulgarisation to the Innovation term:

$$\left\{ \begin{array}{l} \mathbf{Innovation = Invention * Commercialization} \\ \mathbf{with:} \\ \mathbf{Invention \neq 0,} \\ \mathbf{Commercialization \neq 0.} \end{array} \right.$$

*(Developed by Researcher)

The equation has the correct meaning by replacing the addition symbol with the multiplication. So, Innovation is a production of Invention and Commercialisation and not the sum. If there is no Invention (Invention = 0), or no Commercialisation (commercialisation = 0), then there is no Innovation.

The concept of Innovation is defined through many other concepts that sometimes have a deep meaning or a special characteristic. Research conducted by Baregheh et al., (2009) have regrouped most words that appear in the Innovation definition. The findings show that the word “New” has frequent use in the definition, followed by the words “Product”, “Organisation”, “Service”, “Process” and “Idea” (Table 1)

Table 1. The frequency of words and the number of times words appear in the definition.

Words	Total number of occurrences	Number of occurrences in distinct definitions
New	76	42
Product	40	33
Organization	29	15
Service	25	21
Process	23	21
Idea	22	18
Development	13	12
Invention	12	8
Technology	12	11
Firm	11	4
Market	11	9
Technical	10	8
Creativity	10	8
Change	10	9
Commercialization	7	6
Improve	6	4
Implement	6	5
Economic	6	5
Success	6	5
Superior	5	2
Group	3	2
Value	2	1

Source: Candidate's adaptation from Baregheh et al., 2009.

Another researcher, Singh and Aggarwal (2021) try to list most categories used in the Innovation definition (Table 2). The researchers propose four categories based on different codes or keywords used in the research engines.

Table 2. Definition and List of Categories/Themes

Name of category		Definition	Codes included
Source Factors	Creative Potential	Ability to think and generate new ideas, having a diagnostic orientation and inclination toward investment in knowledge and learning	Creativity, Ideas, Knowledge Investment
	Motivation	Commercial and social motivations underlying innovation process	Commercial Motive, Social Motive
	Action	Behavior or act of introducing, implementing, recombining, or adopting something	Implementation, Improvement Recombination, Adoption
Intervening Processes	Psychological Processes	Mental and behavioral processes underlying innovation	Perception, Problem Solving, Goal Orientation
	Ecological Processes	The process concerning the efficient adaptation of innovation in a given environment or domain	Change, Ecological Rationality, Differentiation
Newness		The property of being/perceived as new, original and/or different from the existing or earlier product(s), service(s), or process(es) in a reference category	Newness
Outcome	Economic Growth	An increase in the production of goods, services, and other offerings by a nation, geographical unit, or organization impacting the material and social life of people	Economic Growth, Competitive Advantage, Technology/ Invention, Value Creation
	Competitive Advantage	A superior position because of better efficiency, quality, or performance as compared to one's competitors	
	Technology/ Invention	A product, process, machinery, or equipment developed through the application of scientific knowledge and/or creative ability	
	Value Creation	Creation or improvement of capabilities or intended receivables for different stakeholders of a business, product, process, or unit	

Source: Singh et al., 2021

A total of 52 conceptual labels are suggested to conduct this research before it was reduced to 38 labels only. Based on these labels, the researchers have collected 208 definitions of Innovation from 1910 to 2020. These definitions are represented in the following table (Table 27; Appendix A, p 152).

2 The Determining Factors of Innovation

Several studies of innovation adoptions focus on Innovation Products and Processes. But other factors can have considerable importance in the Innovation process or system.

2.1 Organisational Factors

The organisational factors are linked to the structure and strategies of the company. For example, the organisational policies, which can promote the participation of different departments in the strategic planning stages, can promote the adoption of innovation (Rhaiem, 2014). In this regard, Udo et al. (1996) have explained that the communication level between departments within a company is positively correlated with departments' commitment to the process of adopting innovations. On the other hand, Maffei and Meredith (1994) have shown that the deployment of a strategy for integrating new manufacturing technologies in the different departments of an enterprise makes it possible to take full advantage of these technologies.

2.2 Individual factors

Many models explain that Innovation adoption is particularly focused on individual behaviours, perceived utilities, and usability of potential adopters of technologies and innovations (Calisir et al., 2009).

Other researchers have argued that individuals within an enterprise are decisive in their decision to adopt an innovation, as it bases directly on their skills, knowledge and their capacities to foster the successful implementation of that innovation (Germain, 1993).

2.3 Technological factors

These factors refer to external factors to the enterprises. These are essentially non-controllable factors and they are directly relied on the adopted technologies in the future, such as the attributes of the technology and its maturity (Oh et al., 2012). Therefore, we can consider the innovation characteristics like the cognitive indices that inform the behaviours and attitudes of potential adopters towards technologies (Frambacha et al., 2002). In addition, these characteristics include the perceived compatibilities of the technology to be adopted with the existing one, its complexity and the perceived net benefit of its adoption (Mansfield, 1993); and the possibility of testing and/or observing its use elsewhere before using it on a larger field (Frambacha et al., 2002).

2.4 External Environment Factors

The external environment factors are linked to the channels of communication and information requested by the company and may influence its decision whether to adopt an innovation or technology. These factors are perceived by the authors as facilitators or barriers to innovation and technology adoption (D'este et al., 2012).

Indeed, they cite two advantages for the enterprise if the latter maintains a privileged relationship with its network providers: (1) suppliers have to continue to support and guide the innovation evolution within the enterprise; and (2) the company will have greater access from its technology providers to services and staff with in-depth knowledge of the innovation, thereby reducing adoption costs.

3 Typology of Innovation

Through the literature reviews, we can consider several classifications and categorisation of the type of Innovation, but the many research includes the OECD methodology as a classical basic classification, it is the most widespread in the innovation research fields. This classification consists of four types, “Product Innovation, Process Innovation, Marketing Innovation and Organisational Innovation”. These types are represented in the following table (Table3).

Table 3. Types of innovation According to OECD methodology.

Type of Innovation	Field of Application	Distinctive Characteristic
Product innovation	Innovations related to goods and services.	Significant improvements in the Technical specifications, components and materials in the embedded software in the degree of friendliness to the user or other functional characteristics.
Process innovation	Implementation of new or significantly improved methods of production or delivery of the product.	Significant changes in technology, production equipment and / or software.
Marketing Innovation and	Implementation of new methods of marketing, including significant changes in design or packaging of the product during its storage, market promotion and market-based prices	Increasing in the degree of consumer satisfaction, creating new markets or new, more favorable market position for production companies to increase sales.
Organizational Innovation	Implementation of new forms and methods of organization of business companies, the organization of jobs and external relations.	Implementation of business practices in the organization of workplaces or in the external relations previously used for organizational method that represents the result of the implementation of strategic decisions.

Source: Kotsemir et al. (2013)

According to Bessant and Tidd (2007), Innovation is classified into four types. This classification is closely similar to the OECD classification. However, in this model organisation innovation is replaced by paradigm innovation. Paradigm innovation encompasses different changes in enterprise strategy and behaviour and, it can be the consequences of all or one of other three other types of innovation (Table 4).

Table 4. Innovation types according to Bessant and Tidd (2007).

Type of innovation	<u>Essence of Innovaton</u>
Production innovation	Introduction of new products and services or changes to products and services that has added benefits for the customer or it meets market need.
Process innovations	Introduction of new device, method, tool or knowledge to produce a product or render a service.
Position innovation	Positioning of a certain product in a specific industry / business segment.
Paradigm innovation	Shifting of long-held assumptions about the modus operandi of some industry or businesses.

Source: Kotsemir et al. (2013)

There exists another type of innovation that can be found in the literature reviews such as the study of Zawislak et al. in 2011 that consists of two innovation types, (1) technology-driven and (2) business-driven (Table 5). Walker et al., (2011) propose four innovation types with more specification details in process innovations (Table 6).

Table 5. Innovation types of Zawislak, 2011

Type of innovation	Essence of innovation
Technology-driven innovation	
Technological Innovation	Development of new design, new materials and new products. In addition, they include the development of machinery, equipment and new components.
Operations Innovation	New processes, improvements in existent processes, introduction of modern techniques, new layouts, etc. It allows the firm to produce products with quality, efficiency, flexibility with the lowest possible cost.
Business-driven innovation	
Management Innovation	Development of management skills which reduce the “internal friction” between different areas of the firm. It is intended to create new methods of management and new business strategy, improve decision-making and inter-functional coordination, etc.
Transaction Innovation	Development of ways to minimize transaction costs with suppliers and customers. It is intended to create new commercial strategies, improve relationships with suppliers, streamline market knowledge, etc.

Source: Kotsemir et al. (2013)

Table 6. Innovation types of Walkers, Avellaneda and Berry, 2011

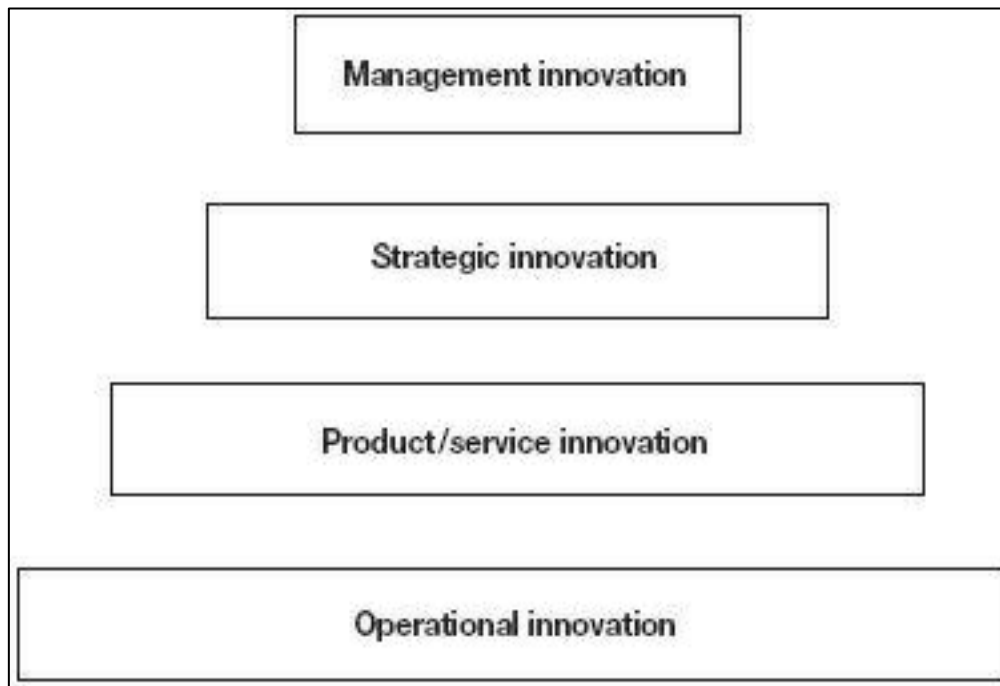
Type of innovation	Sphere of application	Distinctive characteristic
Ancillary innovations	Concerned with working across boundaries with other service providers, users or other public agencies.	Successful adoption is dependent on factors outside an organization's control.
Service innovations	New services offered by public organizations to meet an external user or market need: they are concerned with what is produced.	Occur in the operating component and affect the technical system of an organization and include the adoption of goods (which are material) and intangible services, which are often consumed at the point of production.
Process innovations	Affect management and organization. They change relationships amongst organizational members and affect rules, roles, procedures and structures, communication and exchange among organizational members and between the environment and organizational member.	Concerned with how services are rendered.
Subcategories of process innovations		
Organization innovations	Innovations in structure, strategy, and administrative processes; improvements in an organization's practices and the introduction of new organizational structures.	Concerned with an organization's primary work activity and changes in the social system.
Marketization innovation	Modifying the organization's operating processes and systems to increase the efficiency or effectiveness of producing and delivering its services to users.	Concerned with methods to purchase and deliver services and revenue generation, and reflect the core new public management themes of contracting, externalization and market pricing of public services.
Technological innovations	Associated with changes in physical equipment, techniques and organizational systems.	Include information technology, hardware (Physical equipment) and software (organizational systems).

Source: Kotsemir et al. (2013).

Hamel Gray has defined Innovation Management as *“anything that substantially alters the way in which the work of management is carried out, or significantly modifies customary organisational forms, and, by so doing, advances organisational goals. Put simply, management innovation changes the way managers do what they do, and does so in a way that enhances organisational performance”* (Hamel, 2007).

Hamel distinguishes four types of innovation and lists them in order, (4) managerial innovation at the top of the pyramid, as is the innovation at the origin of other innovation forms and not as a consequence of technical and market innovations. This type proposes a new way of coordinating people with each other to achieve the main goal of the organisation and to develop organisational dynamism. Followed by (3) strategic innovation which consists of creating innovative products in the context of finding a new business model, (2) product and service innovation that aims to develop and to create new products and services to satisfy current consumer needs. The enterprises have to build a strong competitive advantage that allows them to enter technological barriers and in the bottom (1) process innovation is the first level of innovation and the heart of the operational activity. This innovation represents the ways of doing daily basis to work within the plants. As a tool, an approach of operational excellence can represent this type (Figure 1).

Figure 1. The four types of innovation of Gary Hamel (2007).



Source: Gary Hamel, (2007).

In their book, Keeley et al. (2013) note ten types of innovation. The Ten Types are structured into three categories which are: (1) Configuration category which is focused on the entire system of the enterprise and its innermost functioning (Table 28; Appendix A, p 195), (2) Offering category which is focused on the basic core products of the enterprise, and/or other products (Table 29; Appendix A, p 197) and (3) Experience category which is focused on customer-facing elements and the commercial system of the enterprise (Table 30; Appendix A, p 198).

These types are the most internally concentrated and distant from consumers; and increasingly, moving down from the first type to the last one, they become more evident to end-users.

Geoffrey Moore in 2005 has classified four innovation categories identified through the degree of maturity of new technology and its maturity life cycle. These categories are divided into 14 types of innovation (Table 7).

Table 7. Types of innovation of Moore, 2005.

Type of innovation	Essence of innovation
Product leadership zone	
Disruptive Innovation	Creating new market categories based on a discontinuous technology change or a disruptive business model.
Application Innovation	Developing new markets for existing products by finding unexploited uses for them, often by combining them in novel ways.
Product Innovation	Focuses on existing markets for existing products, differentiating through features and functions that current offers do not have.
Platform Innovation	Interposes a simplifying layer to mask an underlying legacy of complexity and complication, thereby freeing a next generation of offers to focus on new value propositions.
Customer intimacy zone	
Line-Extension Innovation	Structural modifications to an established offer to create a distinctive subcategory.
Enhancement Innovation	Continuation of trajectory begun by line extensions, driving innovation into finer and finer elements of detail, getting closer and closer to the surface of the offer with less and less impact on the underlying infrastructure.
Marketing Innovation	Differentiating the interaction with a prospective customer during the purchase process.
Experiential Innovation	Value here is based not on differentiating the functionality but rather the experience of the offering.
Operational excellence zone	
Value-Engineering Innovation	Extracting cost from the materials and manufacturing of an established offer without changing its external properties.
Integration Innovation	Reducing the customer's cost of maintaining a complex operation by integrating its many disparate elements into a single centrally managed system.
Process Innovation	Focusing on improving profit margins by extracting waste not from the offer itself but from the enabling processes that produce it.
Category renewal zone	
Value-Migration Innovation	Redirecting the business model away from a commoditizing element in the market's value chain toward one richer in margins.
Organic Innovation	On this path the company uses its internal resources to reposition itself into a growth category.
Acquisition Innovation	Solves the problem of category renewal externally through merger and acquisition.

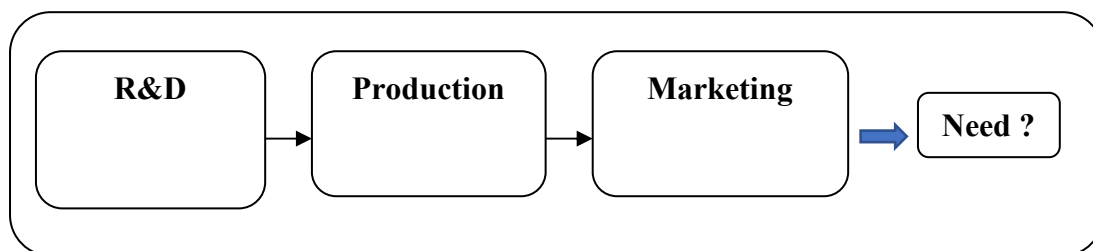
Source: Kotsemir et al. (2013).

4 The six generations of Innovation

4.1 The First Generation: Technology-Push

The innovation process in the technology-push strategy is represented as a linear process. This process starts with scientific discovery then passes through invention, manufacturing activities and finishes with the commercialisation of new products or processes (Figure 2).

Figure 2. The First Generation: Technology-Push

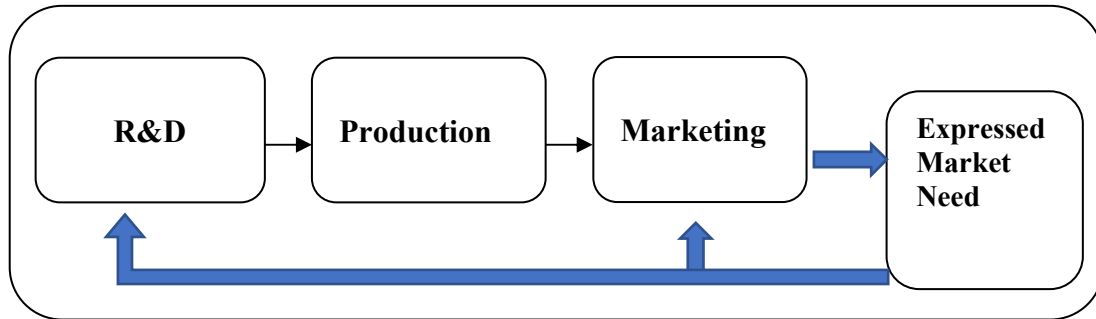


Source: authors' adaptation from *Ville and Pekka (2011)*

4.2 The Second Generation: Market-Pull

In the market-pull strategy, the innovation stems from perceived demands, which influence the technological development directions. In this stage, we consider the market as the origin of the ideas to lead R&D (Figure 3). Many researchers explain that innovations are driven by departments that deal directly with clients. At this level, the business practices should base on the creation of new planning and forecasting products that can predict future needs.

Figure 3. The Second Generation: Market-Pull

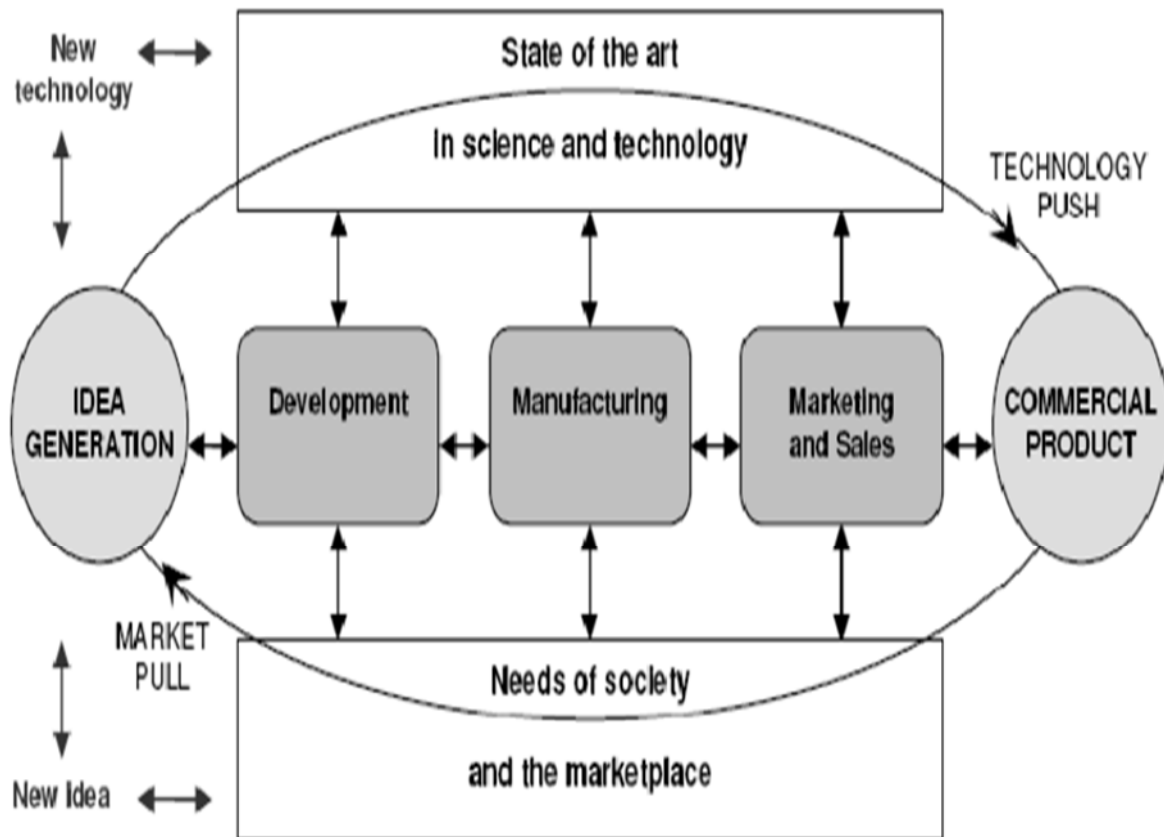


Source: authors' adaptation from *Ville I. and Pekka K. (2011)*

4.3 The Third Generation: Coupling Model

This third model integrates both strategies of technology-push and market-pull. It focuses on an interactive process where innovation is seen as a logical sequential process but not necessarily as a continuous process (Rothwell et al. 1985). Because the steps of the process are interactive, the feedback effects between the linear models of the downstream and the upstream phases have an important role in the model (Figure 4).

Figure 4. Third Generation Coupling Model of Innovation

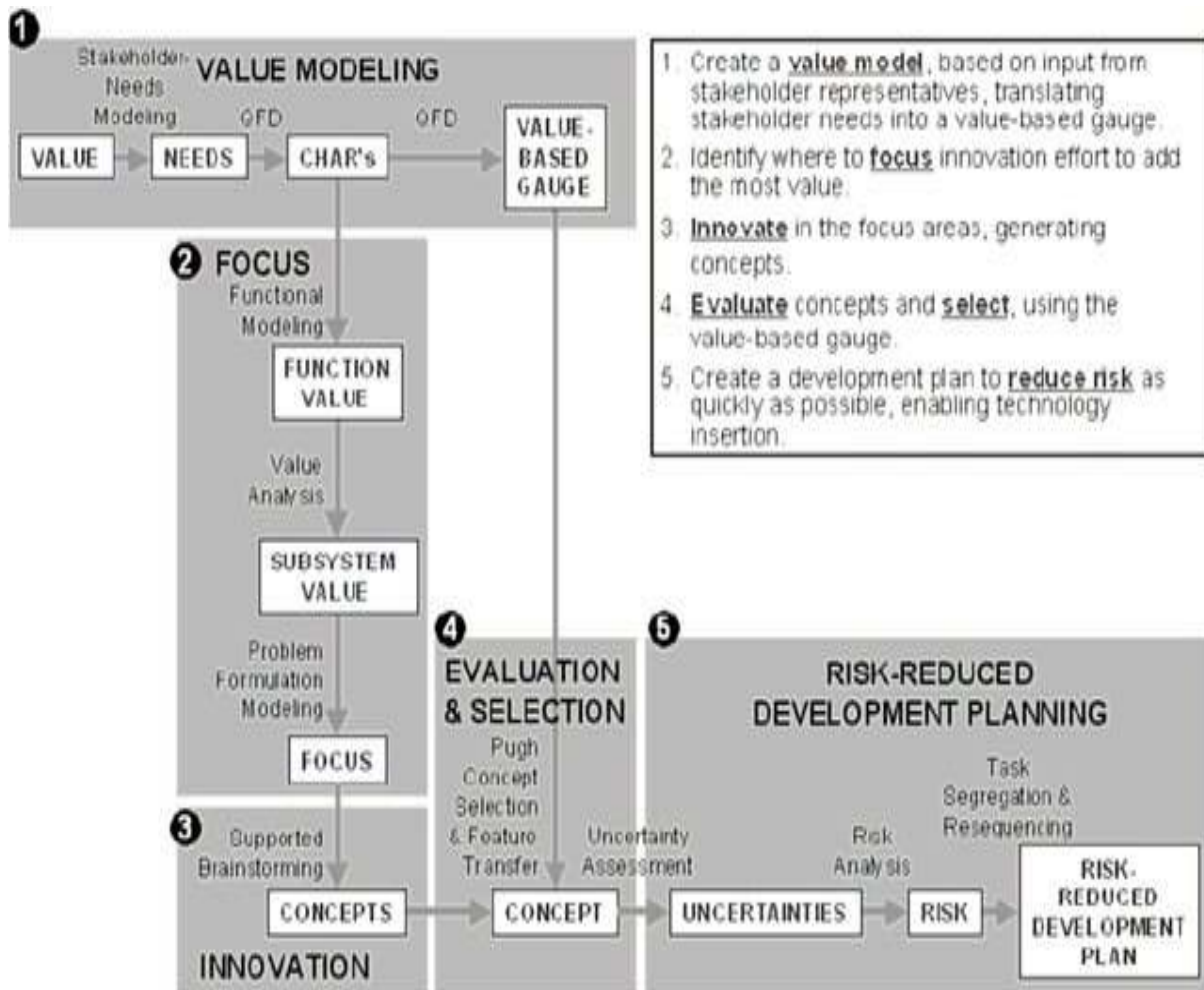


Source: Motilal et al., 2014

4.4 The Fourth Generation: “Collaborative” model

In the collaborative or chained model, we can see the complex iterations, feedback loops and from another side, we can notice the interrelationships between marketing, R&D, manufacturing and distribution in the process of innovation. This process reflects how innovation is accompanied by close relationships between key customers and suppliers. In this case, the model is characterised by the development in parallel with development teams and strong links with suppliers (Figure 5).

Figure 5. The Collaborative Innovation Process

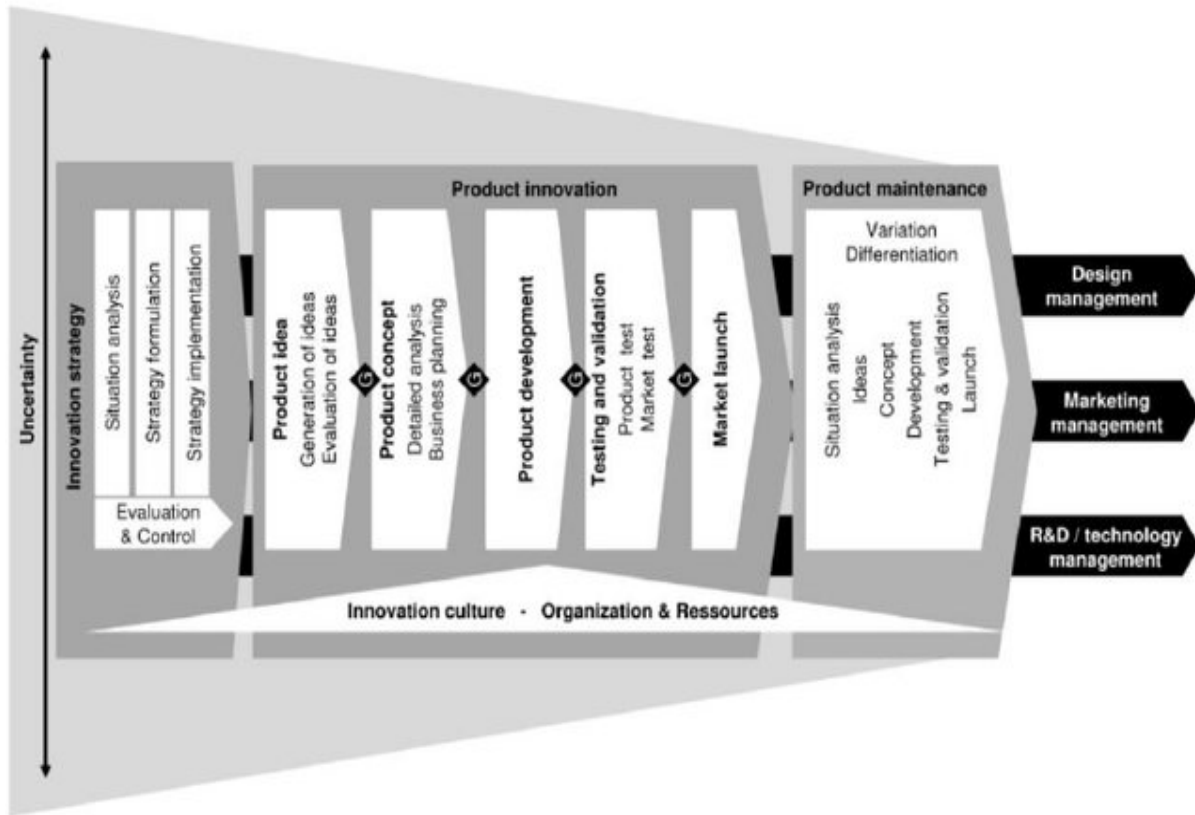


Source: Motilal, et al., (2014).

4.5 The fifth Generation: "Strategic and integrated"

The fifth model consists of two main parts, which are: the increasing strategic and technological integration between the different organisations. This model is concerned about organisational forms, practices and expertise that allow ultimate flexibility and understanding to deal with the different turbulent circumstances of the markets (Figure 6).

Figure 6. Process Model of integrated Innovation Management.



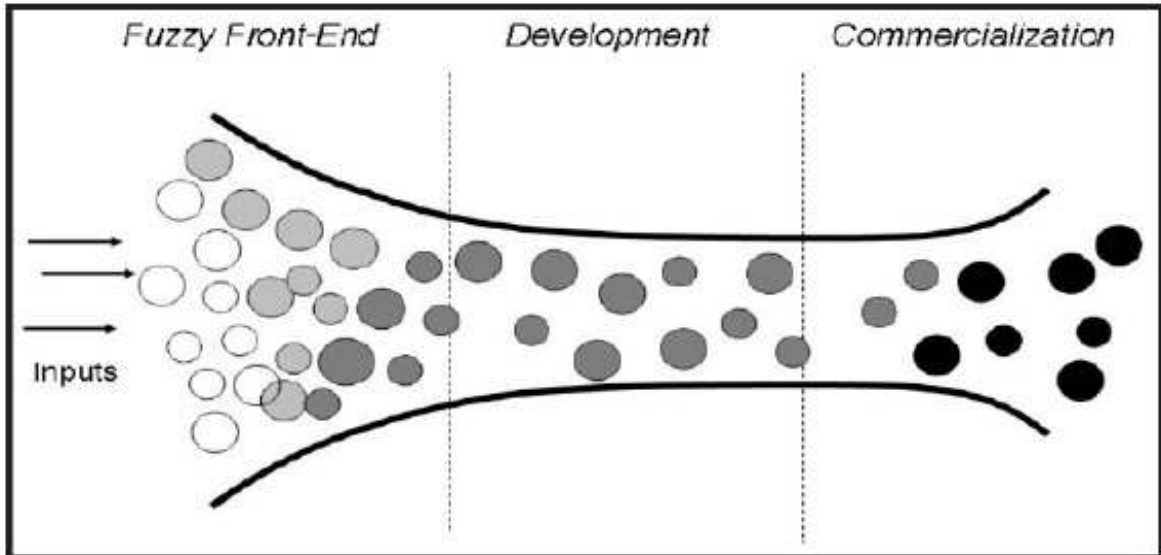
Source: Brandtner et al. 2014.

4.6 The Sixth Generations: “Open innovation”

According to Chesbrough (2003), we can define the sixth generation of innovation by comparing both closed and open systems. He considers closed innovation as the transition to open innovation. Because companies need to adopt and exploit external sources of knowledge and engage with a wider range of employees. However, in the open innovation model, we can find more fluid interactions between innovation activities at both internal and external levels, where all ideas, people and resources inflow within, around and outside companies. However,

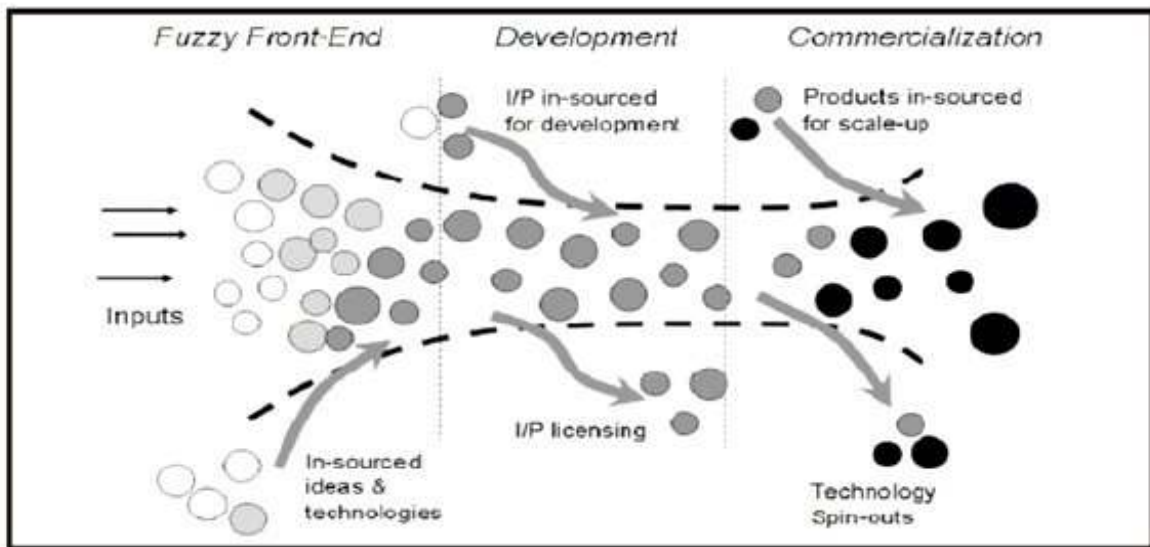
the enterprises do not need to exploit ideas from their own research to generate new ones by making the right connections to innovators' networks (Figure 7 & 8).

Figure 7. Closed Innovation Model



Source: Motilal et al. (2014).

Figure 8. Open Innovation Model



Source: Motilal et al. (2014).

Conclusion

In this first chapter, we present more than 208 definitions of Innovation. These definitions are variously based on many aspects such as technological development, a novelty in different fields, market and customer need, ...etc.

More deeply, we have developed other concepts to clarify the correct meaning of the innovation term. Firstly, we have identified the main determining factors of innovation and various types of Innovation. According to numerous research, to understand the innovation concept more deeply, these types can be divided into several categories. Indeed, the Innovation term has taken several forms, from the simplest to the most complex and in all fields.

Secondly, we have talked about the different generations of Innovation to visualise the big historical picture about the evolution of Innovation in the main domains and their applications. These applications require integrating other enterprise systems such as Production, Marketing and Knowledge Management to have a strong strategic innovation system in the market.

Chapter two:

**Production Management and
Knowledge Management Systems**

Introduction

Knowledge management is one of the key issues in any enterprise strategy. Some researchers consider it as the heart of enterprise development and a powerful tool for creating new capabilities to face different threads of their competitors.

The transfer and the implementation of the knowledge within the enterprise system, especially in the production management system can improve the production processes. The production or the manufacturing represents the engine that keeps the enterprise moving toward.

In this chapter, we will discuss general concepts and perspectives of production management and the knowledge management system. Firstly, we will discuss various concepts like definitions, typologies of production and production models. And in the second phase, we will talk about different knowledge management concepts.

1 Production generalities

1.1 Production definition

Production is a process and procedure represented as a set of activities and actions that aim to transform inputs into outputs or to create products using the production factors' combination such as labour, machines, raw materials and capital. Production is a value addition process that can create useful finished goods and services for the right end-users having the desired quality and utility.

Andy Neely (1993) defines production management as, " ... *a major activity carried out in all manufacturing organisations, consists of two main functions. First, there is production, which is the act of manufacturing goods for which a consumer is willing to pay. This manufacture must be planned and controlled. Hence management, in this context has a dual nature. It involves planning, setting objectives, controlling and monitoring performance as a basis for future planning. Thus, production management has traditionally been defined as the set of activities which are needed to plan and control the manufacturing process... Although this is an acceptable definition of production management, it is incomplete because it does not reflect the true nature of production management. In order to overcome this weakness, the author feels that it is necessary to examine the objectives of the organisation*" (Neely, 1993).

Production is also defined as a transformation of resources (equipment, operators, materials and components, technical information...) belonging to a productive system and leading to the creation of goods and services (Giard, 2003).

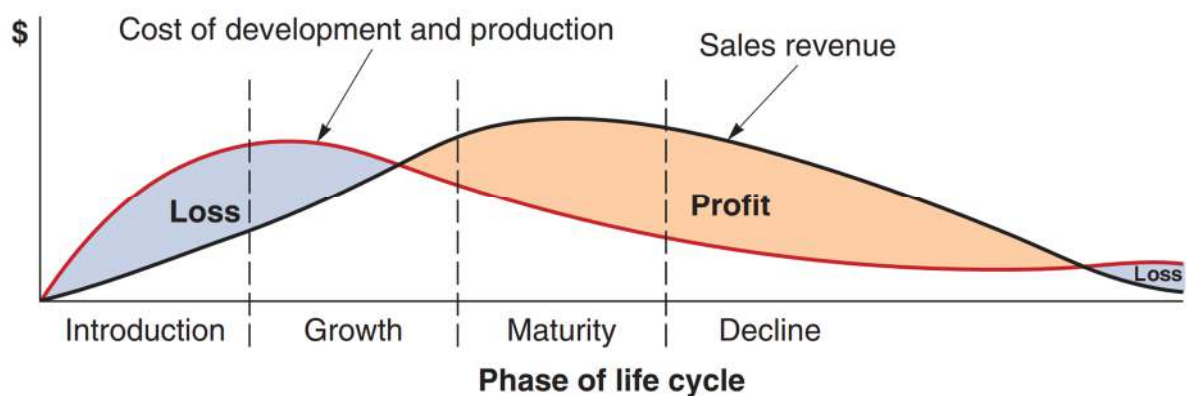
"Production is defined as the step-by-step conversion of one form of material into another form through chemical or mechanical process to create or enhance the utility of the product to the user. Thus, economists define production as. an activity by which form utility is created or enhanced... Elwood Buff defines production as a process by which goods and

services are created... Production management is a process of planning, organising directing and controlling the activities of the production function... Elwood Buff defines production management as follows: "Production management deals with decision-making related to production processes so that the resulting goods or services are produced according to specifications, in the amounts and by the schedule demanded and out minimum cost" ... The production system (function) of an organisation is that part which produces the organisation's products. Production is the basic activity of all organisations and all the other activities revolve around production activity. The output of production is the creation of goods or services which satisfy the needs of the customer" (Telsang, 2017).

1.2 Product Life Cycles

Product life cycles are distinguished from product categories to the other depending on the origin, nature... and utility of the products. The cycles can take a few days (a pen or textbook), months (fashions), years (Mobile or video game), or decades (aeroplane). The cycle length in the previous examples has the same task process to design and to create new products (Figure 9).

Figure 9. Product Life Cycles



Source: Heizer et al.,2020.

In the picture above, we can see the four product life cycle phases which are (1) introduction, (2) growth, (3) maturity, (4) decline. Besides, we can understand the relationship between other concepts over the product life cycle phases. Those concepts are cash flow, product sales and profit.

Typically, we can note that the loss is higher in the introduction and the growth phases, but it will be recovered when the product is in the phase of maturity. Next in the phase of decline, the profit will be decreased. Hence, the demand for new products continues (Heizer et al., 2020).

1.3 Applied Strategies Through the Life Cycles Stages

Developing new products requires in parallel the development of strategies for new products and existing ones. According to Heizer et al.,2020, *“Successful product strategies require determining the best strategy for each product based on its position in its life cycle. A firm, therefore, identifies products or families of products and their position in the life cycle”* (Heizer et al.,2020). And these are some products options strategies in its different life cycles phases proposed by the same authors:

a. The phase of the introductory

“Because products in the introductory phase are still being “finetuned” for the market, as are their production techniques, they may warrant unusual expenditures for (1) research, (2) product development, (3) process modification and enhancement, and (4) supplier development. At the same time, operations managers were still groping for the best manufacturing techniques” (Heizer et al.,2020).

b. The phase of growth

“In the growth phase, product design has begun to stabilise, and effective forecasting of capacity requirements is necessary. Adding capacity or enhancing existing capacity to accommodate the increase in product demand may be necessary” (Heizer et al.,2020).

c. The phase of maturity

“By the time a product is mature, competitors are established. So high-volume, innovative production may be appropriate. Improved cost control, reduction in options, and a paring down of the product line may be effective or necessary for profitability and market share” (Heizer et al.,2020).

d. The phase of decline

“Management may need to be ruthless with those products whose life cycle is at an end. Dying products are typically poor products in which to invest resources and managerial talent. Unless dying products make some unique contribution to the firm’s reputation or its product line or can be sold with an unusually high contribution, their production should be terminated” (Heizer et al.,2020).

2 Production typologies

According to Courtois et al., 2011, the classification of enterprises can be carried out according to the three criteria which are, (1) quantities manufactured and their repetitiveness, (2) the organisation of production flows, (3) relationship with customers.

These criteria are not exhaustive, but they are fundamental because they help to determine the choice of production management methods that are the most suitable for each topology.

2.1 Classification by Serial Size

The first notable difference between companies is, of course, the importance of production. The quantities produced by different enterprises mark the importance of production for each one. These last can be classified and defined as (1) production by the unit, (2) production by small series, (3) production by medium series, (4) production by large series. For each type of these productions, there is a particular type of management and suitable implantation of the means required.

2.2 Classification by organization of production flow

In this classification, we can note three main types of production, (1) continuous production, (2) discontinuous production, (3) production by the project.

2.2.1 Continuous Production

We can find this type of production when processing large quantities of a product. The implantation is carried out in the production line. In this case, the implantation is linear and it is called a flow shop.

In general, this type of production is accompanied by this automation system of the production processes. As a result, the enterprises can obtain low cost and release a high quality.

2.2.2 Discontinuous Production

Discontinuous production is used to treat the relatively low quantities of many varied products. The implementation is carried out by functional workshops that group the machines according to the task they perform and the flow of products depends on the sequence of achieved tasks. These machines are able to carry out a considerable number of works. In this case, the implantation is linear and it is called a job shop.

2.2.3 Production by Project

In the case of project production, the product and the production process are unique and are not renewed (dam construction). The principle of this type of production consists of chaining all the operations leading to the completion of the project, minimising the dead time in order to deliver the product with a minimum delay or at the agreed time.

2.3 Classification by Client Relationship

In the classification according to the relationship with the customer, there are three types of production and sales, (1) sale on stock, (2) production to order, (3) assembly at the control.

2.3.1 Sale on stock

The customer buys products existing in the stock created by the enterprises. This type of production has two principal reasons which are (1) when the manufacturing time is longer than the delivery time requested by the customer. Then in this case and based on sales forecasts, it is necessary to produce in advance to satisfy the customer, (2) to produce large quantities and thus reduce costs.

2.3.2 Production to Order

Production to order is only started if there is a confirmed order based on a predetermined commitment from the customer. The stock of finished products is then avoided. Thus, it will be advantageous to choose this type of production when the delivery time corresponding to the production time is accepted by the customer. This organisation is required for non-standard products.

2.3.3 Assembly to Order

This type of production falls between the first two. Standard subassemblies are manufactured from stock. These sub-assemblies are assembled according to customer orders. This organisation significantly reduces the time between ordering and delivering a product. Indeed, the apparent delay is reduced when assembling the subassemblies. This organisation reduces the value of inventory and allows the customisation of finished products based on customer orders.

3 Production Models

Through the literature review, we can note that much of the research includes production as a system or a concept focused on singular concepts. These concepts are studying how the different practices and their result can influence the enterprise system.

A few papers have studied the multi-relationship between different concepts. This research tried to represent a partial or a holistic model of production management.

3.1 production models evolution of Bartezzaghi et al. (1999).

Bartezzaghi et al. in 1999, proposed five theses of the production model's evolution. These theses summarise the main interpretative approaches; (1) the dominant lean production model; (2) the production models indefiniteness; (3) the diversity of production models in various contexts; (4) the convergence of production models; (5) the development and emergence of new paradigms.

3.1.1 Dominant lean production model.

In this thesis, we can consider lean production as a process that helps to exit from the Fordist-Taylorist paradigm (Bartezzaghi et al., 1999). In addition, in the twenty-first century,

lean production will become the main global standard system for production (Womack et al., 1990).

Many research asserts that the concept of lean production is difficult to define and its practices are very confusing to describe the relationship between them. Indeed, the Japanese model considers it more as modification in the practical redundancy nature by moving from preponderant materials to essentially new organisational forms (Cattero, 1995).

Authors like Nomura in 1993 suggest that the bot of Toyotism and lean production systems can be surpassed. While other researchers like Shimuzu et al. (1993) claim that the Toyotism system must be revised and lean production should be developed. Therefore, the lean definition as it becomes no more valid our days.

Hence, lean production must not be interpreted as an infringe of the Fordist-Taylorist model; but we can consider it as an intensification and renewing of its basic features (Elegard et al., 1992; Bergren, 1994).

3.1.2 Production models indefiniteness.

According to Regini et al. (1989), *"Surpassing old organisational models does not automatically lead to the predominance and spread of a single alternative"*, so they group together a series of several positions. Besides, Bartezzaghi et al., explain that: *"The decline of the Fordist-Taylorist paradigm thus opens the way to different responses, since the disappearance of a leading model for the organisation of production and work relations, and the greater indeterminacy in choices have given more scope to local factors... A company's development does not depend exclusively on external pressures, but also on internal factors, in particular its past history, organisational know-how and learning processes, and the local context. Lutz and Hirsch-Kreinsen (1988) claim that it is not possible to define the trends in the evolution of production models, as economic conditions outside the company and the*

specific features of technology and the workforce generate diverse and contradictory demands and challenges on companies own rationalisation strategies” (Bartezzaghi et al., 1999).

The companies have to plan independent models in order to mould a strong and sustainable competitive advantage (Hayes et al., 1994). And it is impossible to guarantee the success of the developed models because of the various strategic approach to manufacturing choices.

3.1.3 Diversity of production models in various contexts.

In this thesis, the surpassing processes of Fordism-Taylorism results are definable, and it is based on a set of solutions that rely on the economic conditions, social and institutional context; it depends on the strategy of the company.

According to Engstrom et al. (1996), there are more classification models besides the Fordism-Taylorism model. They list four classifications which are (1) Japanese lean production; (2) German diversified quality production; (3) Swedish reflective production also called Volvoism or the Uddevalla model and (4) flexible specialisation based on customised products.

In addition, Streeck (1992) claimed that the second classification is based on a rational system, a qualified workforce and social consensus. Besides, the third and the second classification is closely similar, except that they are different in the training and qualification of the workforce (Ellegard et al., 1992; Berggren, 1994; Sandberg, 1995; Engstrom et al., 1996)

3.1.4 Convergence of production models.

The author in this thesis proposes that the differences between the new production models will be decreased in the development phase.

Mertins et al., in 1996 highlight the convergences in production systems, product development, and work organisation that are used by companies in different regions like Japan, the US and Europe. Particularly, they found that the organisational aspects have a common trend towards creating a flexible and high-performance team in the context of the learning organisation.

Although the difficult choice of the production model, Bonazzi (1993) has suggested both western and Japanese companies would tend to develop similar models.

The difference between the both has appeared in the use of the high technologies and the minimising the cost and operations of production for the western enterprises and the Japanese concentrated in organisation system enhancing than they used technology.

3.1.5 Development and emergence of new paradigms.

Bartezzaghi et al. (1999) Explain that “... *there is a movement not towards a single post-Fordist model, but towards a coherent body of shared principles for the planning and management of production systems which bring together various models and practices from different sectors, countries and types of company. This is the argument of various studies cited above, such as Roobeek (1987), Kenney and Florida (1989), Boyer (1993) and, from a more strictly management point of view, Hayes et al. (1988), Dertouzos et al. (1989), Drucker (1990) and Zeleny (1995). The author has also shared this opinion from its initial formulation (Bartezzaghi, 1992) and subsequently extended and refined (Spina et al., 1996).*

The concept of the paradigm is that of development, a search, even a plan and for a meta-model. According to Zeleny (1995), the paradigm is a management system that is not a collection of techniques, methods and approaches, but rather a coherent body of interdependent criteria and logic in the spheres of organisation, management, decision-making and motivation. The components of this system are found in different moments, countries,

companies, and conditions which began to come together in the approaches of a growing body of innovative companies.

The problem thus becomes one of identifying the basic principles which come to define the paradigm. Schuring (1996), for example, in analysing the similarities and differences between work groups in lean production and those in socio-technical models, such as reflective production, uses the principle of operational autonomy” (Bartezzaghi et al., 1999).

In the following table, we regroup several proposals presented by the various researchers for defining this paradigm. (Table 8).

Table 8. Some proposed aspects and components

Authors	Proposed aspects or components
Dertouzos et al. (1989)	<ul style="list-style-type: none"> - simultaneous improvements of quality; - costs and service ; - proximity to customers; - close relations with suppliers; - use of technology to build competitive advantage; - flat organisations with greater inter-functional integration; - innovative human resources policies.
Zeleny (1995)	<ul style="list-style-type: none"> - The horizontal corporation ; - re-engineering of the process ; - mass customisation ; - autonomous teams or cells; - customer integration; - intra-company market; - supplier integration; - elimination of trade-offs.
Boyer (1993)	<ul style="list-style-type: none"> - Network of interdependencies; - A body of organisational criteria and logic; - The mode of social regulation.
Kenney and Florida (1993)	Innovation-mediated production
Goldman et al. (1995)	Agile Manufacturing
De Meyer (1993) ; Upton and McAfee (1996)	Virtual manufacturing
Nakane and Hall (1991) and Mathews (1995)	Holonic manufacturing
Okino (1989)	Bionic manufacturing
Warnecke (1993)	Fractal manufacturing

Source: Proposed by the Candidate based on Bartezzaghi et al. (1999) study.

In general, the companies can identify many common aspects of diverse models and distinguish their effects from the aspects caused by strategic choices, contingency factors and differences in the development paths.

Focusing on the managerial and the strategic dimension of the production practices, this research will demonstrate three production management models. These models are the most representative of our proposal.

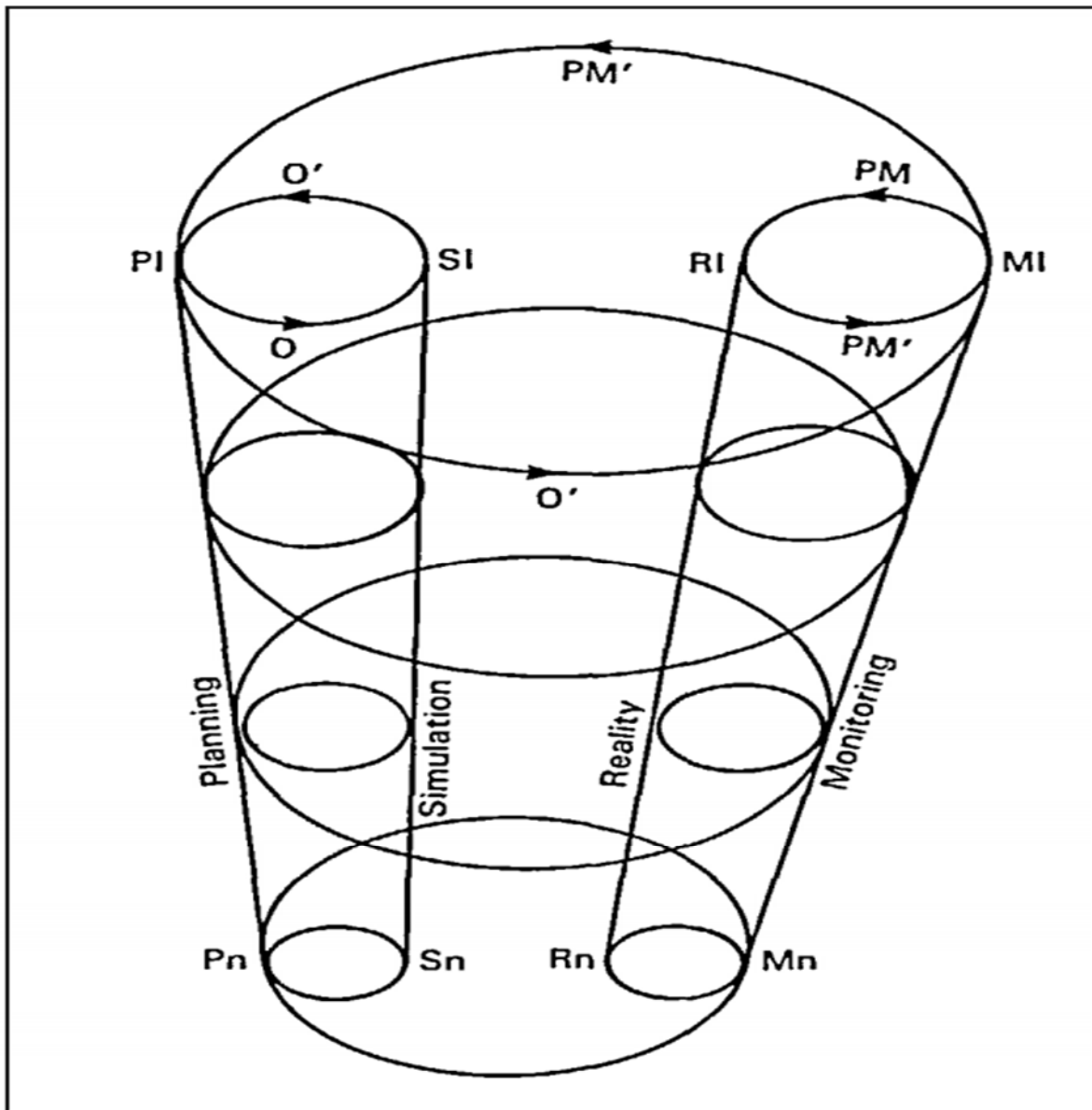
3.2 Production Management Based on Two-dimensional Function

Andy Neely (1993) suggested that there are two main aspects to production management. Firstly, the enterprises have to satisfy their consumers more effectively and efficiently than competitors. Secondly, the enterprise has to improve continually its current position in the market. Hence, he proposed a production management model based on the process with two dimensions (Figure 10). This dimension operates at:

(1) *“The qualifier level this is the set of activities which are needed to plan and control the manufacturing process, to ensure the organisation achieves its goal, by meeting the current requirements of the consumer.”*

(2) *“The improver level this is the set of activities which are used to continually enhance the organisation's performance by constantly increasing the efficiency and effectiveness of consumer satisfaction.”*

Figure 10. Production Model of Neely



Source: Neely, 1991

In this model, the author expresses the links between the four processes that are proposed by Zebiri et al. (1989), which are (1) planning, (2) simulation, (3) reality and (4) monitoring. The Zebiri's model depends on the aspects of computer-aided production management. But Nelly (1991) studied the link between these processes in terms of two concepts which are the objectives and the performance measures.

In this case, the objectives represent the output of planning (P1) and they are evaluated before they are linked to the simulation process (S1). Next objectives have been established and they are modified (O') and feedback to the planning process. In this stage, the production management system has to check the feasibility of the predefined objectives. This operation is executed in a loop. In the next stage, the modified objectives are all imposed on reality (R1) via a monitoring system (M1). This objective represents the input of monitoring systems. The performance measures (PM) its output, then (PM') fed back to (P1) via (M1) and it represents the new inputs for future running.

Nelly (1991) also explains that *“the same process should take place at the improver level of production management. Objectives should be set which identify improvements to the process that are required and performance against these objectives monitored. Dixon et al. (1990) provide an example of this when they discuss the concept of the half-life for process improvements. If, for example, the objective is to reduce the number of defects per million components then the time taken to halve the number of defects will be recorded. The next objective set would be to repeat the reduction process, that is half the number of defects again, but in the same length of time. Hence an objective is set and performance is monitored and used to set the next objective...The definition is consistent with both the traditional planning type definitions of production management as well as current academic thinking and industrial practice. Recent production management philosophies, such as just-in-time (JIT), emphasise the importance of continual improvement of the manufacturing processes. Other philosophies, such as total quality management (TQM), emphasise customer satisfaction. Coupling these concepts allows us to highlight priority areas for improvement”* (Nelly, 1991).

3.3 The integrated production management model based on Knowledge.

Muniz et al., (2010) proposed a new production model based on knowledge dimension integration and both traditional dimensions, the production and work organisation.

Based on many research in the literature review, the authors regroup several factors which are categorised on three proposed dimensions (Table 9). These factors concentrate on the production system or the environment of the shop floor and they demonstrate the integrated knowledge relevance in the production management model.

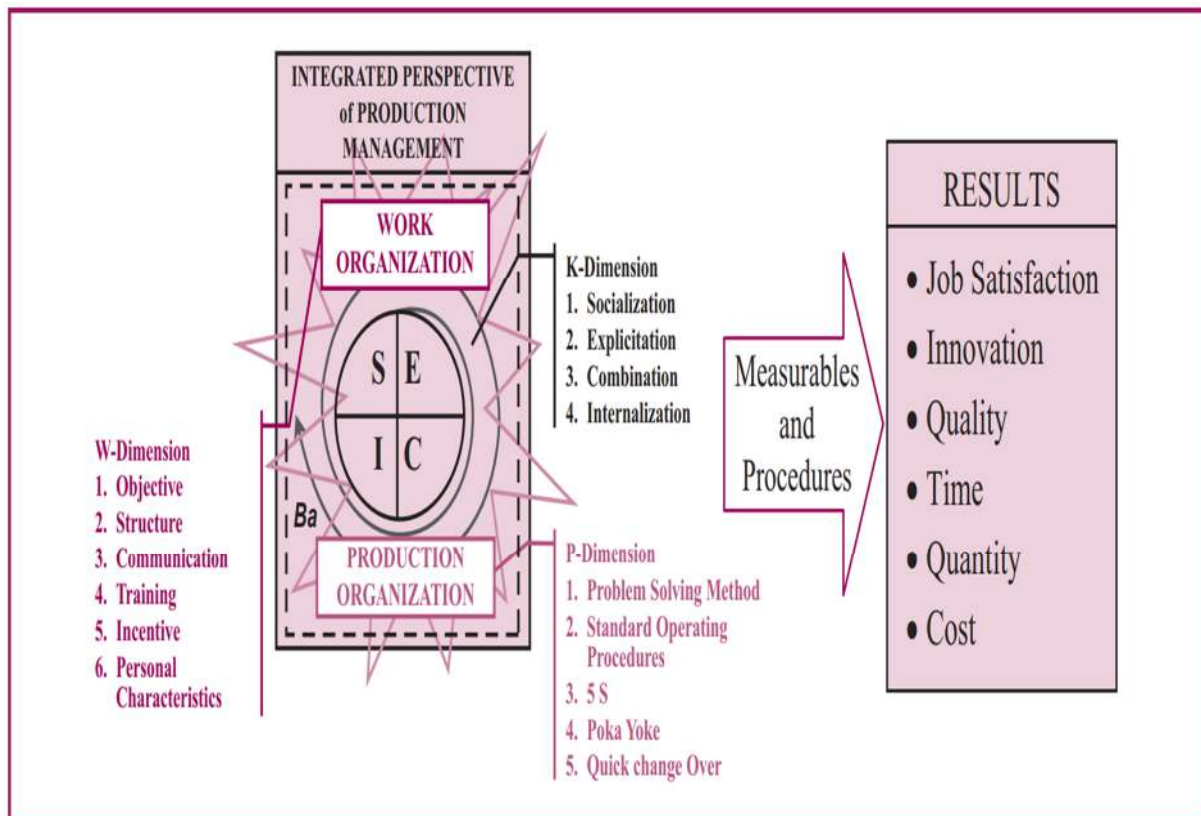
Table 9. The production model dimensions of Mauniz et al.

Code	K - Dimension				W - Dimension						P - Dimension																																																	
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Source: According to Mauniz et al. (2010).

The knowledge-based production management model (K-PMM) highlights the importance of the role of the knowledge and other factors to provide favourable content for the sharing of the knowledge, to maintain the improvement of production operations, and to reach good results (Figure 11).

Figure 11. The K-PMM including dimensions and factors



Source: Mauniz et al. (2010).

The P-dimension refers to a set of processes, activities, equipment and materials flow. This dimension has a role in defining, managing and enhancing the production operations in order to lessen the defects and to minimise the manufacturing time, product model changeover, hours of tasks and costs.

The W-dimension refers to a set of methods, content and role of jobs and responsibilities. In addition, on the one hand, this dimension focuses on skills, behaviour, capabilities, and other different human aspects. And on the other hand, it supports the interaction between the

operations and the organisation through training, incentives, communication, work structure ...etc.

The K-dimension refers to various knowledge processes management, its role is to promote the combination between the P-dimension and the W-dimension using knowledge measures, knowledge use, knowledge identification and sharing activities.

According to Nonaka 1994, the Ba processes consist of socialisation, externalisation, combination and internalisation process and its expected role is firstly to support the built of knowledge, to stimulate teamwork, to develop and improve the transferring of the individual knowledge to organisational knowledge and the transforming the tacit knowledge into explicit knowledge and at last to stimulate the work on the problem as a learning or training process.

In addition, Muniz et al., (2010) explain that *"...the integration of K, P and W dimensions lead to improvement activities, such as problem solving, kaizen projects, waste reduction, standard operation procedure elaboration and reviews. Those activities are the result of people's interaction in a working group and of their knowledge application in the production environment. Kaizen improvement activities, applied continuously, incrementally and in a participative way for obtaining results, are in line with the socio-technical model. Brunet and New (2003) state that kaizen activities must be outside contractual scope... related to the W-factors, there must be formal support (W-STR, structure) and time allocation (W-COM, communication by meetings) for improvement activities. Therefore, kaizen activities must be carried out, routinely, for improvement, without conflict with production objectives (e.g., pieces produced per day)"* (Muniz et al.,2010).

3.4 Maturity Model for Production Management by Anna Kosieradzka (2017)

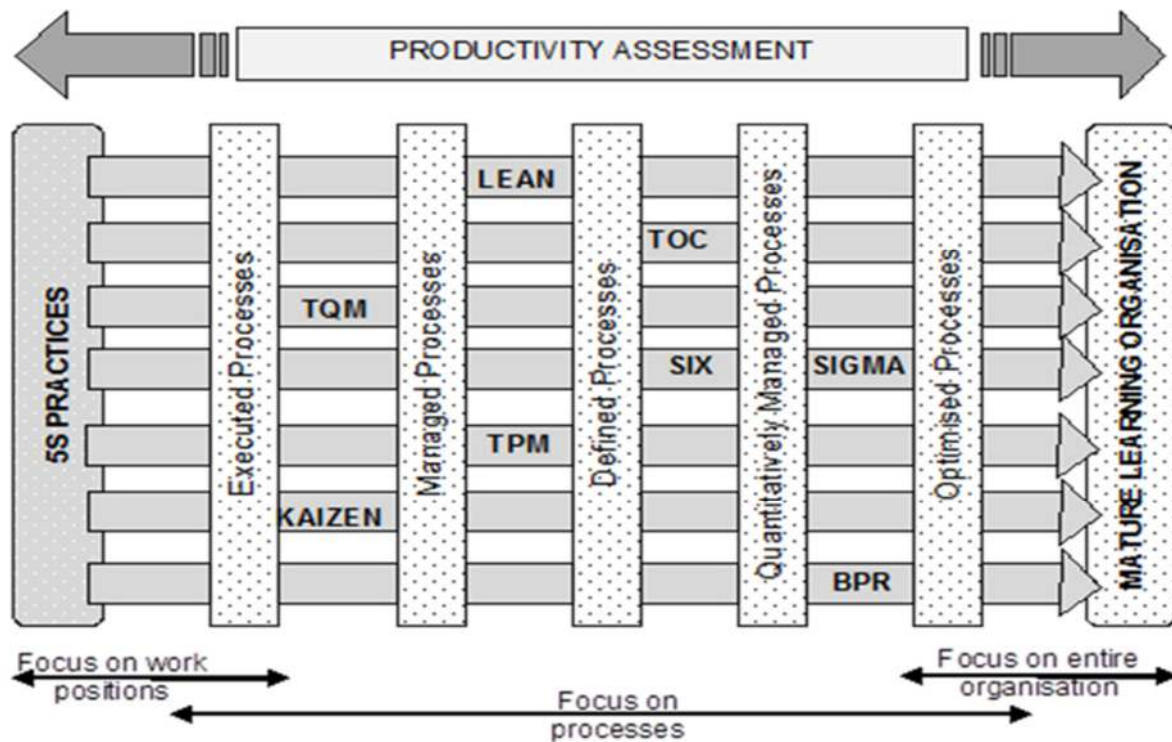
In this model, Kosieradzka (2017) developed a production management model based on five levels of maturity that were initially developed by Chrissis et al. (2003) (See table 10). For each level of maturity, she assigned a specific set of production practices as shown in figure 12 and table 10.

Table 10. Maturity levels for production processes by Chrissis et al. (2003).

Maturity Level	Status of production processes	Description
Level 1	effectively executed production processes	targets are met (adequate products are manufactured in the right quantity and on time) – but these processes are not iterative or predictable, which makes it impossible to control progress
Level 2	managed production processes	production targets are met as a result of implementing plans and progress is monitored for consistency with plans
Level 3	defined production processes	production targets are met in processes defined (described) in line with the process approach parameters
Level 4	quantitatively managed production processes	quantitative and qualitative targets and performance control tools have been defined for individual processes and their constituents (operations)
Level 5	optimised production processes	processes are continuously improved and adapted to changing environment and corporate strategy

Source: Kosieradzka (2017).

Figure 12. Maturity Model for Production Management.



Source: Kosieradzka (2017).

The author emphasises the notion of the absence of coordination that can lead to the complexity of the enterprise management and can lead to failure when the enterprise tries to implement advanced tools or techniques. And she suggested, that in order to achieve excellence in the production management field, the enterprise needs to ensure the simultaneous and coordinated application of various contemporary concepts of management which are mentioned in table 11.

Table 11. Profile of Maturity Model for Production Management.

Concept	Area	Maturity level				
		1	2	3	4	5
5S	5S Practices	■	■	■	□	□
LM	Waste elimination	■	■	■	□	□
	LM principles	■	□	□	□	□
	Leveling – one piece flow	■	□	□	□	□
	VSM – Value Stream Mapping	■	□	□	□	□
	Pull system – kanban	■	□	□	□	□
	Standardization	■	□	□	□	□
	Supplier partnering (JIT)	■	■	□	□	□
TPM	SMED	■	■	□	□	□
	TPM – principles	■	□	□	□	□
TQM	Mistake proofing – Poka Yoke	■	■	□	□	□
	Quality management system	■	■	□	□	□
	TQM – principles	■	■	□	□	□
Six Sigma	Six Sigma – principles	■	□	□	□	□
Kaizen	Kaizen – Continuous improvement	■	■	□	□	□
TOC	TOC – principles	■	□	□	□	□
BPR	Process management and BPR	■	□	□	□	□
	Target production maturity profile	■	■	■	□	□
	Current production maturity profile	■	■	■	□	□

Source: Kosieradzka (2017).

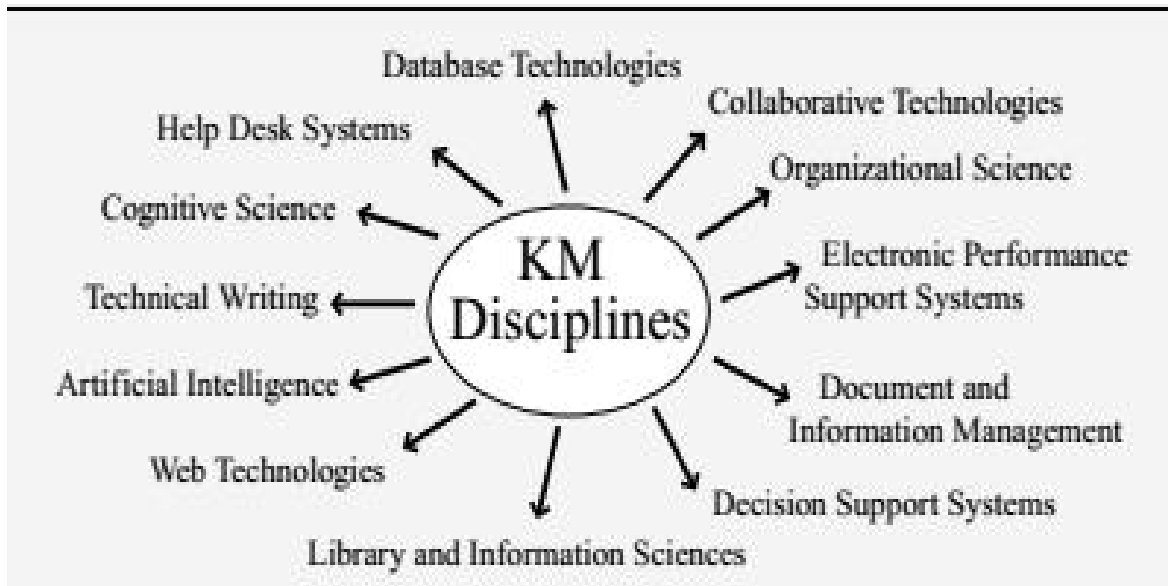
4 Knowledge Management

4.1 Knowledge Management Definition

According to Richards (2002), knowledge management is a valuable and efficient capital and it represents a critical factor that can determine the competitive situation of the company. Knowledge management is considered as an intangible asset and a vital indicator for organisational success (Allameh et al., 2014).

Dalkir (2005) claim that knowledge management is a multidisciplinary concept that represents a set of attributes necessary to create a knowledge management system as a discipline and a practice area (Figure 13). In addition, Dalkir has defined knowledge management depending on three perspectives which are (1) business perspective, (2) the knowledge science perspective, and (3) the technology and process perspective. From the first perspective, he defined knowledge management as a business activity based on the treatment of the knowledge component as an explicit interest and the practice at the whole enterprise levels and ensuring a direct link between an intellectual asset of the company. Secondly, from the cognitive science perspective, he considers knowledge as the fundamental resources (the insights, perception, reflection, technology, practices ...) that lead us to the right way to augment the effectiveness. Finally, knowledge management is a concept that can be turned into practical knowledge; and made it obtainable form that can apply.

Figure 13. The nature of knowledge management interdisciplinary.



Source: Dalkir (2005).

Uriarte (2008) defined knowledge management as “... *the process through which organisations generate value from their intellectual and knowledge-based assets... knowledge management is concerned with the process of identifying, acquiring, distributing and maintaining knowledge that is essential to the organisation*” (Uriarte, 2008).

Besides, knowledge management can be defined as “...*the practice of selectively applying knowledge from previous experiences of decision-making to current and future decision-making activities with the express purpose of improving the organisation's effectiveness...*” (Jennex, 2007).

In addition, it exists many definitions of knowledge management suggested by numerous researchers; but we can define it very simply as the transformation of the tacit knowledge into explicit knowledge, and sharing this knowledge between different actors (Table 12).

Table 12. Different definitions of Knowledge Management Uriarte (2008).

N	Authors	Definitions
1	Thomas Bertels	« Knowledge management is the management of the organisation towards the continuous renewal of the organisational knowledge base - this means, for example, the creation of supportive organisational structures, facilitation of organisational members, putting IT-instruments with emphasis on teamwork and diffusion of knowledge (e.g. groupware) into place ».
2	Denham Grey	« Knowledge management is an audit of "intellectual assets" that highlights unique sources, critical functions and potential bottlenecks which hinder knowledge flows to the point of use ».
3	Gregory Wenig	« Knowledge management consists of activities focused on the organisation gaining knowledge from its own experience and from the experience of others, and on the judicious application of that knowledge to fulfil the mission of the organisation ».
4	Rebecca O. Barclay and Philip C. Murray	« Knowledge management is a business activity with two primary aspects: (a) treating the knowledge component of business activities as an explicit concern of business reflected in strategy, policy, and practice at all levels of the organisation; and (b) making a direct connection between an organisation's intellectual assets - both explicit (recorded) and tacit (personal know-how) - and positive business results ».
5	Megan Santosus and Jon Surmacz	« Knowledge management is the process through which organisations generate value from their intellectual and knowledge-based assets ».
6	Wally Bock	« Knowledge management is a process with four parts that includes a loop: knowledge is created, knowledge is captured, knowledge is classified and modified, and knowledge is shared.
7	Asian Development Bank	Knowledge management is the way organisations create, capture, enhance, and reuse knowledge to achieve organisational objectives ».
8	David Smith	« Knowledge management is the strategy and processes to enable the creation and flow of relevant knowledge throughout the business to create organisational, customer and consumer value ».
9	University of Texas	« Knowledge management is the systematic process of finding, selecting, organising, distilling and presenting information in a way that improves an employee's comprehension in a specific area of interest ».
10	UN Knowledge Management Workshop	« Knowledge management is a collection of activities, processes and policies, which enable organisations to apply knowledge to improve efficiency, innovation and quality ».
11	Wally Bock	« Knowledge management is the way that organisations create, capture and re-use knowledge to achieve organisational objectives ».
12	KMTool Community	« Knowledge management is information or data management with the additional practice of capturing the tacit experience of

N	Authors	Definitions
		<i>the individual to be shared, used and built upon by the organisation ».</i>
13	Peter Novins	<i>« Knowledge management is organising information from disparate sources into a context that reflects the business and the decisions and processes of the business ».</i>
14	Economic and Social Commission for Western Asia	<i>« Knowledge management is the identification and mapping of intellectual assets within an organisation, the creation of knowledge for competitive advantage, the conversion of vast amounts of available corporate data into accessible information and the distribution of best practices ».</i>
15	OIC Document Management	<i>« Knowledge management is the process of capturing value, knowledge and understanding of corporate information, using IT systems, in order to maintain, re-use and re-deploy that knowledge ».</i>
16	CIO Magazine	<i>« Knowledge management is the process through which organisations generate value from their intellectual and knowledge-based assets ».</i>
17	Felix Weigel	<i>« Knowledge management is concerned with organising knowledge repositories so as to allow for easy retrieval and exchange of the information stored therein ».</i>
18	Tenrox PSA	<i>« Knowledge management is a streamlined approach at improving knowledge sharing across the entire organisation ».</i>

Source: Candidate's adaptation based on Uriarte, 2008.

4.2 Knowledge Management Translation into Business Terms

According to Milton and Lambe (2020), the interpretation of Knowledge Management in terms of business can solve three types of business problems aiming to guarantee effective and efficient functioning. These three types include:

Coordination: Each enterprise has to effectively coordinate its processes, activities, maintain shared objectives, expertise and avoid mistakes. To achieve the best result from the previous concepts, the managers can be based on three business issues which are;

- Collaboration: that helps to regroup together knowledge from all parts of enterprise in order to develop the ways of realising the work;

- Situation awareness: the enterprise must ensure that each team communicate effectively with the rest of the workgroups by using several tools like shared knowledge bases, task flows, checklists and standards templates ...etc.

- Document and information management: the enterprise should have a flexible information system that enables easy accessibility to different important shared documents and all other forms of information.

Memory: As people come and go, the enterprise has to keep track of its decisions, plans, commitments and activities in order to conserve the capabilities such as partner relationships, skills and experiences. For that, the enterprise can keep records of knowledge to ensure the documentation of the essential knowledge which consists of decisions, activities and plans, and it can maintain the capabilities over time to avoid the loss of critical knowledge and capabilities when employees quit or retire or transfer them to the new replacing workforce.

Learning: The enterprise must be able to adapt its practices to the external changes and internalise what it learns. In this issue, the enterprise can speed up the learning curve, meaning, that employees have to deal with the job of the new work areas very quickly.

In this issue, continuous improvement has a significant role. It can help to not repeat the same mistakes and it can create new knowledge from its solutions and successes by using a business intelligence system to collect, analyse and disseminate information from the internal and external environment.

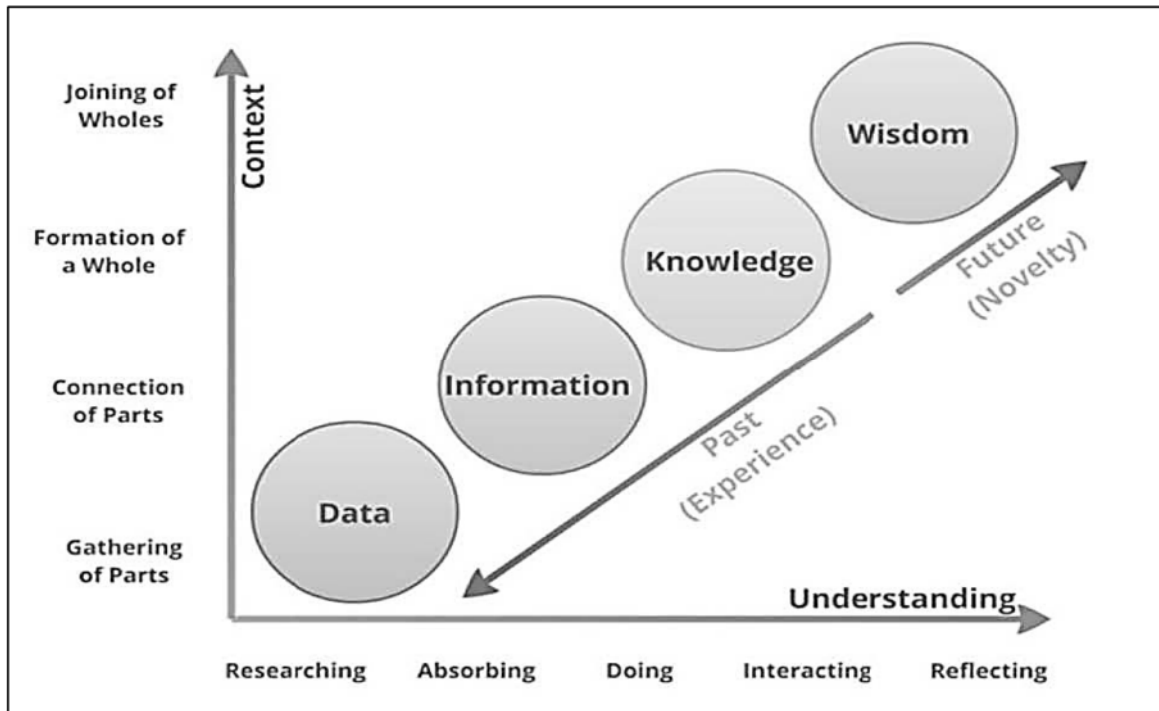
4.3 Knowledge nature and types

Through the literature review, we notice the existence of four main characteristics or nature of knowledge as well as are mentioned in the model of Ackoff or what so-called DIKW pyramid or hierarchy (Figure 14).

The DIKW model shows two categories of knowledge characteristics. The past experiences or as called also accumulated experiences (Hartani and Maliki, 2020) consists of (1) raw data (facts, numeric character, symbols...etc.) that have no meaning (Williams, 2014), (2) information that represents the interpreted cleaned data with meaning (Mieir, 2009) and it can produce a new useful data patterns and trends (Mieir, 2009; Becerra-Fernandez, Sabherwal, 2015), and (3) knowledge is reproduced in the individual brain, and it represents a combination of the processed data or information in context and experiences (Gottschalk, 2007).

From another hand, the novelty or the future experiences represent wisdom which is the high-level nature of knowledge. Indeed, wisdom is a deep individual understanding; learning, insights, judgment, and situations that help to achieve the goals of the enterprise with minimum costs and time (Ermine & et al., 2012).

Figure 14. DIKW hierarchy Model of Ackoff



Source: Williams, 2014.

According to Nonaka and Takeuchi (2001), we can distinguish two principal kinds of knowledge, which are tacit knowledge and explicit knowledge. The tacit knowledge is personal, has an abstract character and represents all resources that are hard to be formalised and expressed or shared but the explicit knowledge is more formal (it has not an abstract character), it can be processed by computers and represents all resources that can be represented as words form or numbers, so they can be easily shared (Puusa et al., 2010) (Table 13).

More clearly, we can say that the transformation between tacit knowledge and explicit knowledge represents the depth of knowledge management in the enterprise (Dalkir, 2005), and the real challenge is how to support this transformation within the enterprise (Matta, et al., 2016). In addition, this transformation “*requires at the same time human resources where man is at the heart of the system, and technical means to ensure management and exploitation of information flow*” (Datoussaid, 2019).

Table 13. Explicit and Tacit knowledge characteristics.

Tacit Knowledge	Explicit knowledge
<ul style="list-style-type: none"> - Products, patents, code, databases, technical drawings, tools, prototypes, audiovisuals, operating procedures. 	<ul style="list-style-type: none"> - Transfer “depends on the credibility of the transferer” and is “most effectively achieved through face-to-face interaction”. - Learned through observation and imitation; shared through analogies, metaphors, and stories.
<ul style="list-style-type: none"> - Codified, formal, systematic, reports, manuals, documents 	<ul style="list-style-type: none"> - Experimental, intuitive, communicated through face-to-face collaboration.
<ul style="list-style-type: none"> - Easily codified. 	<ul style="list-style-type: none"> - Primarily transferred through direct interaction between individuals.
<ul style="list-style-type: none"> - Data, instructions, simple factual information, work progress, status. 	<ul style="list-style-type: none"> - Big picture issues, company information/rumors/gossip, needs, new ideas, insight, intuition, problems, concerns, issues.
<ul style="list-style-type: none"> - Handbooks, lectures, databases, textbooks, manuals, newsletters. 	<ul style="list-style-type: none"> - Intuition, rule-of-thumb, gut feeling, personal skill.
<ul style="list-style-type: none"> - Know-what, know-why, know-how, copyrights, patents, trademarks. 	<ul style="list-style-type: none"> - Mental models, beliefs, persuasions, care-why
	<ul style="list-style-type: none"> - Transferred through face-to-face interaction, observation, imitation, practice, shared-experiences based on trust.
<ul style="list-style-type: none"> - Academic, know-what, print or electronic media, manuals, mathematical expressions, copyrights, patents. 	<ul style="list-style-type: none"> - Practical, action-oriented, know-how, resembles intuition, mental models, values, beliefs, perceptions, insights, assumptions. Exchanged through “knowledge fairs, learning communities, study missions, tours, advisory boards, job rotation”.
<ul style="list-style-type: none"> - Documents, blueprints, manuals, patents. 	<ul style="list-style-type: none"> - Rules-of-thumb, tricks of the trade, heuristics, estimation and envisioning capability, physical maneuvering, efficiency enhancing, image formation and recognition, and handling of human relationships.
<ul style="list-style-type: none"> - Mathematical formulas, training manuals, product literature, computer software. 	<ul style="list-style-type: none"> - Shared through highly interactive conversation, storytelling, shared experience

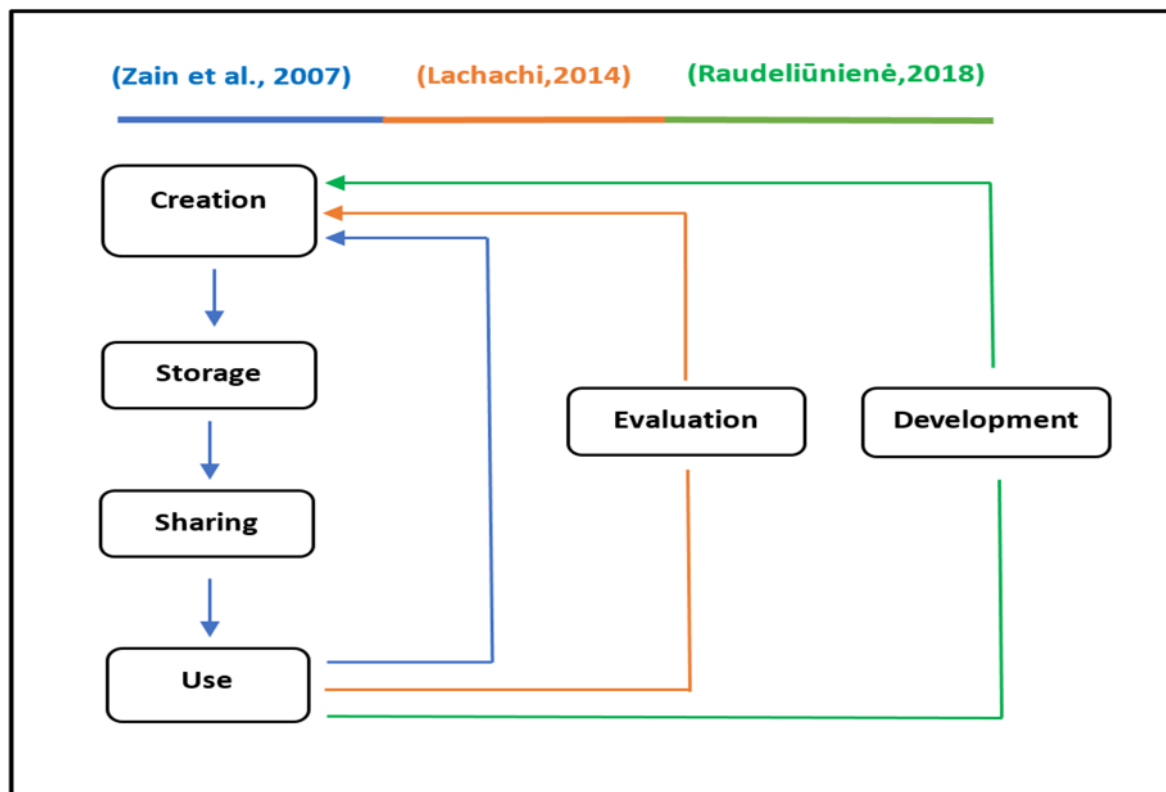
Source: Holste and Fields, 2010.

4.4 Knowledge management process

Most of the research defines four types of knowledge management processes. These processes are knowledge creation (Zaim et al., 2007; skyme, 2001; Matta et al., 2016), knowledge storage (Bayyurt. N, et al., 2013; skyme, 2001; Zaim et al., 2007), knowledge share (Wilde, 2011; Nielsen, 2006; skyme, 2001; Zaim et al., 2007), and knowledge utilisation (Ramachandran et al., 2010; Bayyurt et al., 2013; Zaim et al., 2007; skyme, 2001).

According to Lachachi (2014), in addition to the previous processes, the enterprise has to effectively improve and develop the knowledge management processes by adapting an evaluation process (Lachachi et al., 2015). Instead of the evaluation process, Raudeliūniene (2018) propose a development process (Figure 15).

Figure 15. Knowledge Management Process



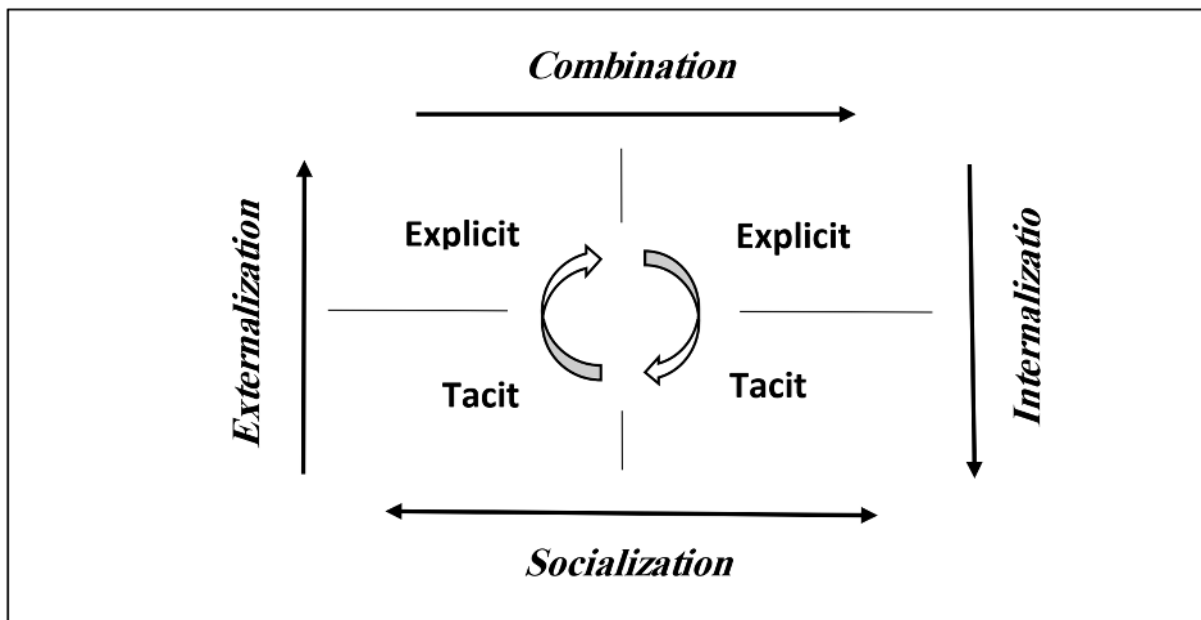
Source: developed by the Authors

4.5 The spiral model of Knowledge

Nonaka et al., (1995) proposed a knowledge model as a result of studying the success of achieving Creativity and Innovation within Japanese enterprises. This model is called the Knowledge Spiral or SECI Model (Figure 16).

According to Dalkir (2005), the spiral model can consider as the heart of the knowledge process and it can be proposed as a holistic model to create knowledge in the company.

Figure 16. The Spiral or SECI Model of Knowledge



Source: Matta et al. (2016).

From the previous figure, we can explain the conversion of knowledge as the following:

- Tacit to tacit transformation or “*Socialisation* “:

In this stage, the employees acquire tacit knowledge and develop a shared mental model by sharing information and experiences; observing others; and the practice.

- Tacit to explicit transformation or “*Externalisation* “:

In this stage, the tacit knowledge is clearly articulated by launching discussions between individuals in order to develop new schemes and plans of knowledge codification.

- Explicit to explicit transformation or “*Combination*”:

In this stage, the juxtaposition of various explicit knowledge can generate new knowledge by creating documents, manuals and databases, for example.

- Explicit to tacit transformation or “*Internalisation*”:

This stage can also be called a process of learning by doing. This process occurs when the individuals share their technical know-how and mental models.

Conclusion

In the first part of this chapter, we present different general concepts definitions of Production Management. Then, we have focused on the definitions of Production, the various production typologies and we have visualised important production models conserving the managerial and the strategic aspects.

In the second part, we have talked about Knowledge Management concepts. Besides, we have mentioned the main points like definitions, knowledge types, Knowledge Management Process and Knowledge Spiral Model.

Both the previous axes need a new framework based on modern technologies and digitalization to keep pace with the current extreme developments and ensure their survival in the market.

Chapter Three:

Coronavirus Pandemic and the Digital Era

Introduction

The digital world has been accelerated by the rapid development of the Covid-19 pandemic (Kotler et al., 2021). The industrial revolutions and the marketing revolutions can be considered as a trend in the field of scientific research.

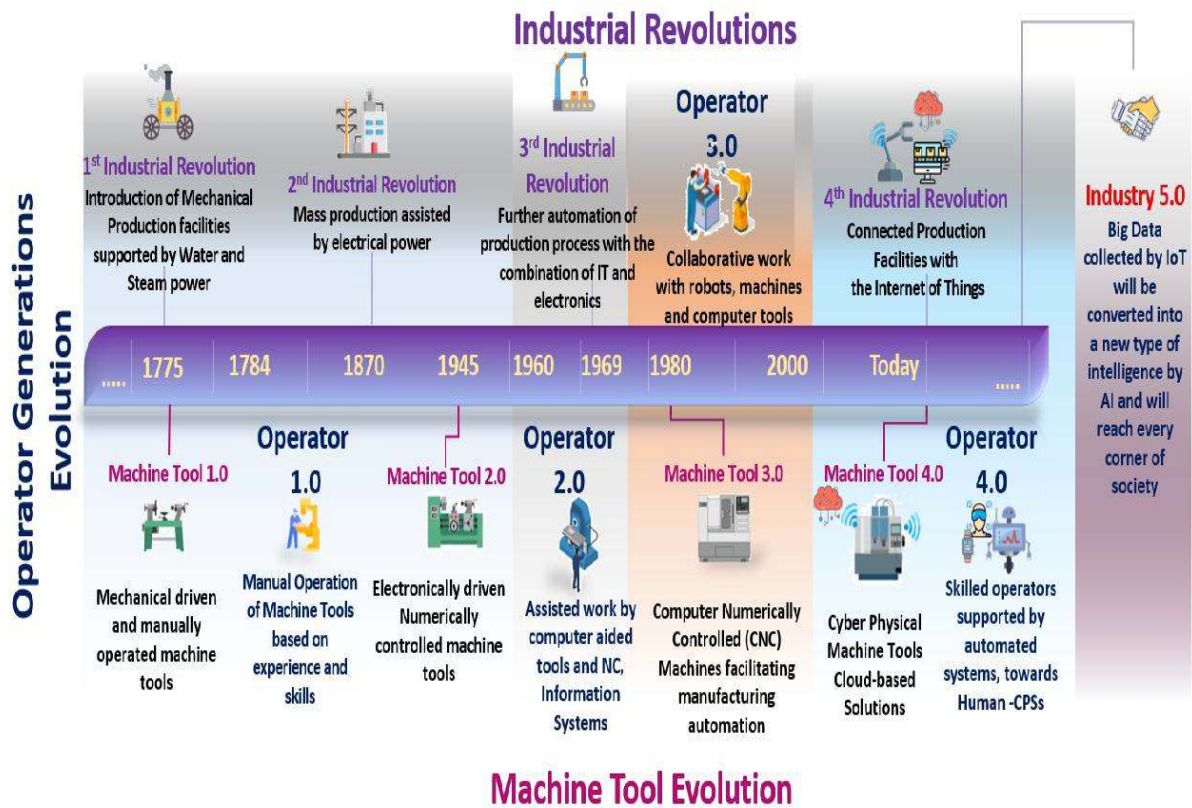
The main challenge is the great acceleration of the digital concept and the re-understanding of this concept in new and particular circumstances.

In this chapter, we will talk about general concepts of the industrial revolutions and the Marketing generations, besides the economic impact of the Covid-19.

1 Industry Revolution development

A lot of opportunities and challenges for the future of manufacturing are created as a result of the increasing integration of artificial intelligence (Mourtzis, 2021). Industry 5.0 is the main goal of the majority of the leaders even though industry 4.0 is still in its way of development. The new situation of the Covid-19 pandemic makes the transformation toward the high and the advanced technologies one of the best solutions to face the different failures in the future. This last industry generation basically relied on the third and the fourth generation of the industry (Figure 17).

Figure 17. The Industry, Machine and Operator Evolution



Source: Mourtzis, 2021.

1.1 The first Industry Revolution (IR 1.0): “Mechanisation Generation”

The first industrial revolution (IR 1.0) was based on mechanical production. The IR 1.0 depends on human physical labour in both industrial and agricultural sectors (Aslam et al., 2020). In this period, from 1780 to 1820, its main changes were represented in the transfer from the agricultural production system (rural system) to manufacturing production systems (Mourtzis, 2021; Narvaez Rojas et al., 2021). These changes can consider as the most important and significant changes in human history, in terms of economic, technological and social concerns (Mourtzis, 2021).

The new technology led to an eight-time increase in the produced quantities compared to the rural labour system in the same period (George and George, 2020; Pilevari and Yavari, 2020). In this period, the technology was based totally on steam power and led to manufacturing productivity improvement and development (George and George, 2020; Narvaez Rojas et al., 2021; Pilevari and Yavari, 2020).

On another side, the use of steam power in the engines of the different means of transport, like ships and automotive help to reduce the time in transportation of peoples and merchandise, especially on very long distances (Mourtzis, 2021; Pilevari and Yavari, 2020).

1.2 The Second Industry Revolution (IR 2.0): “*Electrification Generation*”

The second generation of the industry relied on the power of electricity as the principal source of power to feed business engines or machines (George and George, 2020; Pilevari and Yavari, 2020). In the same period (from 1870 to 1914), other different sources appeared as well as oil-generated sources, transportation means development, automation machinery and communication systems (Narvaez Rojas et al., 2021).

As a result of this development, a new type of production system has been created which are the Mass Production and Assembly Lines Production (George and George, 2020; Narvaez Rojas et al., 2021; Pilevari and Yavari, 2020). These systems enable firstly a decrease in production cost and time and secondly an increase in the internationalisation process of the economy. In contrast, this new situation led to an augmentation of unemployment due to the automation of different business processes by integrating machinery systems that replaced the employees (Narvaez Rojas et al., 2021).

1.3 The Third Industry Revolution (IR 3.0): “Automation & Globalisation Generation”

The third industrial revolution (IR 3.0) was begun in the last of the 70s of the 20th century. It was developed especially in Japan, Europe, and the USA (Aslam et al., 2020; Mourtzis, 2021; Narvaez Rojas et al., 2021). This generation was also won by the Information Society which was founded based on the utilisation of microchips and integrated electronic components (Narvaez Rojas et al., 2021). In the same field, R&D policies had a very important priority in business development (Mourtzis, 2021).

Until the period of the 2000s, a new concept appeared which was Information and Communication Technologies (ICT) (Mourtzis, 2021; Narvaez Rojas et al., 2021). This new development required a new information paradigm perception (Narvaez Rojas et al., 2021). In addition, this third revolution was *“characterised by a shift to digital from analogue, modular products, and shorter product life cycles”* (Aslam et al., 2020).

1.4 The Fourth Industry Revolution (IR 4.0): “Digitalisation Generation”

According to Aslam et al. (2021), the fourth revolution of the industry commenced from 2000 to date. It is essentially based on big data, the Internet of Things (IoT), artificial intelligence, 3D printing, electric vehicles and cloud computing. Besides, we can also find the augmentation reality, robotics and another alias in order to enhance manufacturing automation (Narvaez Rojas et al., 2021).

In addition, Narvaez Rojas et al. (2021) suggest that the main goal of the IR 4.0 *“...was to design and develop subsequent transitions and adaptations of new information systems based on modern digital revolution infrastructures in a shorter time... In this way, emerging*

technologies of the Fourth Industrial Revolution directly impacted society by generating new ways to move and communicate, creating value, and distributing opportunities” (Narvaez Rojas et al., 2021).

On another side, George and George (2020) say that “...*Manufacturing systems that already have computer technology is being expanded by network connectivity and are equipped with a digital twin over the internet so to say. This will allow communication with other facilities as well as the output of information regarding themselves. The networking of all the systems is leading to cyber-physical production systems. Therefore, smart factories, where production systems, components, and individuals communicate through a network and manufacturing is almost independent” (George and George, 2020).*

Table 14. Key objectives of Industry 4.0

Technologies	Description
IIoT	The Internet of Things (IIoT) is one of the concepts in the virtual world. Lasers, global positioning systems and sensors are elements of connecting the virtual world to the real world. (Zhou, Liu, & Zhou, 2015)
Cyber physical system	Cyber physical systems are related to the real world. (Lu, 2017b) CPS and other digital technologies help to integrate the real world with the virtual world. These technologies create intelligent factories that accelerate energy production, logistics, transportation, and so on. (Lee, Kao, & Yang, 2014), (Zhou et al., 2015), (Lasi et al., 2014), (S. P. Singh et al., 2019)
Cloud computing	This technology is used as a computing solution to provide services on the Internet at an optimal cost. In fact, with this tool, users can share resources with the help of a dynamic memory and use software, hardware and other infrastructure to calculate data if necessary (Lee et al., 2014), (Lu, 2017b), (Zhou et al., 2015)
Agility and sequencing	The current method is a mechanism that enables the system to make adjustments and send parts based on the appropriate sequence in the production system based on the user's opinion and wishes. This method is based on the time and needs of the customer. (Lee et al., 2014), (Lu, 2017b), (Zhou et al., 2015)
Additional manufacturing	The application of this simple percentage technology in the factory of parts with the help of 3D printing. The mentioned technology improves the production and manufacture of products based on the customer's order and wishes and strengthens personalization in the Industry 4.0. (Lee et al., 2014), (Lu, 2017b), (Zhou et al., 2015)
Big data, data mining and data analytics	This concept is actually used to exploit and use large volumes of heterogeneous data on the Internet. This technology, along with data mining and data analysis techniques, improves data analysis and their use in production processes and leads to process optimization and cost reduction. (Lee et al., 2014), (Lu, 2017b), (Zhou et al., 2015)
Artificial intelligence	Artificial intelligence is a science that uses adaptive and collective intelligence to extract useful information when needed. Applied tools in this technology are machine learning and innovation algorithms. (Lee et al., 2014), (Lu, 2017b), (Zhou et al., 2015)
Coclub foot	A new generation of robots that has closed cooperation with humans without security restrictions. These types of robots can be programmed to facilitate use in production. (Lee et al., 2014), (Lu, 2017b), (Zhou et al., 2015)
Augmented reality	Augmented reality is used in cases such as the selection of warehouse parts and maintenance instructions for mobile devices and equipment. Augmented reality helps people to have the information needed to make the right decision at the right time. (Lee et al., 2014), (Lu, 2017b), (Zhou et al., 2015)
THAT IS / CAM	These programs are used to design and produce products using computer software. (Lee et al., 2014), (Lu, 2017b), (Zhou et al., 2015)
MY / SCADA	Manufacturing Execution Systems (MES) are computer systems used in manufacturing to track and document the conversion of raw materials into finished goods. (Lee et al., 2014), (Lu, 2017b), (Zhou et al., 2015)
Sensoring	This tool is used to improve the capabilities of robots and production processes such as measurement, reasoning and decision making. (Lee et al., 2014), (Lu, 2017b), (Zhou et al., 2015)
We demand manufacturing	To stay in the world of competition, providing customer needs and wants is the first priority of product manufacturers and service providers, so organizations must achieve customer satisfaction based on dynamic patterns and considering the agility in responding and setting priorities. (Lee et al., 2014), (Lu, 2017b), (Zhou et al., 2015)

Source: Pilevari &Yavari, 2020.

1.5 The Fifth Industry Revolution (IR 5.0): “*Personalisation Generation*”

The industry revolution 5.0 (IR 5.0) is based on the advancement and the future perspective of IR 4.0. Therefore, it has most of the characteristics of IR 4.0 and its distinctive features are centralised about digital smart society, innovation ecosystem, human centrality of technology, the virtual and physical spaces interpreted and brain-machine interfaces (Aslam et al., 2020).

According to Mourtzis (2021), the transition from the fourth generation to the fifth generation industry, which depends on the best practice and development in both human and machine domains, can help enhance business efficiency.

Table 15. The main characteristics of Industry 5.0

N.	Elements	Description	References
1	Clever materials	<ul style="list-style-type: none"> - Smart materials have changeable properties that change with temperature, humidity, light, etc. - These materials are used in various industries such as textiles, medicine and electronics and aerospace industries - In the 5.0 industry, smart material capabilities play an important role 	(X. Li, Shang, & Wang, 2017; Hakanen & Rajala, 2018; Yang et al., 2019; Haleem & Javaid, 2019a)
2	Clever devices	<ul style="list-style-type: none"> - Computing capabilities are a prominent feature of smart devices in Industry 5.0. - Ability to connect in smart devices for effective management and monitoring. - Internet-connected cameras in smart devices improve the operation control system. 	(Crutzen, 2005; Derby et al., 2007; Matindoust, et al., 2016; Shammar & Zahary, 2019)
3	Clever automatisation	<ul style="list-style-type: none"> - This element integrates different aspects of humans, software and machinery and improves their participation. - Automation system is effective for detecting process errors. - Machine learning in this system increases productivity in complex tasks and processes and is useful in reducing process time. 	(Mekid, et al., 2007; Butner & Ho, 2019; Pagliosa et al., 2019)
4	Clever systems	<ul style="list-style-type: none"> - Intelligent systems can be used in various parts of the supply chain, such as transportation, logistics, research and development, etc. - In industry 5.0, this system increases the ability to interact and react to environmental changes. - Intelligent systems enable the customer's personalised needs to be met at the required time 	(Dragcevic et al., 2007; Sykora, 2016; Xie, et al., 2019; Sakamoto et al., 2019)

Source: Pilevari & Yavari, 2020.

In addition, he said that *"...IR 5.0 implies people working together with robots and intelligent machines. It is about robots assisting humans to work better and more quickly by utilising advanced technologies such as the Internet of Things (IoT) as well as big data. It will add a human touch in accordance with the IR 4.0 pillars of automation and productivity.*

In production environments, robots have historically worked dangerous, repetitive or physically laborious work, like welding and painting in automobile manufacturing plants and loading or unloading heavy materials in the warehouses.

Since machines at the workplace come to be more intelligent and much more connected, IR 5.0 is targeted at combining those cognitive computing abilities with human cleverness and ingenuity in collaborative processes.

In IR 5.0, industrial robots that will be working safely and efficiently alongside humans. While industrial robots have been traditionally operated independently from employees and behind safety cages.

The collaboration of human and machine workers opens the door for numerous opportunities in the manufacturing industry. Since the used cases of IR 5.0 are currently still in its relative formative years, manufacturers must be actively organising ways to incorporate human and machine workers with a view to maximising the unique advantages that can be gained as this movement continues to develop" (Mourtris; 2021).

Table 16. Critical components of Industry 5.0

N.	Elements	Description	References
1	Internet of Things (IoT)	<ul style="list-style-type: none"> - Connecting devices and machines to the Internet changes the way the production system and supply chain change. - Tools and equipment are always monitored using control and monitoring tools. - With the Internet of Things, the experience of customers and manufacturers is increasing. 	(Makori, 2017; Pinochet, et al., 2018; Chatterjee & Kar, 2018; L. Li, 2018; Shammar & Zahary, 2019, Leminen, et al., 2018; Aziez, et al., 2019; Zhang & Chen, 2020)
2	Big Data	<ul style="list-style-type: none"> - The stored data and information to improve production- related activities. - This component is used in various manufacturing industries and financial and managerial fields. - Data and their analysis help to increase productivity and improve quality in the production process and facilitate optimal decision-making. 	(Pauleen & Wang, 2017; Ahmed & Ameen, 2017; Wiencierz & Röttger, 2017; Tan, 2018; Santoro, et al., 2019; Khan, 2019; Xu & Duan, 2019)
3	Robots	<ul style="list-style-type: none"> - Robots increase production volume and improve product quality, and on the other hand, increase profitability by reducing costs and losses and preventing errors. - Increasing the efficiency of production processes and equipment. - Producing of products and providing services to the customer according to their needs and wants. 	(Ranky, 2003; Müller, et al., 2014), (Tang et al., 2015; Bloss, 2016; Malik & Bilberg, 2019; Vergara et al.,2018)
4	Artificial Intelligent (AI)	<ul style="list-style-type: none"> - Human-like intelligence improves the performance of production process activities. - Artificial intelligence is a useful tool in medicine for diagnosis, treatment of disease and remote surgery. - With this tool, complex macro problems and issues can be solved in less time and at a lower cost. 	(Jovic et al., 2017; Liu et al., 2018; Paschen et al., 2019; Lauterbach, 2019; Narainet al., 2019; Lu, 2019a)
5	Smart Manufacturing	<ul style="list-style-type: none"> - The Internet connects machines and equipment and provides intelligent manufacturing with the automation system created. - In intelligent production, equipment and machinery failures are identified to be remedied. - Ordering raw materials to improve the distribution network plays an important role in intelligent production. 	(Al-Sayed & Yang, 2018; Daudt & Willcox, 2018; Torres et al., 2019; Ghobakhloo & Fathi, 2019)

6	Smart Material	<ul style="list-style-type: none"> - Smart materials have changeable properties that can change to follow the situation, which plays an important role in the industry 5.0. - By changing the temperature and pressure, the shape of the product can be changed and controlled. - Control and distortion of products using smart materials based on the needs and desires of the fabricate. 	(Bug, 2012; Chiodo & Jones, 2012; Bug, 2014)
7	3D Printing	<ul style="list-style-type: none"> - Using this feature, a physical 3D model is created based on computer models. - This method is used to produce a test sample exactly according to the original product. - By using easy fabrication of the test sample and modifying it if necessary, the efficiency of making the original product is increased. 	(Kanada, 2016; Bai et al., 2017; H.-C. Wu & Chen, 2018; Yuan, et al., 2018; Javaid & Haleem, 2018; Ali, et al., 2019)
8	4D Printing	<ul style="list-style-type: none"> - With this technology, product manufacturing is done with smart materials. - By adding the fourth dimension to 3D, time, 4D technology is created. - In this technology, environmental changes can change the shape of the product. 	(Pei, 2014; Pei et al., 2017; Javaid & Haleem, 2019)
9	5D Printing	<ul style="list-style-type: none"> - In 5D technologies, the product is made in the X, Y, Z axes, and on the other hand, the bed and head of the printer are movable. - 5D printing granting the product to be manufactured in several directions by reducing pressure and load. - One of the applications of this technology is to make car parts that must have high reliability and strength. 	(Gillaspie et al., 2016; Zeijderveld, 2018; Haleem & Javaid, 2019a)
10	Virtual Reality	<ul style="list-style-type: none"> - One of the advantages of this technology in manufacturing is learning knowledge and establishing knowledge management and improvement skills in production and automation systems. - It clearly shows the problems of the production system. - Improves access to information and better decision-making, thus helping the product development process. 	(Xia, Lopes & Restivo, 2013; Jung & Dieck, 2017; Baxter & Hainey, 2019)

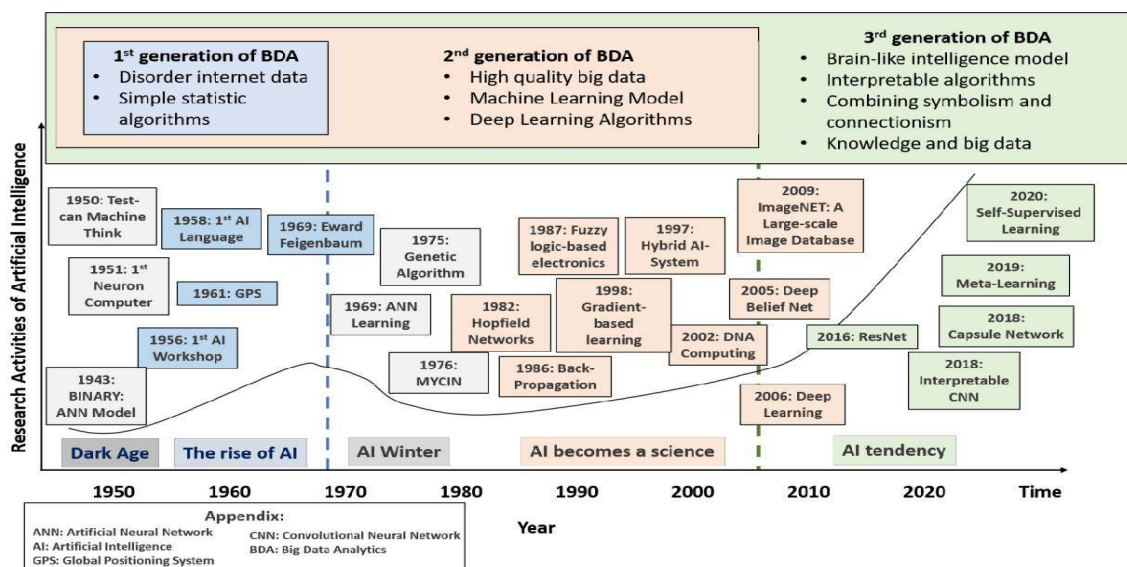
Source: Pilevari &Yavari, 2020.

2 The Big Data Analytics Revolution

According to the IBM report (cited by Mourtzis, 2021), most of the industrial manufacturers how to develop their quantitative assessment depending on IT, Big Data and Data Analytics can create a competitive advantage. Besides, the big data market share can reach 103 billion US dollars by 2027 compared to the actual investment of between 65 and 70 billion US Dollars (www.statista.com, 2021).

According to Wang (2019) and Mourtzis (2021), big data can be represented in three phases or generations. The first generation (from 1950 to 1970) is based on disorder internet data and simple statistic algorithms. And the second generation (from 1970 to 2010) was characterised by the high quality of data, machine learning modelling and the development of deep learning algorithms. Finally, the third generation (from 2010 to date) is characterised by brain intelligence modelling, interpretable algorithms, combining symbolism and connectionism and knowledge and big data. The following figure (figure 18) summarises the big data revolution.

Figure 18. The Big Data Analytics Revolution



Source: Mourtzis, 2021.

3 The Digital Marketing

3.1 Digital Marketing definitions

In general, Digital Marketing consists of high techniques and tools (Table 17) such as data science that relies on the internet in order to persuade the consumers to purchase an offer (products and/or services) (Avery et al., 2012) and to increase the companies' profitability (Tiago and Verissimo, 2014).

Chaffey and Ellis-Chadwick (2019) define simply Digital Marketing as *“the application of digital media, data and technology integrated with traditional communications to achieve marketing objectives”* (Chaffey and Ellis-Chadwick, 2019).

Table 17. The Most Frequent Digital Marketing Techniques

N.	Marketing intelligence	Idea
1	Big data or data driven marketing	Big Data or data driven marketing is the systematic alignment of marketing measures with a digitally recordable target, process, and data result, as well as the corresponding analysis results based on digital data.
2	Search engine marketing	<ul style="list-style-type: none"> • Placing contributions in the search results of search engines such as Google as high up as possible. • Since Google has a market share of over 90 percent, search engine marketing is currently actually google marketing.
3	Social media marketing and personalisation	<ul style="list-style-type: none"> • Social Media as big data sources. • Social media data as a digital farm seeded by the users themselves. • Personalisation is the adaptation of information, services or products to the defined or presumed needs of a person. The adaptation can take place on the basis of the person's profile, the current situation of the person, but also through active “personalisation” by the user.
4	Mass customisation and (micro-) targeting	<ul style="list-style-type: none"> • Targeting means the formation of target groups through (market) segmentation. On the basis of the evaluation of mass data, it deviates from conventional target group formation.

		<ul style="list-style-type: none"> • Micro-targeting as big data targeting or data-based marketing refers to the evaluation of large amounts of data, the definition of special target groups and, in marketing, the (quasi-) individualised approach to each customer with personalised advertising content.
5	Recommendation marketing	<ul style="list-style-type: none"> • Simple recommendation systems already work when a webshop operator simply stores a number of products as recommendations when visitors search for certain other products in his shop. • Marketing intelligence refers to recommendations that are based on the analysis of mass data.
6	Dynamic pricing	<ul style="list-style-type: none"> • Marketing intelligence is also partly applied to price by optimising the price on the basis of mass data, especially in online trading. • This turns marketing intelligence into pricing intelligence. It refers to automated price optimisation in real-time, so called repricing.
7	Mobile and proximity marketing with location based services and near-field communications	<ul style="list-style-type: none"> • Proximity communication refers to the part of mobile corporate communication or product communication at the location of a company, e.g. in retail outlets, shopping malls or stadiums. • Location-based services (LBS) are applications of mobile commerce that generate added value for the user through localisation. Here, a combination of mobile image management and marketing with call-to-action, i.e. appeals for action such as the redemption of discounts, takes place. • Near-field communication (NFC) enables services as cashless payment.
8	Semantic marketing	<ul style="list-style-type: none"> • Voice recognition systems enable digital conversation. • Web 3.0 as semantic web enables real-time conversation.
9	Predictive marketing	<ul style="list-style-type: none"> • Predictive marketing depicts the application of analytics to calculate probabilities of occurrence of events and the application of marketing measures from them. • Predictive analytics is a method used to identify recurring patterns in data and then use sophisticated algorithms to predict their future development, e.g. with predictive prices.
10	Touchpoint marketing	<ul style="list-style-type: none"> • Collecting, analysing and optimising the data customers leave at any touchpoint: web searches, online purchases, Geo

		data, payments, posts, etc.
11	Marketing automation	<ul style="list-style-type: none"> • Marketing automation currently refers primarily to the software-supported networking of defined marketing channels with the goal of planning and implementing marketing as well as public relations-management and sales activities in a cost-efficient and time-optimised manner. • One application of marketing automation is programmatic advertising. The term describes the data-supported trading of online advertising spaces.

Source: Jan Lies, 2019.

And according to the Institute of Direct and Digital Marketing, the digital marketing definition comprises *"the management and execution of marketing using electronic media such as the web, email, interactive TV, wireless media in conjunction with digital data about customers' characteristics and behaviour"* (Puneet Singh Bhatia, 2017).

More deeply, Grégory Bressolles (2016) has defined Digital Marketing *"as the process of planning and implementing the development, pricing, communication, distribution of an idea, a product or service for creating trade, carried out in whole or in part using digital technologies, consistent with individual and organisational objectives. The implementation of digital marketing techniques aims to acquire new customers or improve the management of the relationship with current customers. Digital marketing is, of course, integrated with traditional marketing tools in a multi-channel/crosscanal marketing strategy...Digital marketing is changing traditional marketing in two ways. First, it improves the effectiveness and efficiency of traditional marketing functions. Second, digital marketing technologies are transforming marketing strategies. They allow the emergence of new business models that add value to the consumer and/or increase the profitability of the company"* (Grégory Bressolles (2016).

4 The Revolution of the Digital Marketing

4.1 Marketing 1.0 or “Product-Driven Marketing”

Marketing 1.0 represents the first generation of marketing. This generation was emerged and developed in the industrial age and its main characteristics were products selling depending on the market demands (Jara et al., 2012).

According to Kotler (2011), Marketing 1.0 is considered as product-based marketing. In this same field, the production strategies were based on high-quality products as a competitive advantage (Wongmonta, 2021) to create a functional benefit to the users (Kotler, 2021; 2011). Besides, Erragcha and Romdhane (2014) say that the producers used only traditional communication ways like TV or radio.

4.2 Marketing 2.0 or “Customer-Oriented Marketing”

The second generation of marketing (2.0) has emerged with the beginning of the information age. In this phase, the consumers and their needs were the heart of Marketing 2.0 (Guven, 2020).

According to Fucin and Dumetresce (2018), the fulfilment of the consumer’s requests and needs considers as an important interest in the marketing 2.0 strategies or policies. In addition, the detailed study of the consumers' wishes and needs represents the main key to revealing new potential markets (Jara et al., 2012). Besides, the promotion and the communication are based on traditional ways and the internet (Tarabasz, 2013), and the consumers can participate in the marketing processes (Erragcha and Romdhane 2014b).

On another side, Marketing 2.0 can be considered as “...*brand marketing focusing on brand communication and brand experiences with a purpose to gain shares of mind. A design of services was the tool of customer experience management (CEM), and the database was*

used to formulate strategies of customer relationship management (CRM) to gain loyalty. In order to create brand identity, marketers paid attention to brand senses” (Wongmonta, 2021).

4.3 Marketing 3.0 or “Humancentric Marketing”

According to Kotler (2011), Marketing 3.0 was characterised by the value/people-oriented concept. This key concept was defined by the integration of the marketers and the consumers of both with their minds, souls and emotions. In this field, the main interest of Marketing 3.0 has turned toward humans (Varey et al., 2010). Besides, the demands in this phase have changed constantly and as consequence, the companies have to lead continuously market research based on the changes in the technologies in order to reach the consumers' value (Rahayu et al., 2018).

In addition, and according to Wongmonta (2021), *“... To have superior products were insufficient to create charismatic brand equity; companies must have corporate social responsibility... and they designed social contribution programs to correct social dysfunctions. Only companies with passions to be good corporate citizens could win consumers’ hearts, and gained shares of wallet” (Wongmonta, 2021).*

4.4 Marketing 4.0 or “Digital Marketing”

According to Kotler et al. (2017), the concept of Marketing 4.0 refers to *“a marketing approach that combines the online and offline interaction between companies and consumers”* (Kotler et al., 2017).

According to Wongmonta (2021), the strategies of Marketing 4.0 can include *“... content marketing, engagement marketing, experiential marketing, social marketing, community marketing, and viral marketing. It was the era of cocreation and collaboration with a purpose*

to gain shares of community, meaning that there were a large number of followers who were engaging on different platforms of social media" (Wongmonta, 2021).

On another side; the integration of artificial intelligence in the marketing practices and strategies can help to increase the productivity of different technologies used in digital marketing and can also enhance the consumer interaction process by the development and the reinforcement of the connection between human beings (Fucin and Dumetresce, 2018).

The extreme changes in the technologies and the digital area in all fields due to the transformation of the business as the result of the Industrial Revolution 4.0 developments (Akkaya, 2019) led to an acceleration of marketing 4.0 developments (Tas and Seket, 2019). This acceleration can strengthen the relationship between business and consumers (Soyak and Soyak, 2019) (Table 18).

Table 18. Comparison between Digital Marketing Generations

The Feature	Marketing 1.0	Marketing 2.0	Marketing 3.0	Marketing 4.0
Starts at	1950	1970	1990	2010
Concentration	Product-oriented marketing	Consume – oriented marketing	Oriented marketing towards people	Human-centred marketing deepened by the customer's "journey" in the shopping process
Aim	Sale of products	Satisfaction and customer	Making the world a better place, providing positive worth	Inspiring the client to co-create new content and products/services
Enabling forces, the emergence of a concept	Industrial Revolution	Information technology	A new wave of technologies	Digital economy
The way companies perceive the market	Mass customers with material needs	Clever customers driven by reason and emotions	A man with reason, heart and soul.	Netizen man (citizen of the network)
Key marketing concepts	Product development	Diversification and distinction on the market	Providing higher worth	Anthropomorphising of brands
Marketing guidelines	The specificity of the product	Positioning the company and product	Mission, vision and company values	Promoting content and creating brands
Value proposal	Functional	Functional and	Functional and emotional and spiritual	Commitment and trust
Interactions with consumers	Collective approach, one-to-many transactions	Individual approach, one-to-one relations	Relationships and cooperation to many	Relations based on the functioning of the networking, a huge generation of consumers

Source: Based on Kotler et al. (2010; 2017) and Sima (2021).

4.5 Marketing 5.0 “Technology for Humanity”

Kotler, Kartajaya and Setiawan (2021) define Marketing 5.0 as *" the application of human-mimicking technologies to create, communicate, deliver, and enhance value across the customer journey. One of the critical themes in Marketing 5.0 is what we call the next tech, which is a group of technologies that aim to emulate the capabilities of human marketers. It includes AI, NLP, sensors, robotics, augmented reality (AR), virtual reality (VR), IoT, and blockchain. A combination of these technologies is the enabler of Marketing 5.0"* (Kotler, 2021).

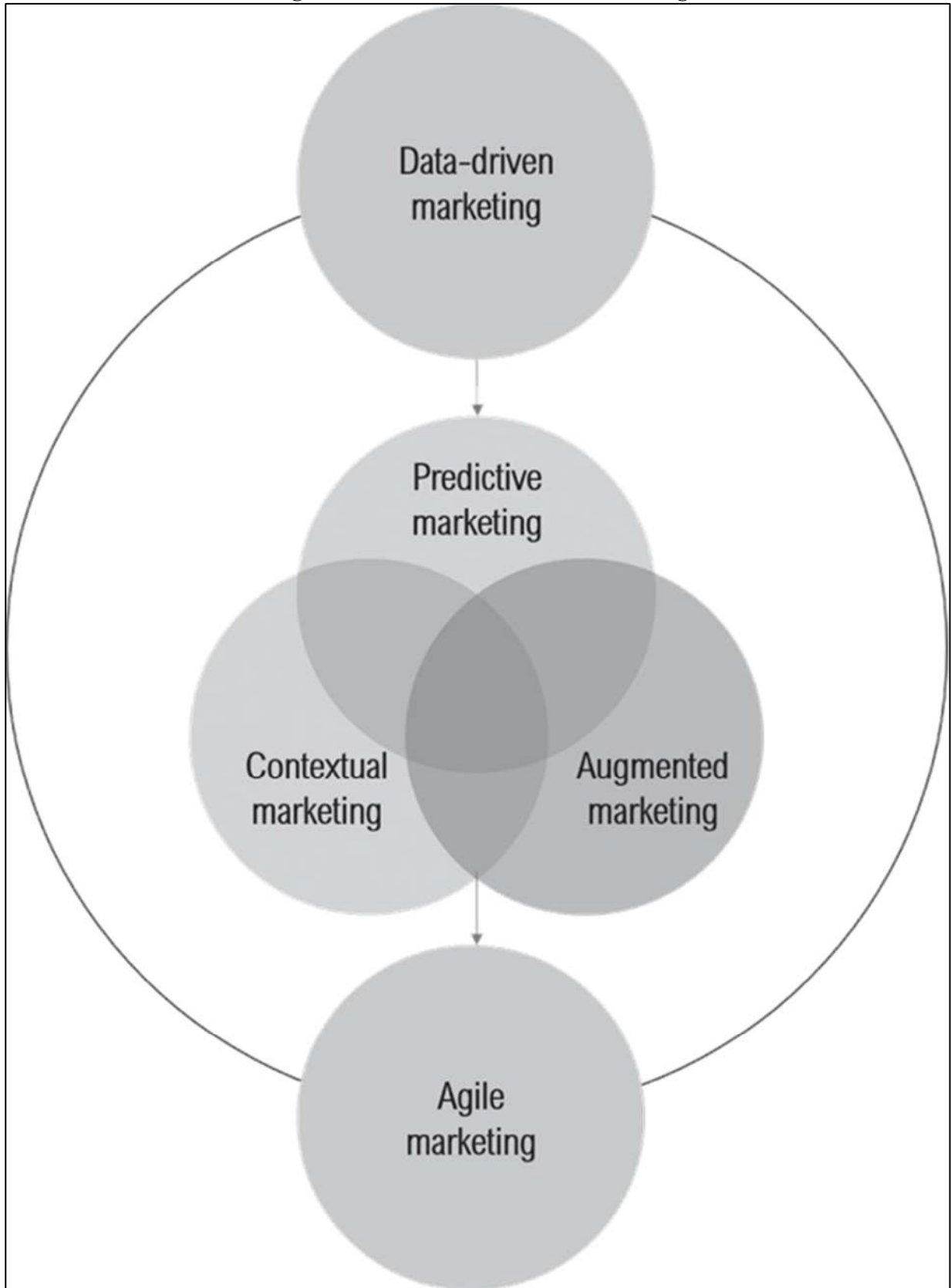
4.5.1 The Components of Marketing 5.0

According to Kotler et al. (2021), the components of Marketing 5.0 can be defined depending on the ways in which the advanced and the high technologies enhance and create value to the marketing processes. In this context, the core elements can be determined to illustrate the main keys of Marketing 5.0.

Marketing 5.0 consists of two organisational disciplines which are data-driven marketing and agile marketing. Furthermore, these disciplines rely on three interdependent applications represented by predictive marketing, contextual marketing, and augmented marketing.

Each of the two organisational disciplines and the three interdependent applications constitute the five elements of Marketing 5.0 (Figure 19).

Figure 19. The Five Elements of Marketing 5.0



Source: Kotler et al. (2021).

4.5.2 Disciplines of Marketing 5.0

4.5.2.1 First Discipline “Data-Driven Marketing”

The first discipline represents the start point of the Marketing 5.0 strategies that consists of two main activities which are firstly the collection of big data and analysing of this data based on different external and internal sources. The second activity is to create a data ecosystem with sufficient data in order to enhance each single marketing decision (Kotler et al., 2021).

According to Kotler et al. (2021), to build the data ecosystem we need three steps which are (1) identifying the objectives of data-driven marketing, (2) determination of the data requirements and data availability and (3) the building of the integrated data ecosystem.

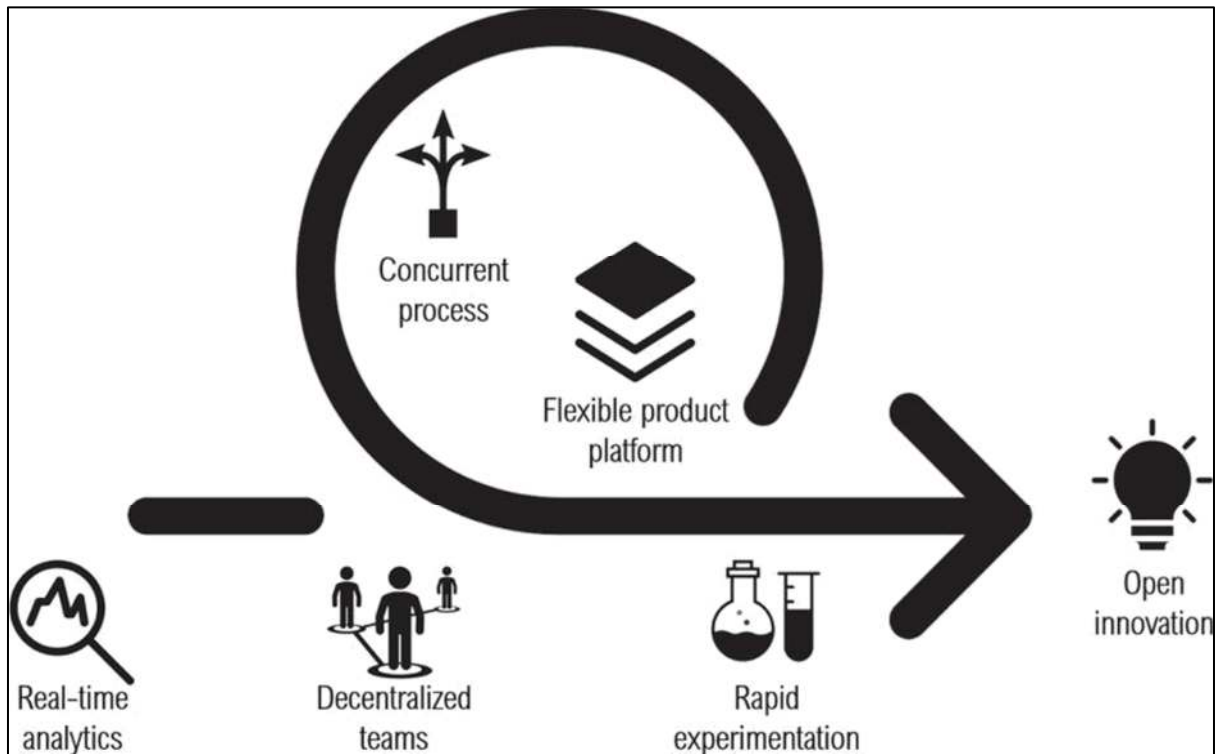
4.5.2.2 Second Discipline “Agile Marketing”

the companies have to ensure the success of Marketing 5.0 implementations by dealing with the permanent changes in the market and mastering its data-driven capabilities.

From another hand, Kotler defines agile marketing as *“the use of decentralised, cross-functional teams to quickly conceptualise, design, develop and validate products and marketing campaigns”* (Kotler et al., 2021).

According to Kotler et al. (2021), to develop agile marketing we need six steps which are (1) Build a Real-Time Analytics Capability, (2) Establish Decentralised Teams, (3) Develop a Flexible Product Platform, (4) Develop Concurrent Process, (5) Perform Rapid Experimentation and (6) Embrace Open Innovation (figure 20).

Figure 20. The Agile Marketing Development Steps



Source: Kotler et al. (2021).

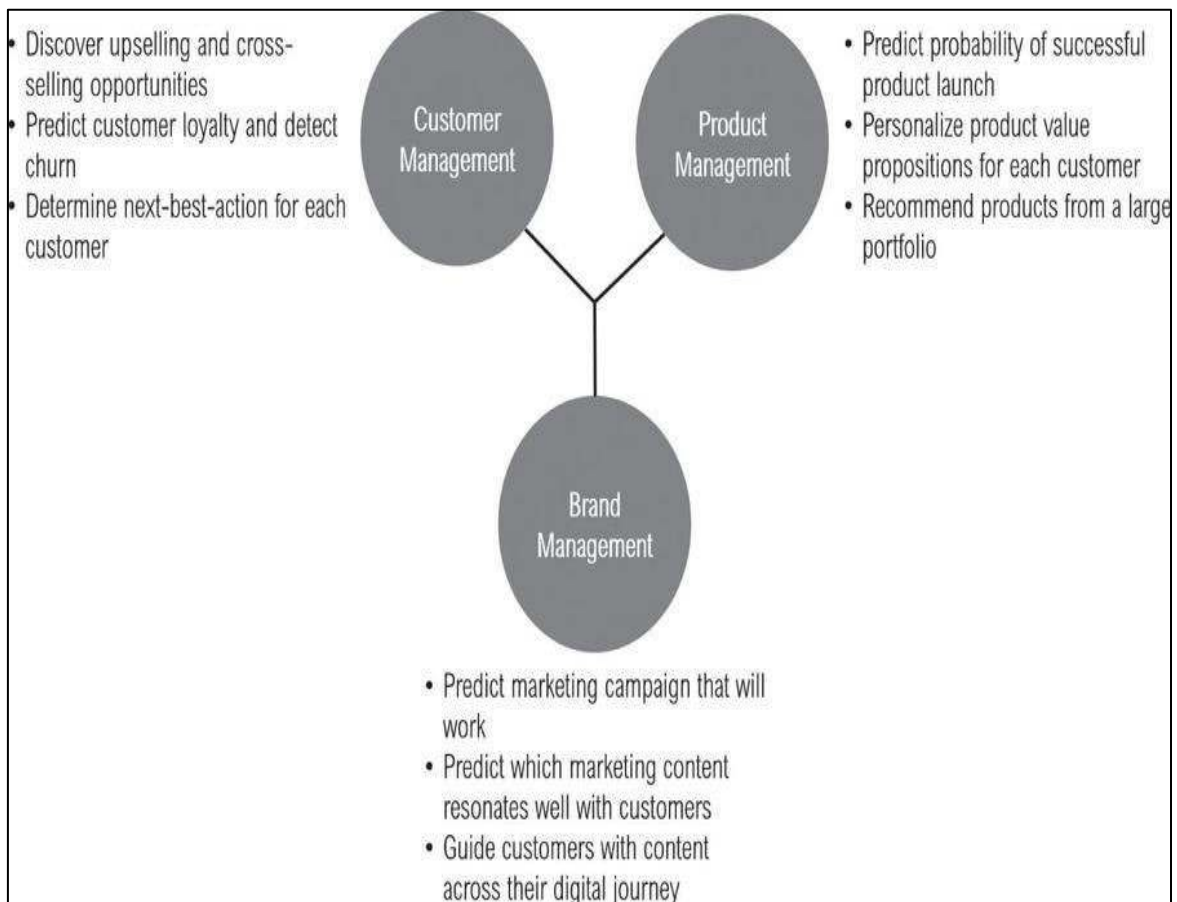
4.5.3 Applications of Marketing 5.0

4.5.3.1 First Application “Predictive Marketing”

Depending on the definition of Kotler et al. (2021), predictive marketing considers as “*a process of building and using predictive analytics, sometimes with machine learning, to predict the results of marketing activities before launch. This first application allows businesses to envision how the market will respond and proactively influence it*” (Kotler et al., 2021).

The predictive analysis process based on the interpretation of the past historical data and real-time data of consumers’ behaviours and product life cycle data aims to respond to the contextual marketing requests and test the agile marketing activities. In general, three principal fields are building this process which are (1) consumer management, (2) product management, and (3) brand management (Kotler et al., 2021) (figure 21).

Figure 21. Applications of the Predictive Marketing

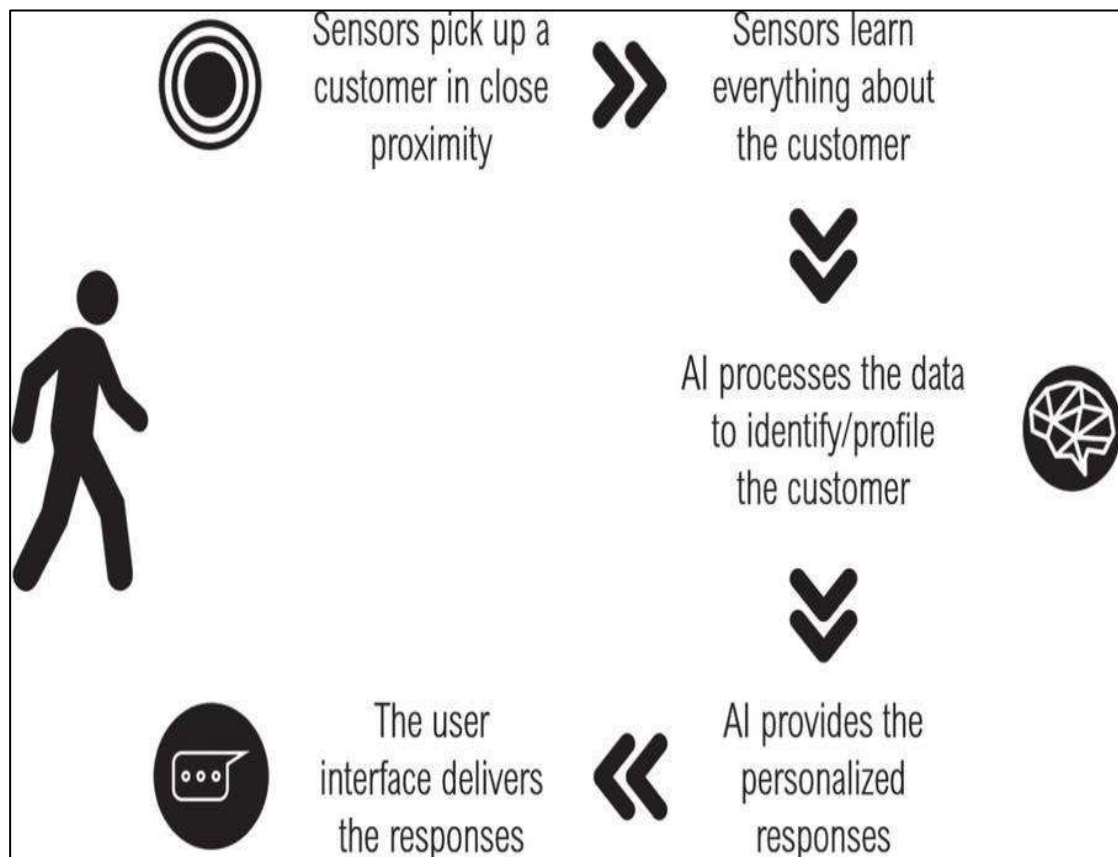


Source: Kotler et al. (2021).

4.5.3.2 Second Application “Contextual Marketing”

According to Kotler et al. (2021), we can define contextual marketing as *“the activity of identifying and profiling as well as providing customers with personalised interactions by utilising sensors and digital interfaces in the physical space. It is the backbone that allows marketers to perform one-to-one marketing in real-time, depending on the customer context”* (Kotler et al., 2021).

Figure 22. Contextual Marketing Mechanism



Source: Kotler et al. (2021).

4.5.3.3 Third Application “*Augmented Marketing*”

According to Kotler et al. (2021), we can define Augmented Marketing as *“the use of digital technology to improve the productivity of customer-facing marketers with human-mimicking technologies such as chatbots and virtual assistants. This third application ensures that marketers combine the speed and convenience of digital interface with the warmth and empathy of people-centric touchpoints”* (Kotler et al., 2021).

5 The Economic Impact of COVID-19

According to Brodeur et al. (2021a; 2021b), the Covid-19 has a negative economic impact and to understand this impact, they suggest firstly understanding the economic transmission channels. In general, we can define three major channels of economic transmission (Carlsson-Szlezak, 2020a; 2020b). The first channel represents the direct impact. It is known by the decrease in the products (goods and services) consumption (Coibion et al., 2020) and losses in productivity (Céspedes et al., 2020) especially, if the coronavirus pandemic persists for a long time which can create a vigilance in discretionary spending, a lack of confidence among the consumers and a pessimistic about the economic prospects in the long term.

The second channel represents the indirect impact, and it is *“through financial market shocks and their effects on the real economy. Household wealth will likely fall, savings will increase, and consumption spending will decrease further”* (Carlsson-Szlezak, 2020a; 2020b).

The third channel represents the disruptions in the supply. Akbulaev et al. (2020) argue that *“the coronavirus pandemic has a very negative impact on electronics production and supply”*. Regarding the main obstacles in the production activities during this crisis, the Covid-19 has a negative influence on the supply chain, employment (Coibion et al., 2020) and labour demand (Carlsson-Szlezak, 2020a; 2020b).

On another side, *“The COVID-19 has led to huge spikes in uncertainty, and there are no close historical parallels”* (Baker et al., 2020). And according to Baldwin (2021), it is very common that in uncertain economic situations, there are low engagement in economic transactions and less confidence in the markets. And the economic impact or shocks can identify based on both consumers' and firms' behaviour, the main epidemiological properties of the coronavirus, and the responses to the public policies.

Conclusion

In the first part of this chapter, we present different general concept definitions of the Industrial Revolution. Then, we have focused on the historical industry revolution development of the industry; the various definitions, we have visualised the important components of each generation of industry and we have motioned the concept of big data analytics.

In the second part, we have talked about the marketing revolutions. And we have focused on the fifth generation of marketing. (Marketing 5.0). Besides, we have mentioned the main points of the impact of the coronavirus on the economy.

Modern technologies and digitalisation can consider as the future choice for any company to ensure their market share.

Chapter Four:
The Empirical Study

1 Research Methodology

To achieve the main objectives of the present research study, the authors adopt a descriptive approach. We have used a printed and electronic questionnaire to collect data for the analysis.

To improve the interpretation and validity of the research findings; First of all, we aimed to measure the variables model by the analysis and the development of the collected data of the research; second of all, after the validating of the collected data, we deeply explore and analyze the data and identifying of the major results by using Statistical Package for the Social Sciences (Ver. 26); in the third step, we focused on the exploration of the impact and the relationship between different concepts that can identify the model of the research and clarify the real relation between the production management and innovation through the knowledge management in Algerian enterprises from the perspective of the consumers.

1.1 Sample and Questionnaires Design

In this research, we have used a printed and electronic questionnaire to collect data. The sample consists of people aged between 20 years old and more than 60 years old and from different sectors of activities (Government; Private sector; Daily Wage; Self-employment). The sample also includes both gender male and female.

191 questionnaires of about 50 items were designed and distributed. These items were listed in five categories; (1) General information; (2) Innovation in Algerian products; (3) Marketing of Algerian products; (4) Production in the Algerian enterprise, and (5) Transfer of information and communication with the Algerian enterprise. In addition, the researchers have included the Corona pandemic situation by studying from one side; the spending behaviour before and during the Covid-19 crisis and from the other side; the purchasing power before and during the Covid-19 crisis.

2 Results and Discussion

2.1 Sample characteristics

As mentioned before, only 191 valid questionnaires were validated from a total of 204 collected questionnaires. Besides, there were more than 70 questionnaires have not been recovered yet.

The main results of descriptive statistics of the sample, are shown in the following tables (Table 19), 58.1% of the sample are males, and 41.9% are female, so the sample has a masculinity characteristic. In addition, the majority of respondents have an age between 20 and 40 years old with a percentage of 33.5% for less than 30 years old, 46.1% of ages are between 31 and 40 years, 18.3% between 41 and 50 years old, and 2.1% for more than 50 years old.

Also, the majority work in the government sector with a response rate of 69.6%, 14.1% in the private sector, 12.6% as self-employment and 3.7% of the participants have a daily wage; and about 94.2% of them work in only one sector, 4.2% have two activities and 1.6% of the participants work in three sectors.

The findings also show that 23.6% of the participants earn more than 50,000 dzd, 23% earn between 30,000 and 40,000 dzd, 22.5% earn between 20,000 and 30,000 dzd, 12% earn less than 10,000 dzd, 11% earn between 10,000 and 20,000 dzd and 7.9% earn between 40,000 and 50,000 dzd.

Table 19. Sample Characteristics.

		Frequency	Percent
Gender	Male	111	58.1
	Female	80	41.9
Age	Less than 20 years	3	1.6
	20 - 30 years	61	31.9
	31 - 40 years	88	46.1
	41 - 50 years	35	18.3
	51 - 60 years	4	2.1
Income	Less than 10,000 DZD	23	12.0
	10,000 DZD - 20,000 DZD	21	11.0
	20,000 DZD - 30,000 DZD	43	22.5
	30,000 DZD - 40,000 DZD	44	23.0
	40,000 DZD - 50,000 DZD	15	7.9
	More than 50,000 DZD	45	23.6
Type of work	Government	133	69.6
	Private sector	27	14.1
	Daily Wage	7	3.7
	Self-employment	24	12.6
Number of activities	Working in one sector	180	94.2
	Working in two sectors	8	4.2
	3 or more sectors	3	1.6

Source: developed by the Candidate.

2.2 The Reliability of Data

According to Sekaran (2006), “*The more scale items represent the domain or universe of the concept being measured, the greater the content validity*”, and reliability reflects the

accuracy and precision of the instrument by including test-retest, using measures stability; parallel-form reliability, ... using inter-item consistency “Cronbach’s alpha”. (Sekaran, 2006).

Cronbach’s alpha is generally accepted as reliable if the result is above 0.60 (Dahou et al., 2019). And it is considered as the best measurement of the internal consistency reliability index, by measuring the mean and the correlation of the interesting items. The Cronbach’s alpha index in our study has shown a good result, about 0.847 (Table 20).

Table 20. Variables’ Reliability

	Nbr of Items	Cronbach's Alpha
Reliability of all items	42	0.847
Covid-19 situation	06	0.674
Innovation	11	0.640
Marketing	10	0.721
Production	10	0.729
Knowledge & Communication	09	0.806

Source: developed by the Candidate.

Table 3.2 shows that the values of all the variables of the search model are good and acceptable (surpassing the value of 0.60). The values vary between 0.640 for Innovation and 0.806 for Knowledge and Communication as the highest value. From the previous analysis, we can consider that the research model is reliable.

2.3 Descriptive Statistics

To more understand the descriptive statistics of the conceptual variables, we start with an overview of the situation of the Algerian consumers before and during the Covid-19 pandemic. Then, we focused on purchasing power and spending behaviour.

2.3.1 Purchasing Power Before and During the Corona Pandemic

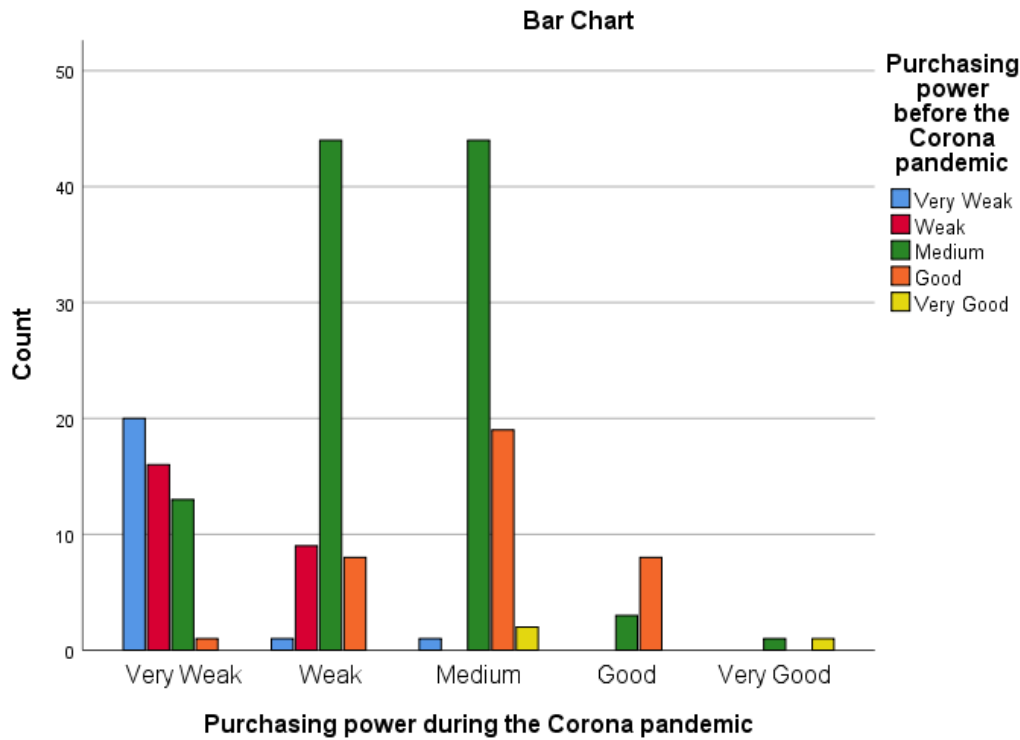
The finding shows that before the Corona crises, about 55% of the consumers have a medium ability of purchasing or living capacity. In addition, 18.8 % of them have a good purchasing power and 1.6% have a very good situation, but the rest have a weak or a very weak situation with 13.1% and 11.5%, respectively (Table 21).

During the Corona crises, all the previous statistics have changed. More consumers declare that they have a weak purchasing power (32.5%) and 26.2% have a very weak purchasing power. Besides, the medium and good categories have dropped from 55% to 34.6% for the medium category and from 18.8% to 5.8% for the good category (Figure 23).

Table 21. Purchasing power during the Corona pandemic * Purchasing power before the Corona pandemic Crosstabulation

Count		Purchasing power before the Corona pandemic					Total
		Very Weak	Weak	Medium	Good	Very Good	
Purchasing power during the Corona pandemic	Very Weak	20	16	13	1	0	50
	Weak	1	9	44	8	0	62
	Medium	1	0	44	19	2	66
	Good	0	0	3	8	0	11
	Very Good	0	0	1	0	1	2
Total		22	25	105	36	3	191

Figure 23. Purchasing power during the Corona pandemic * Purchasing power before the Corona pandemic Crosstabulation



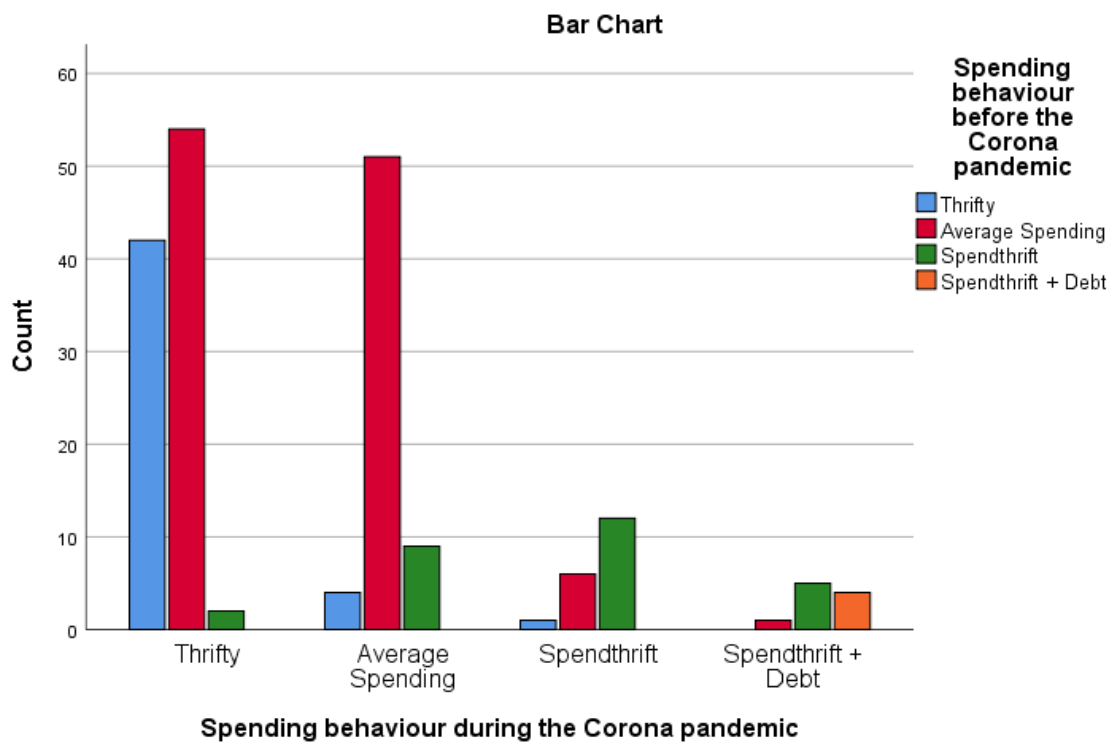
2.3.2 Spending Behaviour Before and During the Corona Pandemic

The spending behaviour statistics before and during the Corona crisis have a big change for all the cases. The thrifty category has changed from 24.6% to 51.3%, and the spendthrift category has changed from 14.7% to 9.9%, these results reflect one side of the difficult situation and how the consumers become more conscious of the situation. Besides, the average spending category has a ratio of 58.6% before the Corona pandemic, and it dropped to 33.5% during the pandemic. Table 22 shows us that about 48% of the average spending category before the pandemic has moved to the thrifty category and 45% of them stay in the same category. For the rest, exceptionally, they have become more spendthrift. In contrast, 6.81% have become more spendthrift and indebted (Figure 24).

Table 22. Spending behaviour during the Corona pandemic * Spending behaviour before the Corona pandemic Crosstabulation

		Spending behaviour before the Corona pandemic				Total
		Thrifty	Average Spending	Spendthrift	Spendthrift + Debt	
Spending behaviour during the Corona pandemic	Thrifty	42	54	2	0	98
	Average Spending	4	51	9	0	64
	Spendthrift	1	6	12	0	19
	Spendthrift + Debt	0	1	5	4	10
Total		47	112	28	4	191

Figure 24. Spending behaviour during the Corona pandemic * Spending behaviour before the Corona pandemic Crosstabulation



2.4 The research model

We design five variables for our research model, which are (1) Innovation, (2) Marketing, (3) Production, (4) Knowledge, and (5) Covid-19 (figure 25). In the data pre-processing, we aim to use the dimensionality reduction technique in machine learning and data science which is based on other techniques called features (variables) selection and feature engineering. Therefore, for each variable, we define two factors (feature engineering) that regroup all items that have the same characteristics or that respond to the same issues (features selection) (Table 23). (For more details, see the list of Items with codification and scale, p 200).

Table 23. Variables and factors of the research model

Variables	<u>Factors</u>	<u>Method of calculation</u>	Nbr of items # factor	Nbr of items # Variable
Innovation	Inn1	MEAN (I2.1, I2.7, I2.8, I2.9)	4	9
	Inn2	MEAN (I2.2, I2.3, I2.4, I2.5, I2.6)	5	
Marketing	Mrk1	MEAN (I3.1, I3.2, I3.3, I3.6, I3.7)	5	10
	Mrk2	MEAN (I3.4, I3.5, I3.8, I3.9, I3.10)	5	
Production	Prox1	MEAN (I4.1, I4.2, I4.4, I4.7, I4.8)	5	10
	Prox2	MEAN (I4.3, I4.5, I4.6, I4.9, I4.10)	5	
<u>Knowledge</u>	KC1	MEAN (I5.1, I5.6, I5.7, I5.8, I5.9)	5	9
	KC2	MEAN (I5.2, I5.3, I5.4, I5.5)	4	
Covid-19	Cvd1	MEAN (I1.6, I1.7, I4.10)	3	6
	Cvd2	MEAN (I1.8, I1.9, I4.9)	3	

Source: developed by the Candidate.

Figure 25. The prediction of the research model

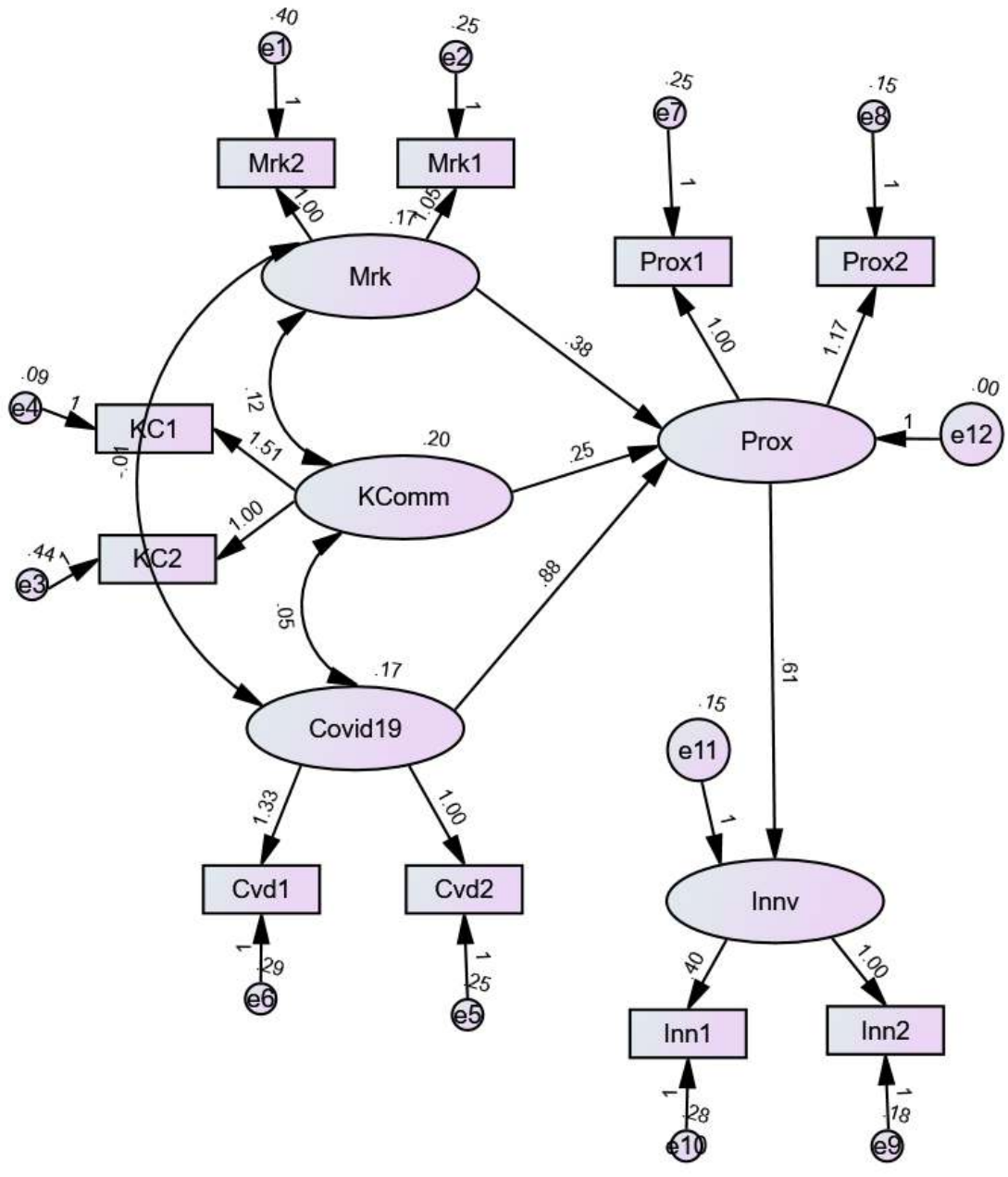


Table 24. Model Fit Measures

<u>Measure</u>	<u>Estimate</u>	<u>Threshold</u>	<u>Interpretation</u>
CMIN	94.086	--	--
DF	28.000	--	--
CMIN/DF	3.360	<u>Between 1 and 3</u>	Acceptable
CFI	0.865	>0.95	Terrible
SRMR	0.089	<0.08	Acceptable
RMSEA	0.111	<0.06	Terrible
<u>PClose</u>	0.000	>0.05	Not <u>Estimated</u>

Table 25. Cutoff Criteria*

<u>Measure</u>	Terrible	Acceptable	Excellent
CMIN/DF	> 5	> 3	> 1
CFI	<0.90	<0.95	>0.95
SRMR	>0.10	>0.08	<0.08
RMSEA	>0.08	>0.06	<0.06
<u>PClose</u>	<0.01	<0.05	>0.05

***Note:** Hu and Bentler (1999, "Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria Versus New Alternatives") recommend combinations of measures. Personally, I prefer a combination of CFI>0.95 and SRMR<0.08. To further solidify evidence, add the RMSEA<0.06.

The suggested goodness fit model was examined using five common model fit indices. The following table 24 summarises the values of the indices with the recommended value in table 25. From table 25, we can consider that the model fit is entirely adequate, especially for the index of CMIN/DF (Dahou, 2015).

2.5 The Results of the Research Model Test

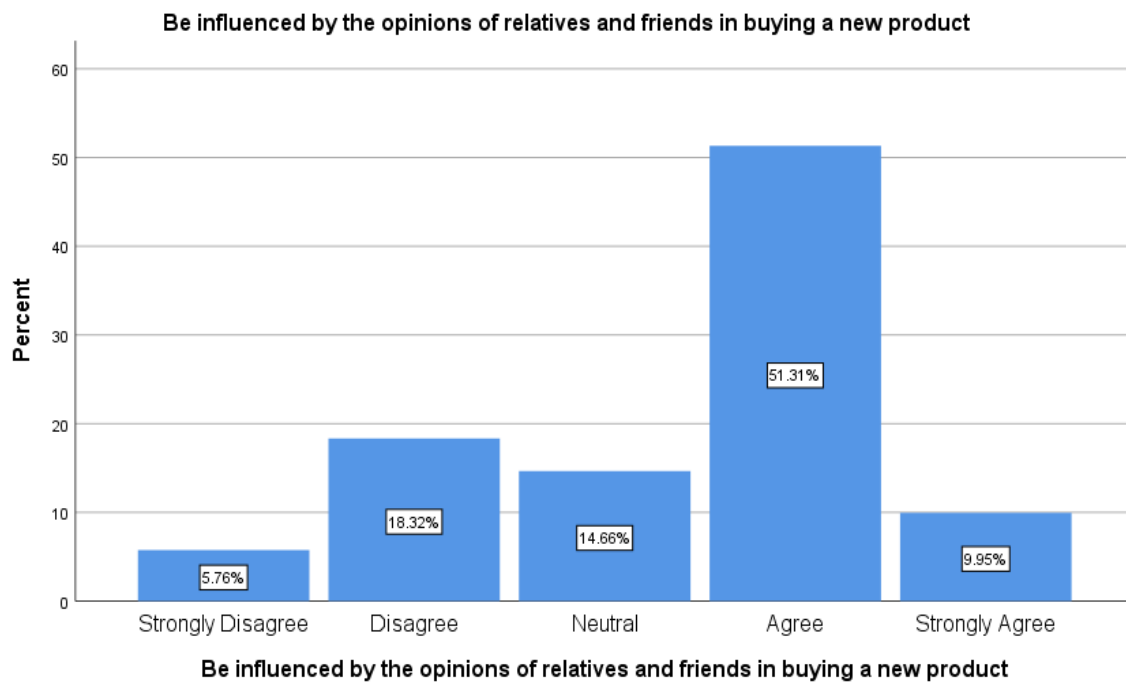
2.5.1 Marketing and Production Relationship

H₀₁: The Marketing of the Algerian innovative product has no statistical significant influence on the Production within Algerian enterprises.

The Marketing of Algerian innovative products has a positive significant impact on the Production within Algerian enterprises ([P-value = 0.041] < 0.05), with a coefficient of 38.1%.

From one side, the results show that about 61.25% of the consumers are influenced by the opinions of their families and friends in buying new products, and more than 68.58% of them use social media to look for a new product (Figure 26).

Figure 26. The influence of family and friends in the purchase process



In addition, we can notice that 43.46% of the consumers contact each other to get more information about the new products (Figure 27). In contrast, only 16.23% of the customers can communicate with the producers and give them their opinions about the new products (Figure 28).

Figure 27. Communication with other consumers

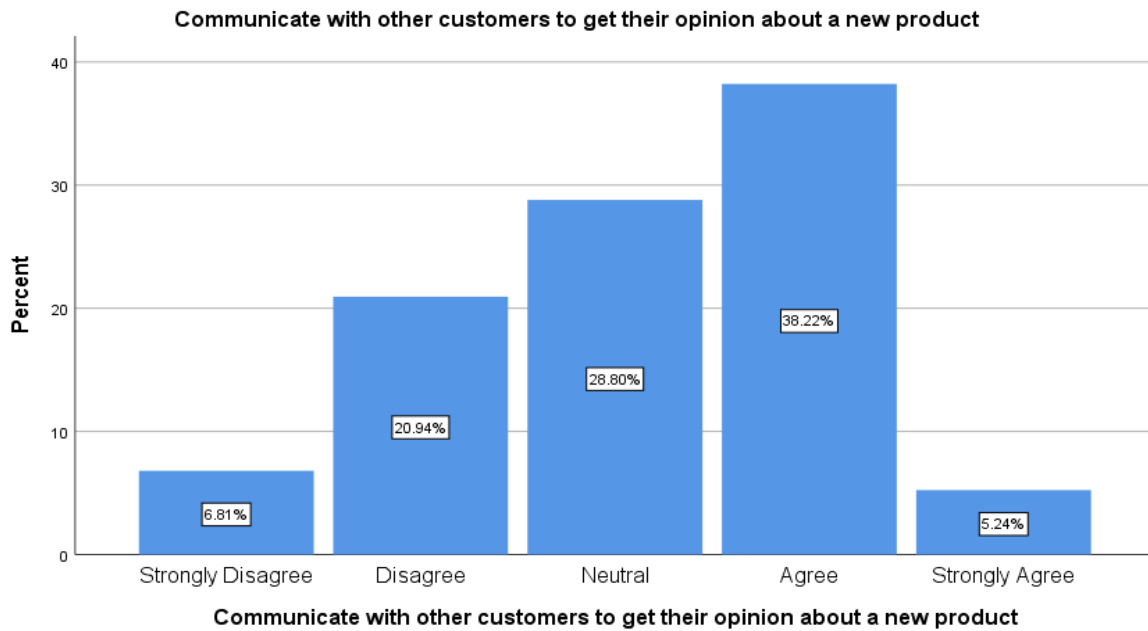
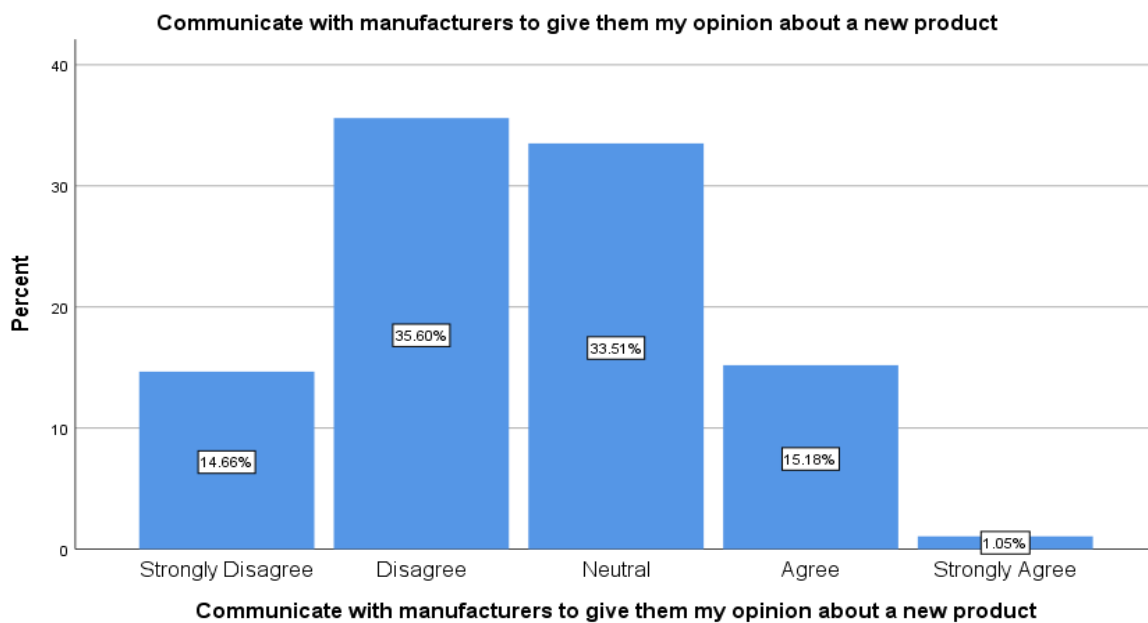
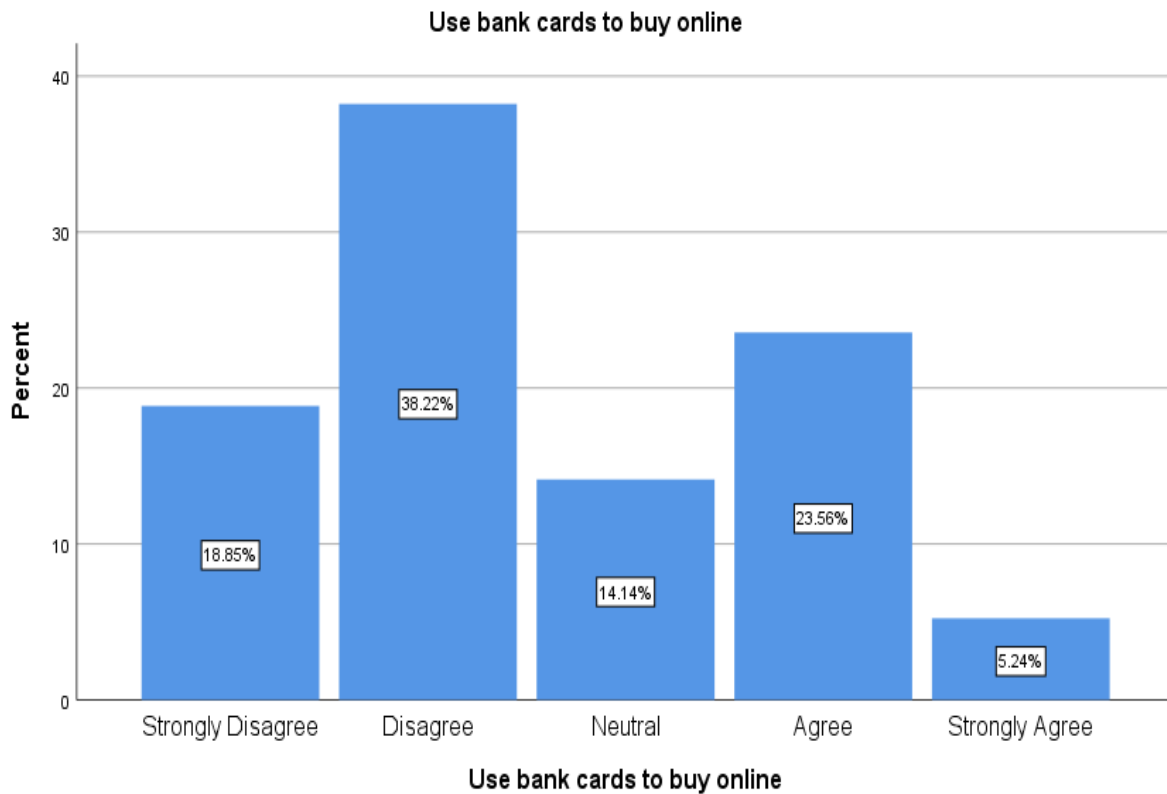


Figure 28. Communication with producers.



And from the other side, about 28.80% of the consumers agree to use bank cards to buy online and at the same time, we can notice that more than 57.07% of them are disagreeing to utilise bank cards in their online operations (Figure 29).

Figure 29. The use of bank cards in the purchase process.



In addition, the findings show that 40.84% of the consumers can buy products online inside the country; against, 44.50% cannot (Figure 30). Besides, 27.75% of them use the internet to buy products outside the country and more than 58.64% of the customers do not prefer to buy products online outside the country (Figure 31).

Figure 30. Purchase via the internet inside.

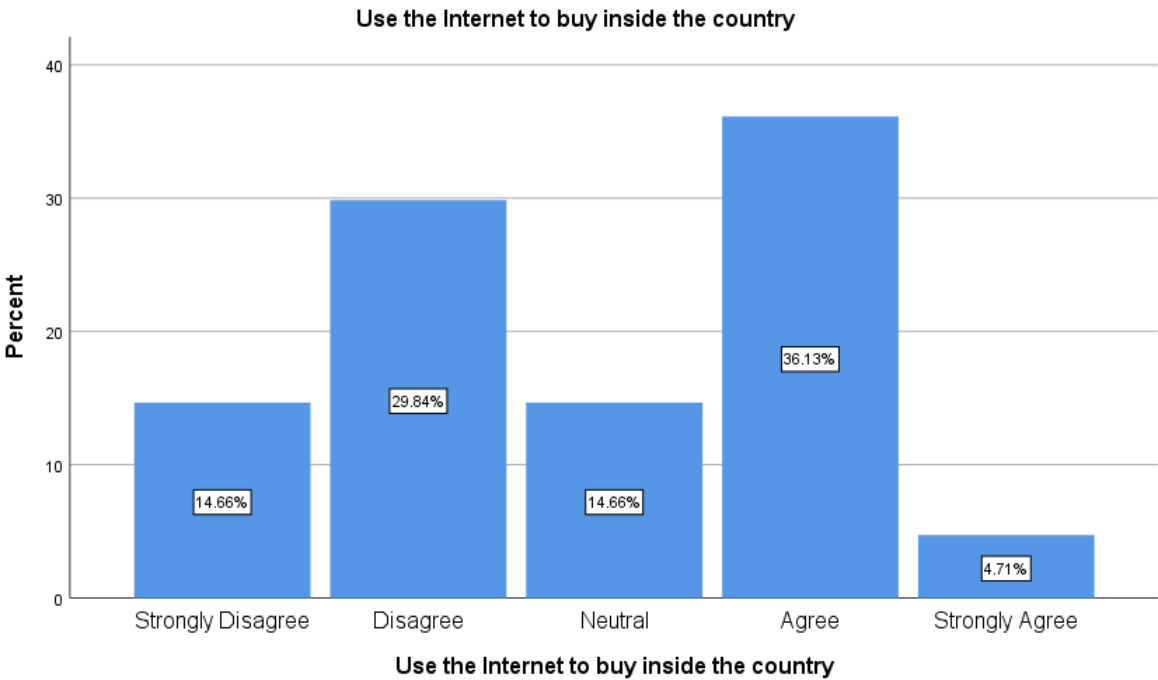
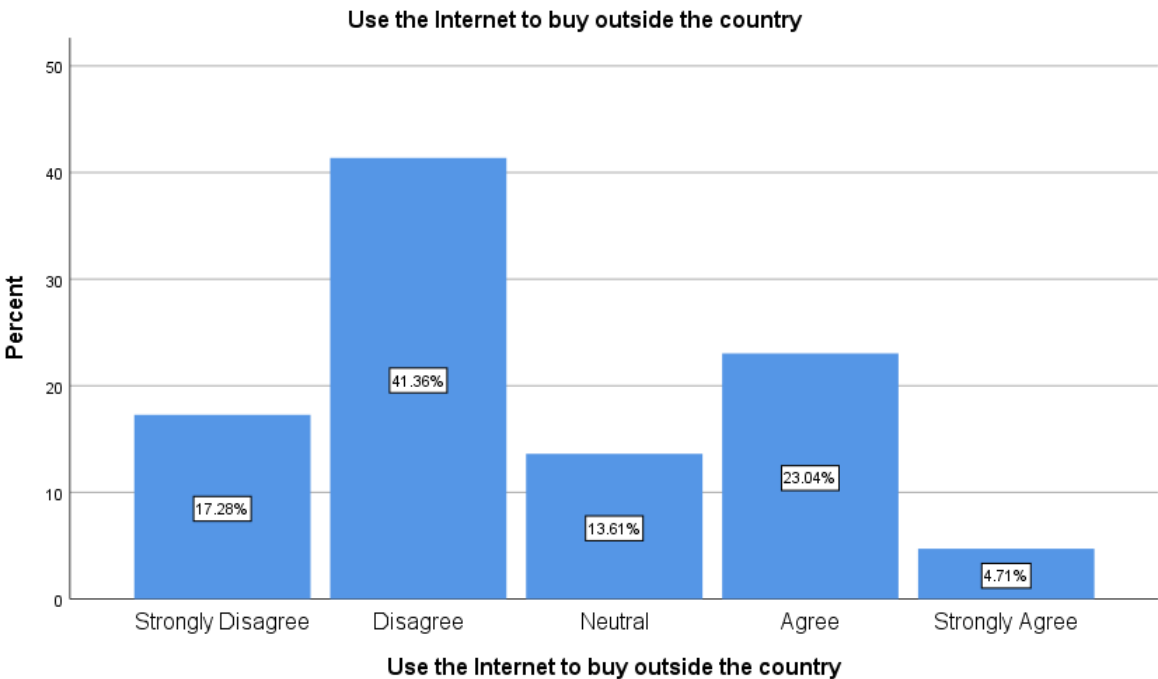


Figure 31. Purchase via the internet outside.



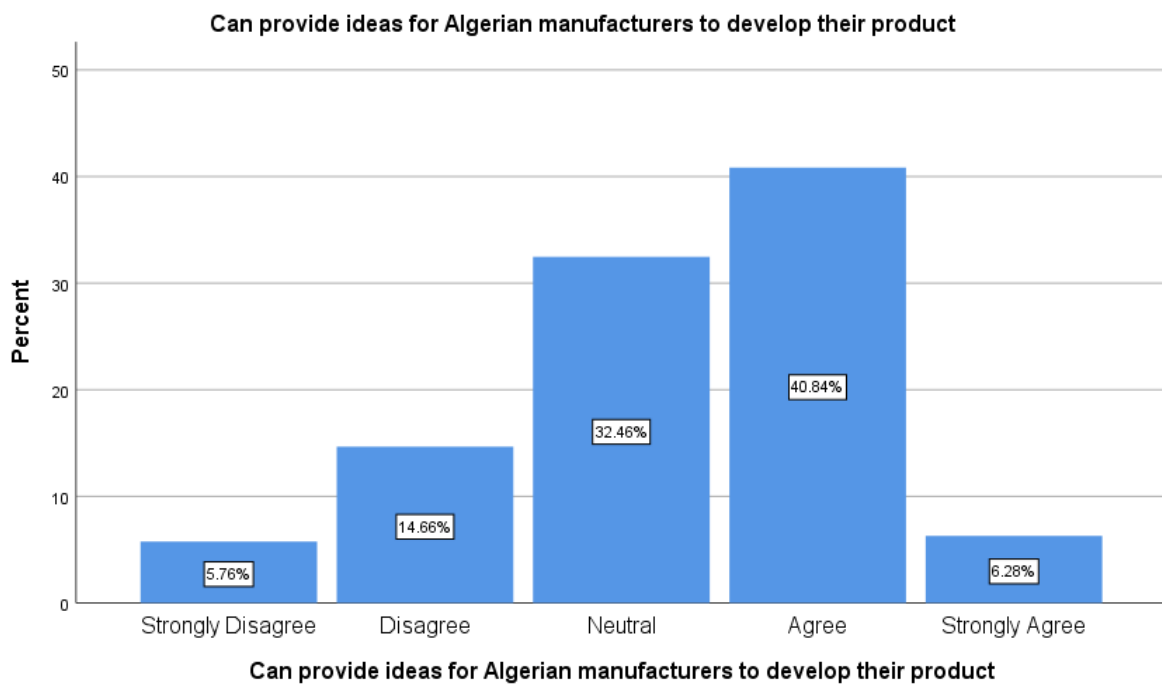
2.5.2 Knowledge / Communication and Production Relationship

H₀2: The Knowledge Transfer and Communication between the Algerian consumers and the Algerian producers have no statistical significant influence on the Production within Algerian enterprises.

The Knowledge Transfer and Communication between the Algerian consumers and the Algerian producers have no significant impact on the Production within Algerian enterprises ([P-value = 0.096] > 0.05).

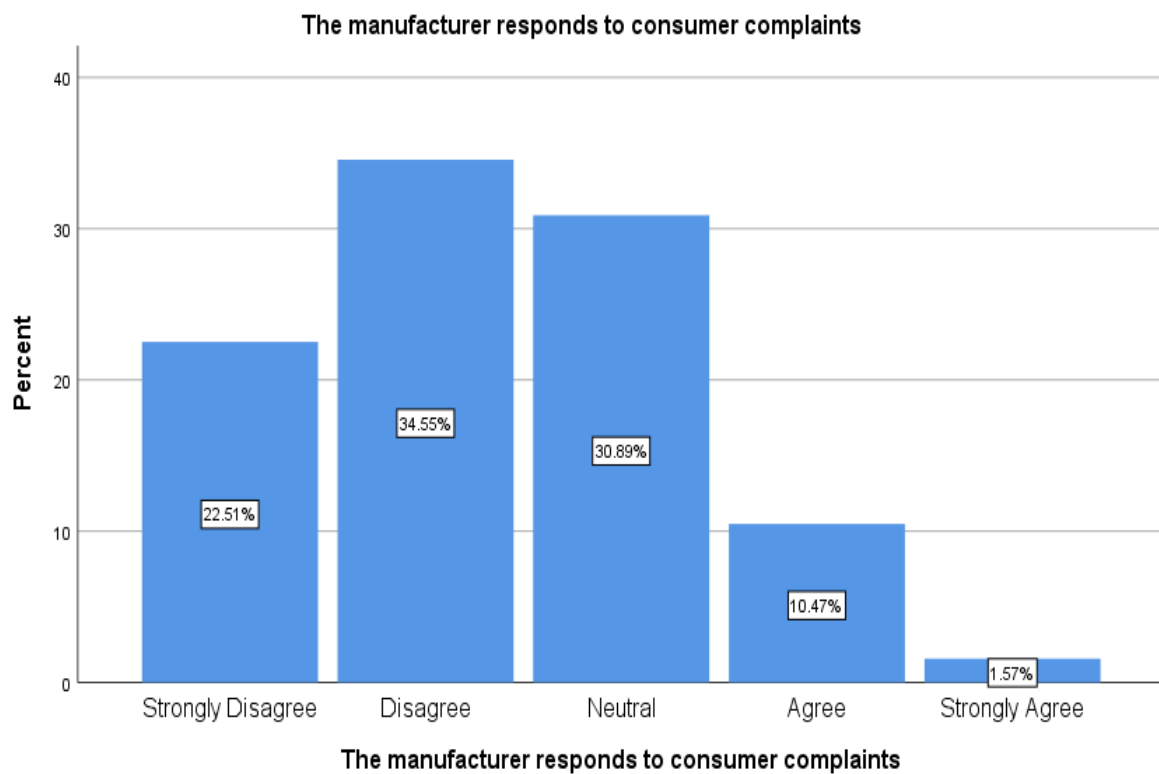
The results show that about 47.12% of the consumers can provide new ideas for the Algerian producers in order to develop their new products (Figure 32).

Figure 32. Providing new ideas for producers.



On the other hand, we can find that most of the consumers (about 63.88%) declare that the Algerian producers do not take into count their negative comments and feedback or even the positive ones (about 52.35%). In addition, about 57.06% of them say that the enterprise does not respond to their complaint about the products (figure 33).

Figure 33. Response to consumer complaints.



In terms of consumer loyalty, most consumers (about 48.17%) say that the enterprises do not offer additional incentives (figure 34), and about 49.21% affirm that there are no price discounts for a new product (figure 35).

Figure 34. Incentives to loyal consumers.

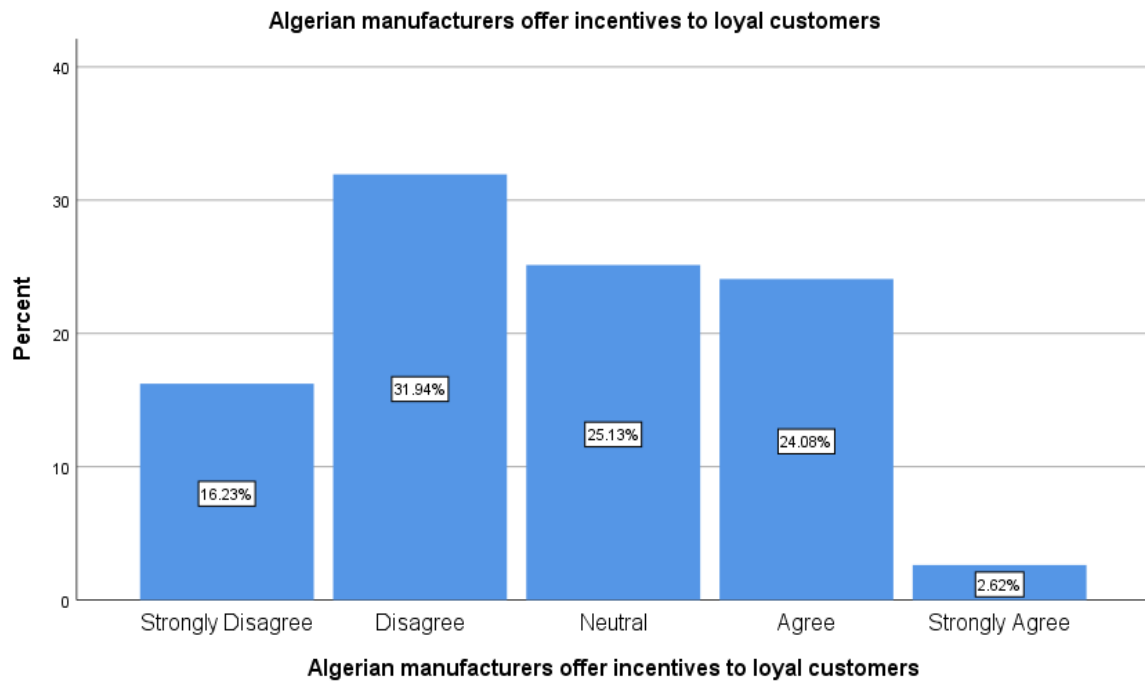


Figure 35. Price discounts on new products.



2.5.3 Covid-19 and Production Relationship

H₀₃: The Covid-19 crisis has no statistical significant influence on the Production within Algerian enterprises.

The Covid-19 crisis has a positive significant impact on the Production within Algerian enterprises ([P-value < 0.001] < 0.05), with a coefficient of 88.1%.

In addition to the previous section of descriptive statistics which is about the Purchasing power before and during the Corona pandemic and Spending behaviour before and during the Corona pandemic, the results show that about 42.93% of the consumers claim that the products are not available in the market and 36.6 of them proclaim the opposite (figure 36). But in the price terms, most of them were not satisfied (about 61.78%), and only 23.56 of them say that the prices of the products are acceptable (figure 37).

Figure 36. Products availability during the Corona crisis.

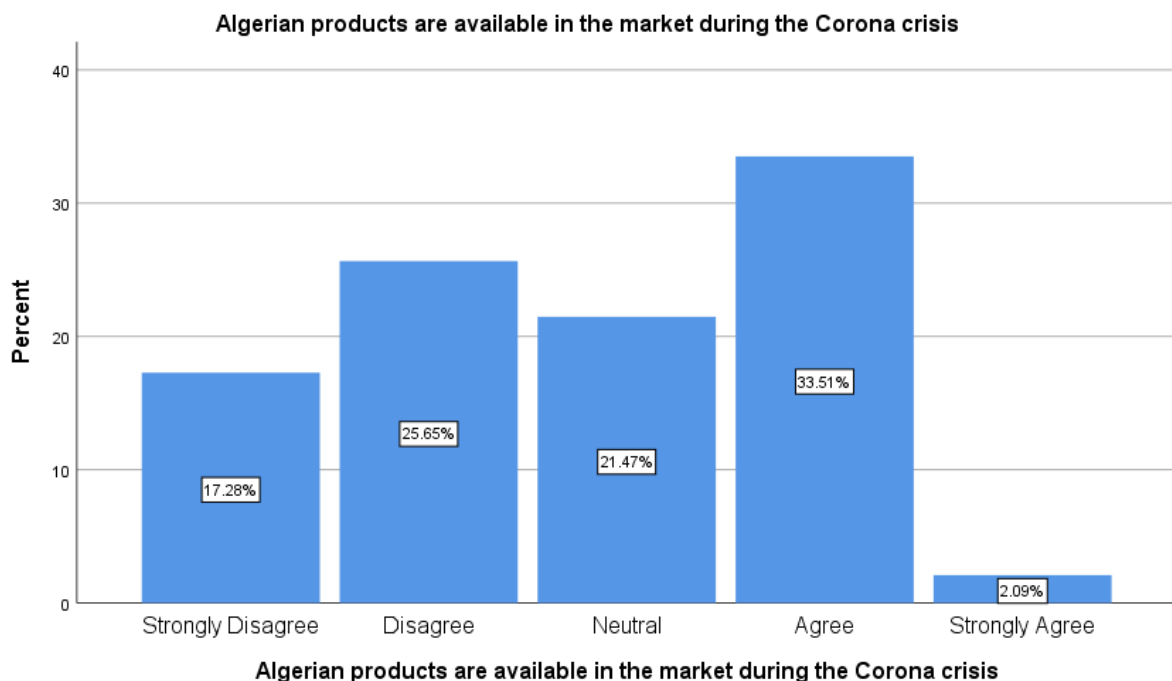
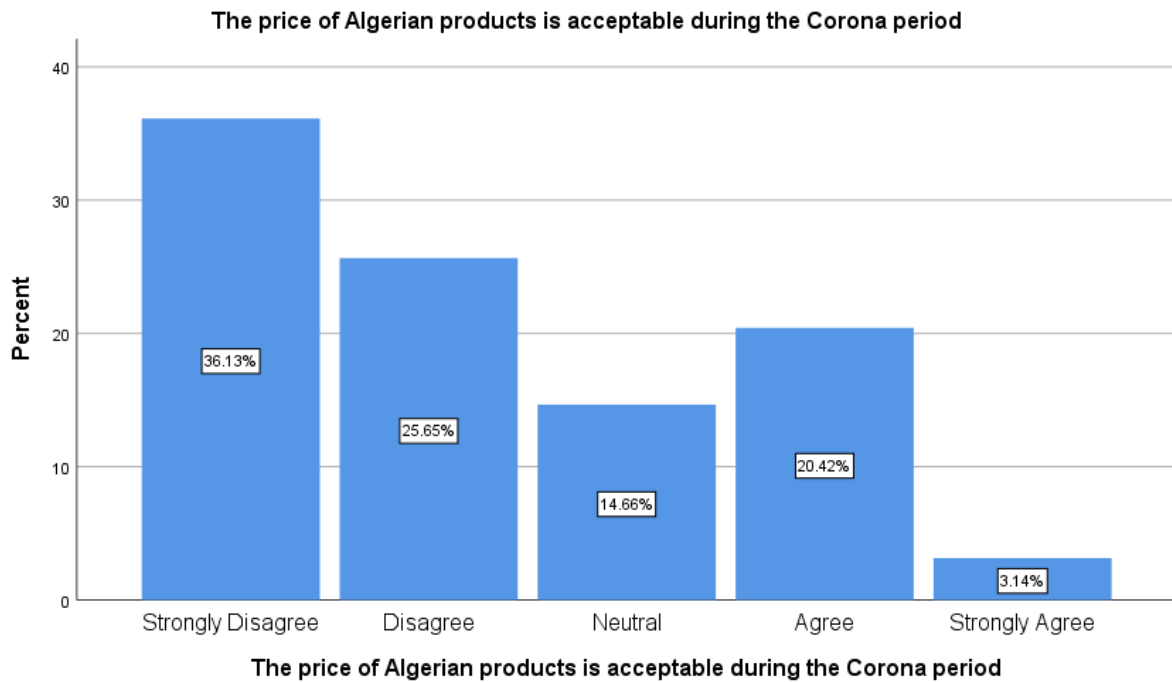


Figure 37. Products price during Corona crisis.



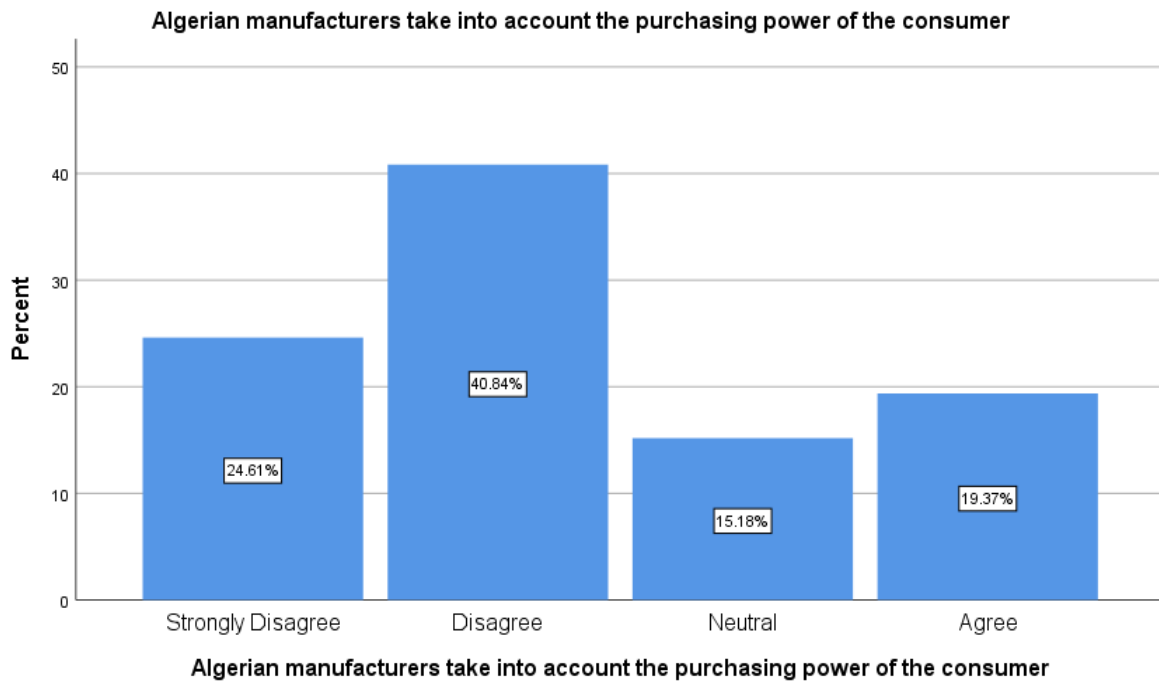
2.5.4 Production and Innovation Relationship

H₀₄: The Production in the Algerian enterprises has no statistical significant influence on the innovation process of the Algerian product.

The Production in the Algerian enterprises has a positive significant impact on the Innovation within Algerian enterprises ([P-value < 0.001] < 0.05), with a Coefficient of 61%.

In terms of the production in the Algerian enterprises, 37.17% of the consumers say that the Algerian producers have the necessary experience in production and 35.6% say that they do not have the experience. From another hand, about 58.11% confirm that the Algerian producers cannot satisfy the consumer's needs and 65.45 of them say that they do not take in consideration the purchasing power of the customers (figure 38).

Figure 38. Take into account the purchasing power.



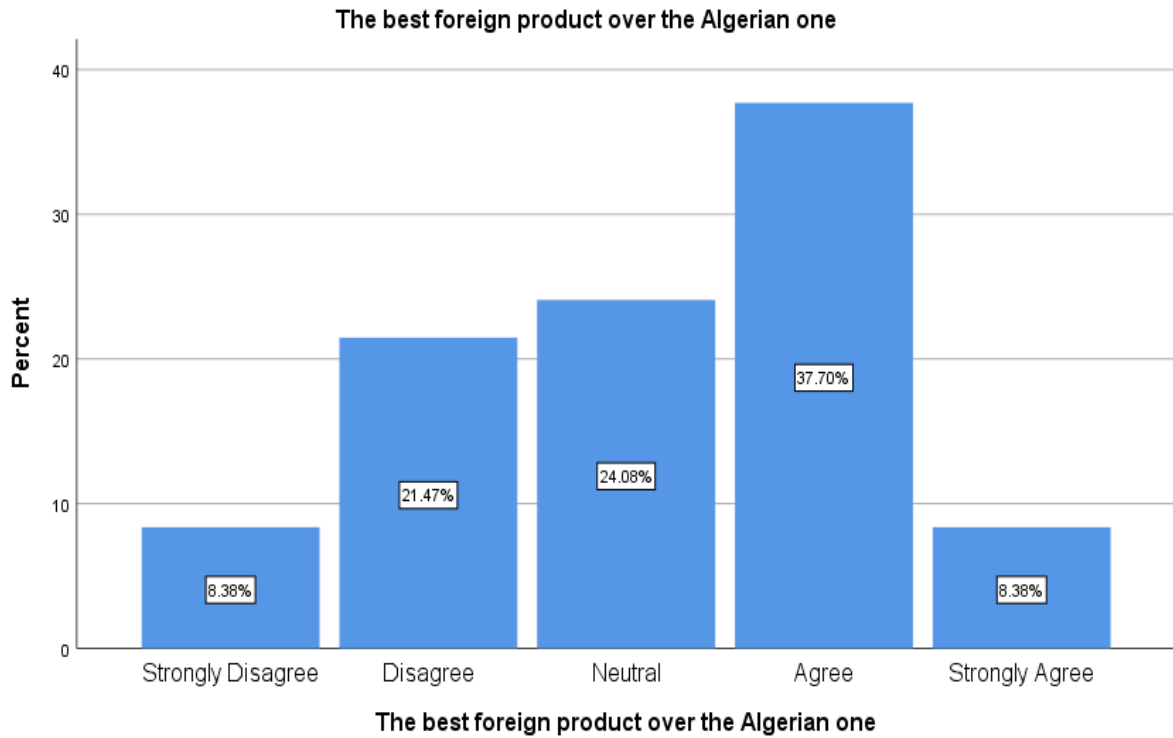
Besides, half of them (50.78%) declare that they cannot refund the price of a product if it has defects (figure 39).

Figure 39. Products price recovering.



In terms of Innovation, the results show that 57.07% of the consumers declare that the innovative products meet their basic needs and 23.56 are not satisfied. Besides, about 46.08% of the consumers prefer foreign products to local ones (figure 40).

Figure 40. Foreign Products vs local products



In addition, most consumers, about 64.39% confirm that the foreign products manufactured under license have not the same quality as the imported products (figure 41) and they are more expensive. And in this case, about 42.41% of them can replace the foreign product with another (figure 42).

Figure 41. Foreign products under license.

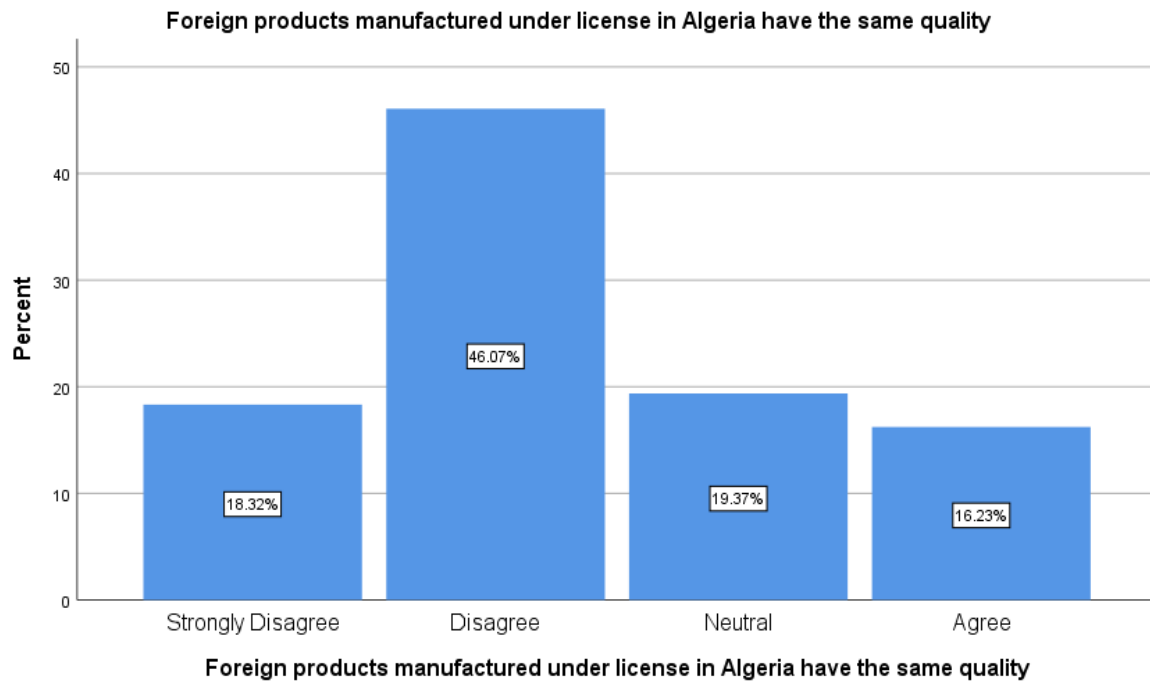
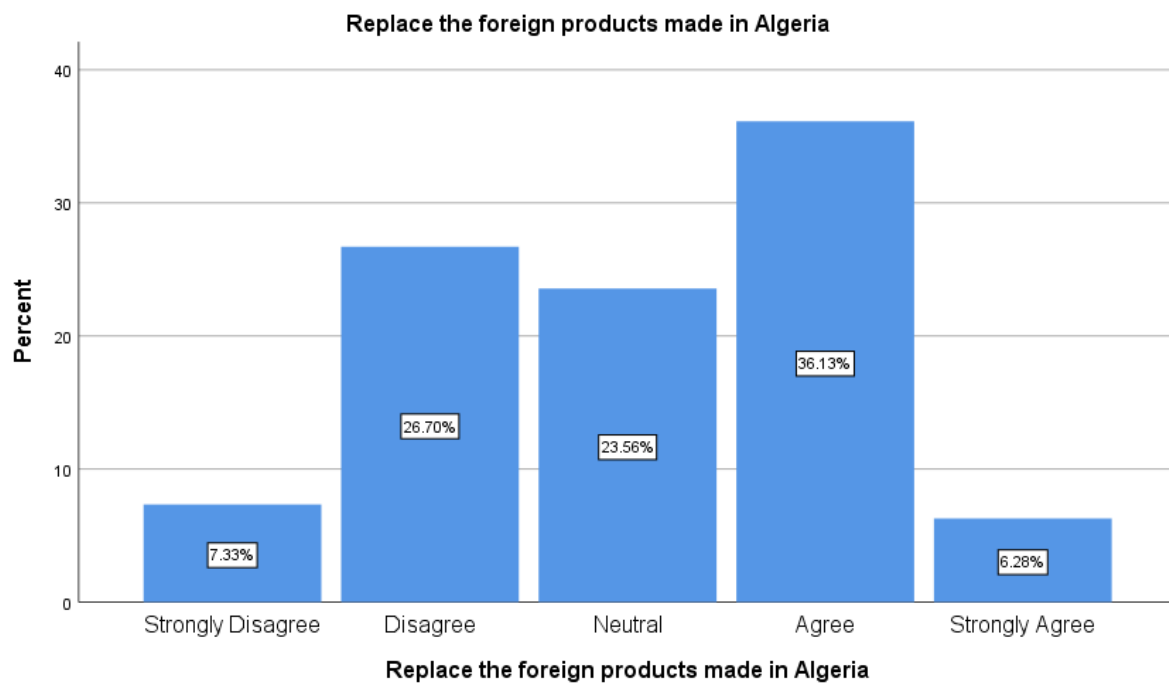


Figure 42. Replacing a foreign product made in Algeria.



General Conclusion

General Conclusion

This research was conducted in order to highlight the relationships between the Innovation process and the Production Management within the Algerian enterprises.

Through the literature reviews, we noticed that a few research talks about different concepts which can improve the production or visualise the relation between them and the production management as a holistic model.

Some of them studied the role of Knowledge Management on production and tried to define a model based on this concept like Muniz et al. in 2010 and Berawi et al. in 2005. Others include in their research the dimension of consumer satisfaction like Neely in 1991.

In 2017 Anna Kosieradzka defined a new maturity model of production management by including many concepts like total production maintenance, quality system management, six sigma, lean management, kaizen, and the theory of constraints. Furthermore, she based on operations inside the enterprises.

Our research aimed to study the contemporary concepts as well as Innovation, Digital Marketing and the new situation of the Covid-19 crisis.

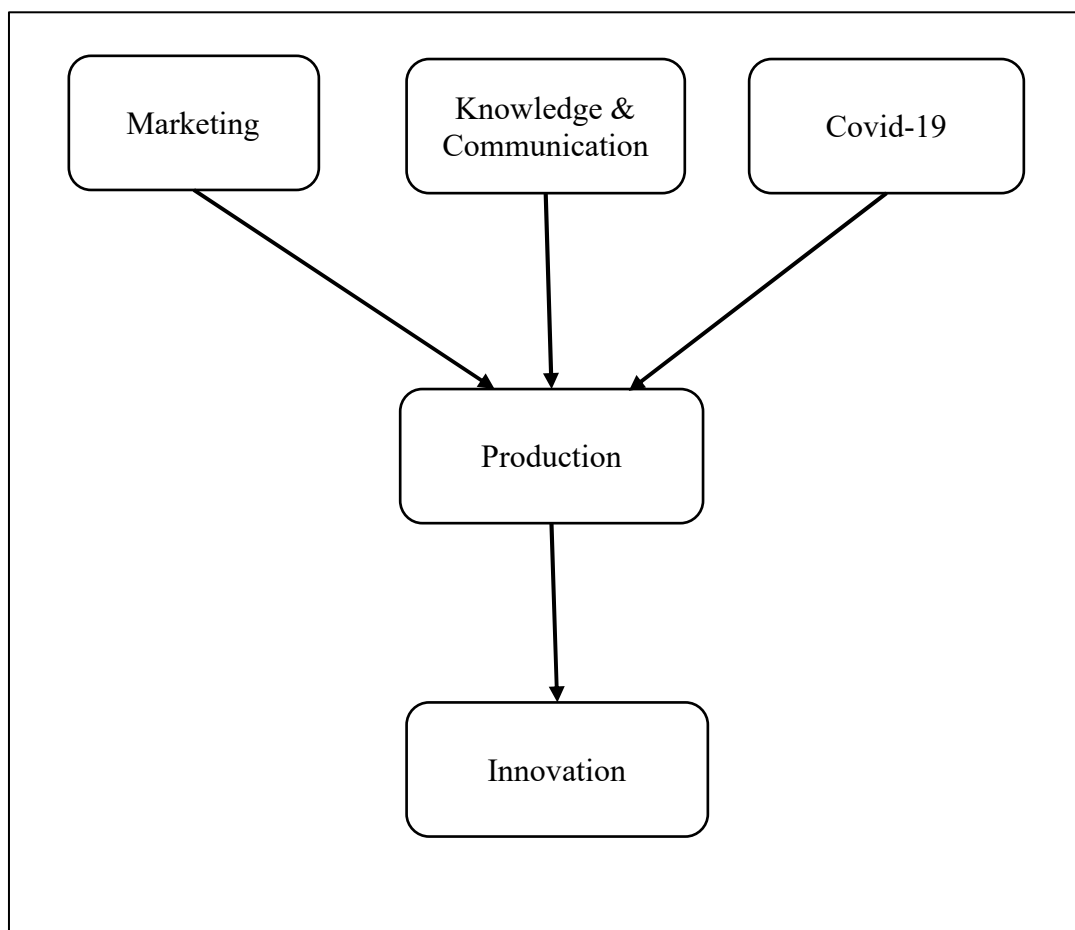
To conduct our research, we divided it into two big parts. The first part concerns the consumer perspective and the second part concerns the enterprise or the producer perspective.

We take into account the marketing dimension as proposed by Professor Benhabib in 2016. Marketing has a double role; we consider it as a framework and as a concept.

Given the current health situation, our study focused only on the consumer perspective. Only 191 questionnaires were collected based on the internet (about 90%).

The items of the questionnaires were categorised on five variables which are, Marketing, Production, Knowledge and Communication, Covid-19 and Innovation in order to create and to define the model of our research (Figure 43).

Figure 43. Conceptual Model



The final results show that (Table 26):

Table 26. Research Model hypotheses and Interpretation

Null hypothesis	Decision	Interpretation
1 - Marketing and Production Relationship		
<i>H₀₁</i> : The Marketing of the Algerian innovative product has no statistical significant influence on the Production within Algerian enterprises.	<i>Reject H₀ at 5% level.</i>	1 - The Marketing of the Algerian innovative products has a positive significant impact on the Production within Algerian enterprises, with a coefficient of 38.1%.
2 - Knowledge / Communication and Production Relationship		
<i>H₀₂</i> : The Knowledge Transfer and Communication between the Algerian consumers and the Algerian producers have no statistical significant influence on the Production within Algerian enterprises.	<i>Accept H₀</i>	The Knowledge Transfer and Communication between the Algerian consumers and the Algerian producers have no significant impact on the Production within Algerian enterprises ([P-value = 0.096] > 0.05).
3 - Covid-19 and Production Relationship		
<i>H₀₃</i> : The Covid-19 crisis has no statistical significant influence on the Production within Algerian enterprises.	<i>Reject H₀ at 0.1% level.</i>	The Covid-19 crisis has a positive significant impact on the Production within Algerian enterprises, with a coefficient of 88.1%.
4 - Production and Innovation Relationship		
<i>H₀₄</i> : The Production in the Algerian enterprises has no statistical significant influence on the Innovation process of the Algerian product.	<i>Reject H₀ at 0.1% level.</i>	The Production in the Algerian enterprises has a positive significant impact on the Innovation within Algerian enterprises, with a coefficient of 61%.

The first relationship test confirms that statistically there is a positive and significant influence between Marketing and Production. And the results show that the Algerian consumers can react positively to different forms of marketing practices in the market and the production policies proposed by the producers.

The findings also attest that the majority of the customers depend on the opinions of their family, friends and other consumers to make a purchase decision directly or indirectly via social media. Besides, most of them prefer and appreciate the use of the internet for their purchase operations, but they do not use bank cards especially in purchasing outside the country. Based on some interviews with some participants, we can say they prefer payment on delivery because it is more truthful for most of them.

The second relationship test mentions that the relationship between Knowledge and Communication and the producers is poorly weak. Statistically, the results are positive, but it is not significant.

Through the questionnaire results, we can notice that the majority of the customers are ready to give their opinions and suggestions about different products in order to help producers to develop their production, but at the same time, we can remark that the plurality of the producers does not deal with the comments and the notes made by their clients. Moreover, in terms of the motivation of their customers, Algerian producers do not take this into account.

The third relationship test indicates that the relationship between the COVID-19 and the Production is statistically positive and significant.

The findings report that a big part of the products is not available in the market, especially in the first period of the crisis and more than 60% of the consumers say that the prices are increased significantly during this period.

This last reflects the deterioration of the purchasing power in the majority of the cases. The low purchasing power category has doubled, and the good purchasing power category has decreased to the half.

The fourth and the main relationship test concern the impact of Production on Innovation. Statistically, the results underline the significant positive influence.

In addition, the data show that the Algerian consumers are not satisfied in terms of quality, meeting their needs and taking into consideration its purchasing ability by the producers.

More deeply, this conclusion reflects that the plurality of customers prefers foreign products to Algerian ones. However, they are ready to change these products, if they are locally manufactured due to the poor quality of the manufacturing and the high prices.

As a final result, our models represent a challenge for the Algerian enterprises to rethink twice in production strategies in order to enhance their relationships with their customers and ameliorate their position in the market. To reach these goals, they have to from one side to enhance the confidence in the use of modern and digital technologies in marketing and production and, from another side to create a real local digital marketing framework in order to reduce costs, increase product sales and to face the current pandemic crisis and any crisis in the future.

The limitation of our research was based essentially on the difficulty of collecting data and reaching the expected sample size of 350 questionnaires and the pandemic situation that led us to focus only on the consumer perspective.

Our future research will focus on enterprise perspective from a side and consumer perspective in more detail using interviews and focus groups in order to get deep into the customers' opinions.

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Appendices

Appendix A

Table 27. The 208 Definitions collected by Singh et al., 2021

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
1	<p>“...actual bringing to market or implementation of a new product, service or process which makes someone’s life better. It’s not creativity, which is the spawning of ideas that have the potential to be innovations.” - Ettlie (2020: 10)</p>	<p>Business/ Economics; Innovation Management</p>	<p>Commercial Motive, Implementation, Goal, Newness</p>
2	<p>“...the creation of something qualitatively new, a process of learning and knowledge building. According to the Oxford Dictionary, innovation is ‘the introduction of novelties,’ which not only encompasses stand-alone innovations but also innovations that build on already existing ones. In a commercial sense, innovation stands for the marketing of a new product. Joseph Schumpeter once asserted that innovation and invention are not necessarily interconnected, as innovation could exist without a proper invention, and not every invention leads to an innovation. In a similar vein, innovation can be seen as ‘the bringing of an invention into widespread, practical use.’ In this sense, an invention is often just the first step toward innovation.”</p>	<p>Law; Competition Law</p>	<p>Newness, Knowledge Investment, Improvement, Commercial Motive, Goal, Scale, Multidimensional</p>

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	- Robertson (2020: 67)		
3	<p>“...new ideas that meet social needs, create social relationships, and form new collaborations. These innovations can be products, services, or models addressing unmet needs more effectively.”</p> <p>- Verschraegen et al. (2020: 27)</p>	Political Science; Social Innovation	Ideas, Social Motive, Goal, Value Creation
4	<p>“Most contemporary definitions of ‘innovation,’ seen as an outcome of a process, rest on two defining characteristics, a degree of newness of a change and a degree of usefulness or success in the application of something new. The concept of ‘new’ could mean new to the world, new to a nation, new to a firm, etc.”</p> <p>- Granstrand and Holgersson (2020: 2)</p>	Innovation Management; Technological Innovation	Newness, Change, Value Creation
5	<p>“...the research and development directed to particular new or improved goods or processes.”</p> <p>- Kokkoris and Valletti (2020: 241)</p>	Business/ Economics; Competition Law	Research, Newness, Improvement
6	<p>“...new business practices for organising procedures, new methods of organising work responsibilities and decision-making; new methods of organising external relations with other firms or public institutions.”</p> <p>- Grande et al. (2020: 12)</p>	Economics; Innovation Management	Newness, Goal
7	<p>“The definitive essence of innovation is to promote socio-economic growth in society. In a capitalist society, innovation is a dynamic, multilayered concept that is related to new products and/or processes in society.”</p>	Engineering; Computational Science	Economic Growth, Multidimensional, Newness, Social Motive

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	- Batraga et al. (2019: 346)		
8	“...to co-create knowledge and solutions for a wide range of social needs and at a scale and speed that was unimaginable before.” - Milwood and Roehl (2019: 374)	Information Technology; Tourism Management	Goal, Speed, Scale, Social Motive, Knowledge Investment,
9	“...new products and/or services that have been “sold” and taken into use in at least one local market.” - Ottosson (2019:1)	Innovation Management; Technology Management	Newness, Commercial Motive
10	“...an orientation towards supporting practical outcomes that have a tangible impact.” - Abbasi et al. (2019: 17)	Applied Science and Technology; Design Innovation	Value Creation
11	“...the successful exploitation of new ideas, concepts, expressions and models through developing new products, services, processes, businesses, organisational settings, industrial and aesthetic designs and ultimately the establishment of alternative ways of responding to societal needs, which can also improve the performance and efficiency of public and private organisations.” - Concilio, Cullen, and Tosoni (2019: 96)	Applied Science and Technology; Design Innovation	Commercial Motive, Newness, Value Creation, Social Motive, Improvement
12	“While there is no universally accepted definition of innovation, most scholars agree that innovation involves the generation and realization of novel ideas.” - Cited from Chen, Walker, and Sawhney (2019: 2)	Political Science; Public Service Innovations	Creativity, Ideas, Newness
13	“...the implementation of a new or significantly improved	Tourism Management; Hospitality	Implementation,

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	<p>product (good or service), a process, marketing method, or organisational method in business practice, workplace organisation, or external relationship.”</p> <p>- European Commission’s definition of innovation, cited from Feniser, Dusa, and Sadeh (2018: 42)</p>		<p>Internal Environment, External Environment, Newness</p>
14	<p>The invention refers to new concepts or products that derive from an individual’s ideas or from scientific research. Innovation, on the other hand, is the commercialisation of the invention itself.</p> <p>- Merriam-Webster Dictionary (2018)</p>	<p>Language; Dictionary</p>	<p>Creativity, Research, Newness</p>
15	<p>...something new or different introduced.</p> <p>- Dictionary.com (2018)</p>	<p>Language; Dictionary</p>	<p>Newness, Implementation</p>
16	<p>“...a multidimensional process where organisations continuously engage in transforming ideas into new products or services either to advance further in a particular situation or gain competitive advantage through differentiation.”</p> <p>- Iddawala (2018:15)</p>	<p>Innovation Management; Tourism Management</p>	<p>Multidimensional, Ideas, Differentiation, Implementation, Newness, Competitive Advantage, Transformation</p>
17	<p>“...the introduction and implementation of an existing or mature management practice, process, structure, or technique that has not only been implemented somewhere else successfully but also intended to improve operational efficiency and organisational performance and further organisational goals.”</p> <p>- Lin (2018: 17)</p>	<p>Business; Management</p>	<p>Implementation, Goal, Value Creation</p>

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
18	<p>...the process of implementing new ideas to create value for an organisation. This may mean creating a new service, system, or process, or enhancing existing ones. Innovation can also take the form of discontinuing an inefficient or out-of-date service, system, or process.</p> <p>- Yale Information Technology Service (2018)</p>	Information Technology	Implementation, Creative Destruction, Ideas, Improvement, Value Creation, Newness
19	<p>“Mulgan and Albury (2003) defined innovation as the successful implementation of a new or significantly improved product, service, marketing strategy, new organisation method that will bring a substantial improvement to the economy, efficiency, or quality of the outputs.”</p> <p>- Lacova and Hunady (2018: 21)</p>	Science/ Technology; Innovation Management	Implementation, Newness, Value Creation, Economic Growth
20	<p>“Invention is the creation of an idea or method or a novel concept. Innovation is the conversion of a novel concept (an invention) into a product, process, or business model that generates revenues and profits.”</p> <p>- Dyer et al. (2018: 178)</p>	Strategic Management; Innovation	Invention, Implementation, Commercial Motive
21	<p>“...the implementation of a new or significantly changed product or process. A product is a good or service. The process includes production or delivery, organisation, and marketing processes. A new or significantly changed product is implemented when it is made available to potential users. New or significantly changed processes are implemented when they are brought into actual use in the operation of the institutional unit, including the</p>	Research Policy; Innovation	Implementation, Newness, Improvement

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	making of product available to potential users.” - Gault (2018: 619)		
22	“Freeman (1974, p. 22) defined innovation related to invention as intrinsic to technological change: “an invention is an idea, a sketch, or a model for a new or improved device, product, process, or system. Although closely linked, invention and innovation are very distinct: a requisite is a successful introduction or commercialisation and marketing of an invention.” - Edwards-Schachter (2018: 66)	Business/ Economics; Innovation Management	Invention, Technology, Commercial Motive, Implementation
23	“Surgical innovation in both the research and the clinical paradigm may contain untested novel ideas, but innovation in research is aimed at generating generalizable knowledge, while innovation in clinical care is aimed at improving the outcome of the individual patient. When new surgical procedures are implemented in patients, generating universal knowledge, thus coincides with the aim of ameliorating the suffering of the individual patient.” - Zaki et al. (2018: 7)	Neurosurgery; Medical Innovations	Ideas, Newness, Knowledge Investment, Improvement, Goal, Implementation
24	“...scenarios where the techniques, instruments, and/or devices used are new to the hospital or new to the surgeon.” - Zaki et al. (2018: 8)	Neurosurgery; Medical Innovations	Newness
25	“Aiming to describe surgical innovation, participants defined it as the progress in surgery with some discrepancy. Yet, two distinct stages were identified: the breaking innovation and	Medicine; Surgical Innovation	Improvement, Transformation, Ecological Rationality, Goal

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	<p>developmental innovation. The breaking innovation is seen as a major advance transforming practice in a particular field of surgery. This process is rare but is the main step leading to progress (e.g., the introduction of laparoscopy in abdominal surgery). The developmental innovation was described as all minor advances and adjustments aiming to accomplish the full potential of breaking innovation. It is seen as the most common innovative process (e.g., development of specific surgical instrumentation used in laparoscopy).” - Zarzavadjian Le Bian et al. (2018: 3-4)</p>		
26	<p>“...new/improved methods related to business, jobs, and relationships.” - Hartono and Kusumawardhani (2018: 6)</p>	Business/ Economics; Innovation Management	Newness, Improvement
27	<p>...a systematic, cross-functional process that creates a quality leap and breaks the old rules resulting in a departure from the existing system. - Based on Kogabayev and Maziliauskas (2017: 63)</p>	Business; Public Administration	Differentiation, Value Creation, Creative Destruction, Disruption
28	<p>“...the process by which, on the basis of creativity, new value is added to a product (good or service) or to the process of its production/distribution. Value can be exchange value (e.g., money) or use value (something useful for society, for some institutions, for some organisation, for the individual, or for a collective of individuals).” - Banet-Weiser and Castells (2017: 16)</p>	Social & Behavioral Sciences; Sociology	Creativity, Value Creation, Newness

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
29	<p>“The original concept of innovation was the ability to create economic value from new ideas. With the development of this concept, researchers defined it with different focuses. From the process perspective, it was defined as the process of the creation, development, and implementation of new ideas. From the marketing perspective, it was defined as an iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which leads to the development, production, and marketing tasks striving for the commercial success of the invention. From the capability perspective, it was defined as “the capabilities which are accustomed to developing effective and efficient systems to foresee opportunities, share and re-examine information using these systems, and overcome organisational inertia.” From the cultural and environmental perspective, it was defined as “the notion of openness to new ideas as an aspect of a firm’s culture as a measure of the organisation’s orientation toward innovation.” The central element in these diverse definitions of innovation is a new idea being put into practice.”</p> <p>- Gao et al. (2017: 13)</p>	<p>Environment and Sustainability; Supply Chain Innovation</p>	<p>Value Creation, Ideas, Implementation, Newness, Perception, Technology, Commercial Motive, Improvement</p>
30	<p>“... solutions to social pressures related to health, land consumption, wasted resources, environmental dangers,</p>	<p>Innovation Management; Social Innovation</p>	<p>Problem Solving, Social Motive</p>

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	unemployment, unmet needs, and marginality.” - Santoro, Ferraris, and Vrontis (2017: 26)		
31	“...all those ideas, activities and processes that support the development of new social solutions (products or services), through the inflows and outflows of knowledge and technologies (inbound and outbound activities) and collaborations between different entities (coupled processes), mobilizing actions across boundaries and exploiting ecosystems.” - Santoro, Ferraris, and Vrontis (2017: 30)	Innovation Management; Social Innovation	Ideas, Social Motive, Multidimensional, Recombination, External Environment, Knowledge Investment, Technology
32	“...the capability of continuously achieving the desired future.” - Kao, cited from Hartmann (2016: 5)	Management; Project Management	Actualization, Creativity, Value Creation
33	“...creating what is new and valuable... Innovation emerges when different bodies of knowledge, perspectives, disciplines are brought together.” - Kao, cited from Hartmann (2016: 5)	Management; Project Management	Newness, Value Creation, Knowledge Investment
34	“...a process by which a product/service takes root in simple applications at the bottom of the market and then moves up market, eventually displacing established competitors.” - Christensen, cited from Hartmann (2016: 6)	Management; Project Management	Competitive Advantage, External Environment, Disruption
35	“...innovation in the creative industries is a process and a by-product of creative production, and is dependent upon openness	Cultural Policy; Creative Industry Professionals	Creativity, Implementation, Newness,

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	<p>to the environment and the utilization of existing or creating new methods that increase or deliver high-quality outputs that are new in specific contexts. The goal of this innovation is not so much developing the spill-overs to the wider economy as many policy reports indicate.”</p> <p>- Wijngaarden, Hitters, and Bhansing (2016: 10)</p>		Value Creation
36	<p>“...humanly created changes in established approaches to value creation.”</p> <p>- Orstavik, Dainty, and Abbott (2015: 4)</p>	Engineering; Construction Innovation	Change, Value Creation
37	<p>“...if the firm reports positive new product and process sales in the year.”</p> <p>- Howell (2015: 1875)</p>	Policy Research; Indigenous Innovation	Commercial Motive, Newness
38	<p>“...the realization of a new idea and its commercial exploitation. The idea must be something that did not previously exist and can involve more elements than the sole product, such as new processes, markets, raw materials, suppliers and/or company reorganizations. Innovation derives from the production domain instead of being propelled forward by user needs or expectations.”</p> <p>- Cited from Filippi and Barattin (2015: 1)</p>	Design; Creativity and Innovation	Newness, Ideas, Commercial Motive
39	<p>“Dong, Karhade, Rai, and Xu (2013) define innovation as the organisational change aiming to improve certain organisational outcomes.”</p> <p>- Gregor and Hevner (2014: 227)</p>	Business/Economics; Innovation Management	Change, Newness

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40	<p>“...an idea, practice, or material artifact perceived to be new by the relevant unit of adoption.” - Zaltman, Duncan, and Holbek, cited from Talukder (2014: 8)</p>	Business/Economics; Innovation Management	Ideas, Adoption, Newness, Perception
41	<p>“...something different that creates value.” - Anthony (2014: 9)</p>	Business/Economics; Innovation and Entrepreneurship	Differentiation, Newness, Perception, Value Creation
42	<p>“...any novel product, service, or production process that departs significantly from the prior product, service, or production process architectures. In organisations, innovations are manifested in significant modifications of production processes or product or service architectures and sometimes by the introduction of an entirely new product, service, or production process. Our construct of innovation focuses on novel processes or their outcomes (products or services), rather than administrative changes, such as downsizing.” - McKinley, Latham, and Braun (2014: 91)</p>	Management; Innovation Management	Newness, Differentiation, Improvement, Goal
43	<p>“...any improvement in a process, product, or system that is novel to the institution developing the change.” - Freeman, Cited from Xue et al. (2014: 113)</p>	Engineering/ Technology; Construction Engineering	Improvement, Newness, Change
44	<p>“... the actual use of a non-trivial change and improvement in a process, product, or system that is novel to the institution developing the change.” - Slaughter, Cited from Xue et al. (2014: 113)</p>	Engineering/ Technology; Construction Engineering	Implementation, Change, Improvement, Newness
45	<p>“...the process through which new ideas turn into new components of constructed</p>	Engineering/ Technology; Construction Engineering	Newness, Value Creation, Economic Growth,

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	products that have economic, functional, or technological value.” - Mottawa, Cited from Xue et al. (2014: 113)		Technology
46	“...the implementation of significantly new processes, products, or management approaches in order to increase the efficiency of an organisation.” - Seaden, Cited from Xue et al. (2014: 113)	Engineering/ Technology; Construction Engineering	Newness, Value Creation
47	‘Innovation = invention + commercialisation or implementation’ - Gaynor (2013:5)	Engineering/Technology; Engineering Management	Invention, Commercial Motive, Implementation
48	“...something that leads to the commercialisation of the invention.” - Gaynor (2013:5)	Engineering/Technology; Engineering Management	Commercial Motive, Invention
49	“...the application of [creative learning] process or product in order to benefit a domain or field.” - Binh (2013: 25), text in bracket added	Education; Creativity	Creativity, Implementation
50	New products/those not seen before/invention/creativity	Business/Economics; Technology	Newness, Invention, Creativity
	Evolving/adapting current products		Enlargement, Adoption
	Brand new technologies/working with technology/technology improving		Newness, Technology
	New ways of solving problems		Newness, Problem Solving
	Continuous improvement/developing processes/products		Implementation, Enlargement
	Specifically, high-tech, e.g., IT/Machinery		Technology

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	Change/harnessing change		Change
	New thinking/new philosophy/harnessing IP/idea creation		Newness, Invention, Ideas
	Reducing cost/becoming more profitable/bettering what has been done before/creating value/improving process		Commercial Motive, Improvement, Value Creation, Implementation, Improvement
	Responding to customer needs/meeting market demand		Commercial Motive
	Activities/products that benefit society		Social Motive
	Combination-products, process, thinking - GE Innovation Barometer Survey, cited from Vaughan (2013: 12-13)		Recombination
51	“...process of bringing new creative ideas to reality.” - Loosemore (2013: 1)	Business/Economics; Construction Engineering	Implementation, Newness, Creativity, Ideas
52	“...creating results by doing new things.” - Miller and Wedell-Wedellsborg (2013: 13)	Business/Economics; Innovation Management	Implementation, Value Creation, Newness
53	“...new and apparently promising strategy designed to solve some persistent and serious human problem.” - Lundstedt and Colglazier (2013: xxi)	Social Science; Innovation Management	Newness, Perception, Problem Solving
54	“...the creative selection, organisation, and utilization of human and material resources in new and unique ways which will	Social Science; Education	Recombination, Goal, Economic Growth,

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	<p>result in the attainment of a higher level of achievement for the defined goals and objectives.” - Richland, cited from Morrish (2013: 22)</p>		
55	<p>“...an invention sufficiently large to have an economic impact.” - Bianchi (2013: 2)</p>	Business/Economics; Economics	Invention, Economic Growth, Scale, Commercial Motive
56	<p>“Some say innovation is a novel idea; yet, ideas are creative but not innovative, given their intelligibility. In reality, innovation is more than new ideas; it is new technology, new ways of operating, and new ways of managing. Innovation occurs when human employ a creative process to meet a particular need; innovation begins at a very human level. You could even call this level the “organic level.” Therefore, the current definition should include the contribution of human beings to address the need with available resources. Innovation begins at the human level, with creative thought and reason to fulfill an important need.” - McLaughlin and Caraballo (2013: 16)</p>	Business/Economics; Innovation Management	Ideas, Newness, Creativity, Ecological Rationality, Actualization, Psychological
57	<p>“We define innovation from its ability to meet a human need.” - McLaughlin and Caraballo (2013: 17)</p>	Business/Economics; Innovation Management	Actualization, Psychological
58	<p>“Invention is the first occurrence of an idea for a new product or process, while innovation is the first attempt to carry it out in practice.” - Fagerberg, Martin, and Andersen (2013: 6)</p>	Business/Economics; Innovation Management	Invention, Implementation, Commercial Motive, Newness

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
59	<p>“...the act of creating a new product or process, which includes invention and the work required to bring an idea or concept to final form.” - Kahn et al. (2013: 454), Also available on ericshaver.com</p>	Management; Product Management	Newness, Invention, Ideas
60	<p>“...a viable offering that is new to a specific context and time, creating user and provider value.” - Kumar (2013: 1), Also available on ericshaver.com</p>	Design; Design Innovation	Ecological Rationality, Value Creation, Newness
61	<p>“...in the words of West and Anderson (1996) and recently by Wong (2008, p. 2): “Innovation can be defined as the effective application of processes and products new to the organisation and designed to benefit it and its stakeholders.” - Cited from Sinha (2013: 70)</p>	Business Research; Reverse Innovation	Value Creation, Newness
62	<p>“Kimberly (1981, p. 108) defines innovation which supports different forms of innovation: “There are three stages of innovation: innovation as a process, innovation as a discrete item including, products, programs or services; and innovation as an attribute of organisations.” - Cited from Sinha (2013: 70)</p>	Business Research; Reverse Innovation	Multidimensional
63	<p>“Schumpeter understood innovation very broadly as a product, a process, and as organisational changes which do not have to arise from new scientific discoveries, but which may combine already existing technologies or their applications in a new context. These are understood more</p>	Engineering/ Management; Innovation Management	Change, Recombination, Technology, Improvement, Value Creation

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	generally and broadly than scientific and technological progress, and they do not include just technical and technological changes or improvements, but also practical applications.” - Žižlavský (2013: 2)		
64	“... a kind of creative act in economics, requiring a business attitude.” - Žižlavský (2013: 2)	Engineering/ Management; Innovation Management	Creativity, Commercial Motive
65	“...development and implementation of a new idea in an applied setting.” - Sexton and Lu (2012: 46)	Engineering/Technology; Construction Engineering	Implementation, Creativity, Newness, Ideas, Commercial Motive, Social Motive
66	“...successful exploitation of new ideas.” - UK Government, cited from Sexton and Lu (2012: 46)	Engineering/Technology; Construction Engineering	Commercial Motive, Creativity, Ideas
67	“...effective generation and implementation of a new idea which enhances overall organisational performance.” - Sexton and Lu (2012:46)	Engineering/Technology; Construction Engineering	Creativity, Implementation, Commercial Motive, Competitive Advantage
68	“...economic use of an invention on the market or within a company itself.” - Brockhoff, cited from Böhle and Bürgermeister (2012: 43)	Engineering/ Technology	Commercial, Invention
69	“...to bring an idea to the market. This means that the term innovation automatically includes that the idea can be implemented with currently available technologies and resources.” - Kraft (2012: 12)	Business/Economics; Economics	Commercial Motive, Ideas, Ecological Rationality
70	“...marketing of a new or improved product, method of	Management/ Economics; Innovation	Newness, Improvement,

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	production or service, as well as the opening of a new market, acquisition of a new source of supply of raw materials, or reorganization of an industry (including by use of anticompetitive practices).” - Faunce (2012: 731)		Commercial, Recombination
71	“...a rewardable innovation with regard to medicinal products can be defined as “a medicinal product that provides, through a step change, something novel, with the potential or proven ability to yield, for individuals and/or their society, a treatment not previously available or a clinically significant improvement in treatment, with large health gains and a favorable benefit to harm balance, at an acceptable cost.” - Aronson, Ferner, and Hughes (2012; 254)	Medicine; Drug Therapy	Newness, Value Creation, Invention, Improvement, Commercial Motive
72	“...novel ideas or concepts that the institution has implemented to bring about real change.” - McCoy et al., cited from Rigby, McCoy, and Garvin (2012: 245)	Engineering/ Technology; Construction Innovation	Newness, Implementation, Change
73	“...novel vehicles for drastic and continuous improvement in the industry rather than distinct ideas, objects, or processes.” - Cited from Rigby, McCoy, and Garvin (2012: 245)	Engineering/ Technology; Construction Innovation	Improvement, Differentiation
74	“Following Hall & Williams (2008), an innovation can be described by two elements: its form, which indicates the form of the innovation, and its impact range, which delimitates whether its effects are observable at a	Business/Economics; Tourism Management	Social Motive, Scale

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	world, national, regional, or sectoral level.” - Camisón and Monfort-Mir (2012: 777)		
75	“...creative ideas or behaviors that help to generate opportunities in organisations. The new idea refers to new technology to produce new product, a new access to market, a new structure in the administrative system.” - Zhang (2011: 14)	Business/Economics; Engineering	Creativity, Commercial Motive, Implementation, Newness, Ideas, Technology
76	“...to be a true innovation, a product, service, or company has to have three essential elements: It has to be unique, it has to be valuable, and it has to be worthy of exchange.” - Kaafarni and Stevenson, cited from Grafsgaard (2012: 416)	Business/Economics; Economics	Newness, Value Creation, Commercial Motive
77	“...production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome.” - Crossan and Apaydin (2010: 1155), also available on ericshaver.com	Management; Innovation Management	Value Creation, Newness, Economic Growth, Social Motive, Renewal, Enlargement,
78	“The first definition of innovation was coined by Schumpeter in the late 1920s (Hansen and Wakonen, 1997), who stressed the novelty aspect. According to Schumpeter, innovation is reflected in novel outputs: a new good or a new quality of a good; a new method of production; a new market; a new source of supply; or a new	Management; Innovation Management	Newness, Differentiation

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	<p>organisational structure, which can be summarized as ‘doing things differently.’” - Crossan and Apaydin (2010: 1155)</p>		
79	<p>“It matters little, as far as human behavior is concerned, whether or not an idea is objectively new as measured by the lapse of time since its first use or discovery... If the idea seems new and different to the individual, it is an innovation.” - Rogers and Shoemaker, cited from Trott (2010: 14)</p>	<p>Innovation Management; Product Development</p>	<p>Newness, Differentiation, Perception</p>
80	<p>“Innovation is concerned with the commercial and practical application of ideas or inventions. Invention is the conception of the idea, whereas innovation is the subsequent translation of the invention into the economy (US Dept of Commerce, 1967). The following simple equation helps to show the relationship between the two terms: innovation = theoretical conception + technical invention + commercial exploitation</p> <p>The conception of new ideas is the starting point of innovation. A new idea by itself, while interesting, is neither an invention nor an innovation; it is merely a concept or thought a collection of thoughts. The process of converting intellectual thoughts into a tangible new artifact (usually a product or process) is an invention. The latter activities represent exploitation. However, it is the complete process that represents innovation.”</p>	<p>Innovation Management; Product Development</p>	<p>Commercial Motive, Value Creation, Ideas, Invention, Economic Growth, Technology</p>

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	- Trott (2010: 14)		
81	“...the management of all the activities involved in the process of idea generation, technology development, manufacturing, and marketing of a new (or improved) product or manufacturing process or equipment.” - Trott (2010: 15)	Innovation Management; Product Development	Ideas, Technology, Newness, Value Creation
82	“The senior vice president for research and development at 3M, one of the most highly respected and innovative organisations, recently defined innovation as: creativity: the thinking of novel inappropriate ideas. Innovation: the successful implementation of those ideas within an organisation.” - Trott (2010: 15)	Innovation Management; Product Development	Implementation, Ideas
83	“...a result of the mindset of the entrepreneur’s openness for new ways of viewing the state of affairs.” - McGrath and Macmillan (2009: 13)	Business/Economics; Innovation and Entrepreneurship	Entrepreneurial, Psychological, Newness
84	“...an act of creating something new or finding new ways to create value.” - Katragadda (2009: xiii)	Business/Economics; Innovation Management	Implementation, Newness, Value Creation
85	“...a multistage process of transforming organisational ideas into new or improved products, process, or services with an aim to advance, compete, or differentiate successfully in the market.” - Baregheh, Rowley, and Sambrook (2009: 1333)	Business/Economics; Management Decision	Multidimensional, Implementation, Improvement, Newness, Commercial Motive, Competitive Advantage
86	“...introduction of management practices new to the firm and intended to enhance firm performance.”	Business/Economics; Business Research	Implementation, Newness, Competitive Advantage

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	- Mol and Birkinshaw (2009: 1269)		
87	<p>“...new approaches to structuring a firm, new management techniques, and new marketing methods that firm adopt from another context.”</p> <p>- Mol and Birkinshaw (2009: 1270)</p>	Business/Economics; Business Research	Newness, Adoption
88	<p>“...the development and intentional introduction of new and useful ideas by individuals, teams, and organisations.”</p> <p>- Bledow et al. (2009: 305), Also available from ericshaver.com</p>	Industrial and Organisational Psychology; Innovation	Implementation, Newness, Ideas, Value Creation
89	<p>“...the act of generating more value for the customer and the business by fulfilling a job to be done better than anyone else... Innovation isn’t about coming up with new or better stuff; it’s about solving the problem of what to come up in the first place.”</p> <p>- Silverstein, Samuel, and DeCarlo (2009: xviii)</p>	Business/ Economics; Innovation Management	Value Creation, Problem Solving, Improvement
90	<p>“...the process of innovation is actually of spontaneous undeliberate learning.”</p> <p>- Kirzner, Cited from Veeraraghavan (2009: 17)</p>	Business/ Economics; Innovation and entrepreneurship	Knowledge Investment, Creativity
91	<p>“...renewal and enlargement of the range of products and services and the associated markets; the establishment of new methods of production, supply, and distribution; the introduction of changes in management, work organisation, and the working conditions of the workforce.”</p> <p>- The European Commission, cited from Petrovic, Mihic, and Stosic (2009: 151)</p>	Strategic Management; Information Technology/Portfolio Management	Enlargement, Change, Social Motive, Implementation

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
92	<p>“...a discovery or the adoption of a policy or program that is new to an adopting agency or a state.” - Chi (2008: 1858)</p>	Policy Research; Public Administration	Adoption, Newness
93	<p>“The word “innovation” comes from the Latin noun <i>innovatio</i>, derived from the verb <i>innovare</i>, to introduce [something] new. It can refer either to the act of introducing something new or to the thing itself that is introduced. In terms of commerce, it is defined in the Oxford English Dictionary as “the action of introducing a new product into the market; a product newly brought on to the market.” - Aronson (2008: 65)</p>	Healthcare Management; Ambulatory Care	Implementation, Newness
94	<p>“...process of making improvement by introducing something new that should potentially yield a benefit for users, in terms of a tangible impact at the level of society.” - Velo and Rizzini (2008: 440)</p>	Medicine; Clinical Pharmacology	Improvement, Social Motive, Value Creation, Newness
95	<p>“...a frame of mind...the art of making new connections, and continuously challenging the status quo- without changing the things for change’s sake.” - Stamm (2008: 10)</p>	Business/Economics; Innovation Management	Psychology, Newness, Change
96	<p>“...process of making changes, large and small, radical and incremental, to products, processes, and services that result in the introduction of something new for the organisation that adds value to the customers and contributes to the knowledge store of the organisation.” O’Sullivan and Dooley (2008: 5)</p>	Knowledge Management; Strategic Management	Change, Value Creation, Improvement, Newness

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
97	<p>“...the successful implementation of a novel idea in a way that creates compelling value for some or all of the stakeholders.”</p> <p>- Varkey, Horne, and Bennet (2008: 383)</p>	Medicine; Medical Quality	Newness, Value Creation
98	<p>“...generation and implementation of a management practice, process, structure, or technique that is new to state of the art and is intended to further organisational goals.”</p> <p>- Birkinshaw, Hamel, and Mol (2008: 829)</p>	Business/Economics; General Management	Newness, Value Creation
99	<p>“... the conversion of a new idea into revenues and profits... Innovation is not complete until its source in the financial results.”</p> <p>- Lafley and Charan (2008: 21)</p>	Business/ Economics; Innovation Management	Commercial Motive, Newness, Ideas
100	<p>“... the practical implementation of an idea into a new device or process... Innovation begins with the generation of new ideas.”</p> <p>- Schilling (2008: 16 - 17)</p>	Strategic Management; Technological Innovation	Implementation, Ideas, Newness, Creativity
101	<p>“...anything new that is successfully introduced into an economic or social process.”</p> <p>- Davis et al. (2007: 7)</p>	Food Policy Research; Agricultural Education	Newness, Social Motive, Commercial Motive
102	<p>“...the combination of creativity and implementation.”</p> <p>- Lyons, Chatman, and Joyce (2007: 174)</p>	Business/Economics; Management	Creativity, Implementation
103	<p>“...creation of tangible social value through fresh thinking.”</p> <p>- The Economist (2007:2)</p>	Business/Economics; Management	Social Motive, Value Creation, Creativity

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
104	“...search for, and the discovery, experimentation, imitation, and adoption of new products, new processes, and new organisational set-ups.” - Dosi, cited from Loh (2007: 5)	Business/Economics; Innovation Management	Adaptive Search, Creativity, Research, Adoption, Newness
105	“...a new method, custom, device, idea, practice, or object.” - Yu and NG (2006: 59)	Engineering; Apparel Technology	Newness, Ideas
106	“...a new idea or concept generated by R&D (invention), which is transformed into a socially usable product. Successful innovation requires changes in organisational processes and conversion of an idea into a commercial product that is designed, manufactured, and adopted by users.” - Khilji, Mroczkowski, and Bernstein (2006: 532)	Innovation Management; Product Innovation	Newness, Ideas, Adoption, Creativity, Transformation, Invention, Research, Change, Commercial Motive, Social Motive
107	“...a process that includes idea generation (creativity), but also the implementation of ideas within the work setting.” - Harrison et al. (2006: 1)	Innovation Management; Biotechnology	Creativity, Implementation
108	“...the commercialisation of a novel technology that provides the customer with new capability.” - Fetterhoff and Voelkel (2006: 14)	Business/ Economics; Research Technology	Commercial Motive Implementation, Newness, Ecological Rationality
109	“...a marked departure from traditional management principles, processes, and practices or departure from customary organisational forms that significantly alters the way the work of management is performed.” - Hamel (2006: 4)	Business/Economics; Innovation Management	Differentiation, Disruption, Change, Value Creation
110	“...the successful creation and delivery of a new or improved product or service in the market ...a process that turns an idea	Business/Economics; Innovation Management	Newness, Improvement, Value Creation,

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	<p>into value for the customer and results in sustainable profit for the enterprise.”</p> <p>- Carlson and Wilmot (2006: 3-4)</p>		Commercial Motive
111	<p>“In the research literature, the definition of innovation includes the concepts of novelty, commercialisation and/or implementation. In other words, if an idea has not been developed and transformed into a product, process or service, or it has not been commercialized, then it would not be classified as an innovation.”</p> <p>- Popadiuk and Choo (2006: 303)</p>	Management; Information Management	Newness, Commercial Motive, Implementation, Transformation
112	<p>“...a long and cumulative process of a great number of the organisational decision-making process, ranging from the phase of generation of a new idea to its implementation phase. New idea refers to the perception of a new customer need or a new way to produce. It is generated in the cumulative process of information-gathering, coupled with an ever-challenging entrepreneurial vision. Through the implementation process, the new idea is developed and commercialized into a new marketable product or a new process with attendant cost reduction and increased productivity.”</p> <p>- Urabe, cited from Popadiuk and Choo (2006: 303)</p>	Management; Information Management	Problem Solving, Creativity, Newness, Ideas, Perception, Research, Entrepreneurial, Implementation, Commercial Motive
113	<p>“...new knowledge incorporated in products, processes, and services.”</p> <p>- Afuah, cited from Popadiuk and Choo (2006: 303)</p>	Management; Information Management	Knowledge Investment

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
114	<p>“...core renewal process in any organisation that changes what it offers to the world (product or service innovation), the ways in which it creates and delivers those offerings (process innovation).” - Bessant et al. (2005: 1366)</p>	Engineering/Technology; Innovation Management	Implementation, Newness
115	<p>“...the introduction of or change to something new.” - Smith, cited from Jongen and Meulenber (2005: 13)</p>	Engineering/Technology; Agrifood Technology	Change, Implementation, Newness
116	<p>“...successful implementation of a new product, service, or process, which for most activities entails their commercial success.” - Gordon and McCann (2005: 31)</p>	Business/Economics; Economic Geography	Commercial Motive, Implementation, Newness
117	<p>“...bringing new product, service, or process leading to commercial success.” - Gordon and McCann (2005: 525)</p>	Business/Economics; Economic Geography	Implementation, Newness, Commercial Motive
118	<p>“...a deliberate and radical change in existing products, processes or the organisation in order to achieve a competitive advantage over competitors.” - de Leede and Looise (2005: 108)</p>	Business/Economics; Innovation Management	Change, Competitive Advantage
119	<p>“...a process of turning opportunity into new ideas and of putting these into widely used practice.” - Tidd, Bessant, and Pavitt (2005: 66)</p>	Business/Economics; Innovation Management	Transformation, Newness, Ideas, Value Creation
120	<p>“...the generation, development and implementation of ideas that are new to an organisation and that has practical or commercial benefits. This definition also encompasses the adoption and implementation of products or</p>	Engineering; Construction Innovation	Creativity, Implementation, Ideas, Newness, Commercial Motive, Adoption,

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	processes developed outside the organisation.” - Dulaimi, Nepal, and Park (2005: 566)		External Environment
121	“...a process that involves the generation, adoption, and implementation of new ideas or practices within the organisation.” - Wan, Ong, and Lee (2005: 261)	Engineering/ Technology; Technological Innovation	Creativity, Adoption, Implementation, Newness
122	“...an idea, practice, or material artifact perceived to be new by the relevant units within the adoption processes social system.” - Larsen and Ballal (2005: 82)	Engineering/ Management; Construction Management	Ideas, Perception, Newness, Adoption, Social Motive
123	“...a technology or management concept that is new to the user.” - Harkola, cited from Larsen and Ballal (2005: 82)	Engineering/ Management; Construction Management	Technology, Newness
124	“...strategic changes in product/services, markets served, and technological breakthroughs used to produce a product or render a service based on significant innovation.” - Koberg, Detienne, and Heppard (2003: 23)	Engineering/Technology; Technology Management	Technology, Commercial Motive
125	“...the use of new technological and market knowledge to offer a new product or service that customers will want... development of technology or invention and its great value to transfer.” - Afuah (2003: 4)	Business/Economics; Innovation Management	Invention, Technology, Value Creation
126	“...a new or innovative idea which is applied to initiating or enhancing a product, service, or process.” - Hivner, Hopkins, and Hopkins (2003: 80)	Business/Economics; Innovation Management	Ideas, Newness, Enlargement, Implementation

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
127	“...use of external ideas as well as internal ideas, and internal and external paths to market, as firms look to advance their technology.” - Chesbrough (2003: xxiv)	Business/Economics; Innovation Management	Ecological Rationality, Technology, Commercial Motive
128	“Florida (1990) considers invention as a breakthrough and innovation as an actualization.” - Shavinina (2003: 116)	Business/Economics; Innovation Management	Actualization, Invention
129	“...development and operationalization of a valuable technology.” - Afuah (2003: 48)	Business/Economics; Innovation Management	Implementation, Value Creation, Technology
130	“...the embodiment, combination, or synthesis of knowledge in original, relevant, valued new products, processes, or services. ” - Luecke and Katz (2003: 2)	Business/ Economics; Innovation Management	Recombination, Knowledge Investment Newness, Value Creation
131	“...the creation of new products within the firm.” - Geiger and Cashen (2002: 70)	Management; Innovation Management	Commercial Motive, Creativity, Newness
132	“...acquisition of disembodied technology and know-how, acquisition of embodied technology, tooling up and industrial engineering, industrial design, other capital acquisition, production start-up and marketing for new or improved products.” - OECD (2002: 18)	Business/Economics; Policy Research	Implementation, Newness, Improvement, Technology, Commercial Motive, Social Motive
133	“...new creations of economic significance normally carried out by firms (or sometimes by individuals).” - Edquist (2001: 7)	Business/Economics; Innovation Management	Commercial Motive, Newness
134	“...a process that includes the generation, development, and implementation of new ideas or behaviors.”	Management; Innovation Management	Creativity, Implementation

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	- Damanpour and Gopalakrishnan (2001: 50)		
135	<p>“...an organisation’s means to adapt to the environment, or to preempt a change in the environment, in order to increase or sustain its effectiveness and competitiveness.”</p> <p>- Damanpour and Gopalakrishnan (2001: 47)</p>	Management; Innovation Management	Change, Ecological Rationality
136	<p>“...the creation of a new product-market-technology-organisation-combination. This definition suggests three key elements of innovation: innovation is a process, it results in at least one new element, and it may vary from incremental, small step innovation through synthetic innovation, i.e., the creative combination of existing techniques, ideas or methods, to discontinuous, radical, quantum leap innovation.”</p> <p>- Boer and During (2001: 84)</p>	Technology Management; Innovation	Recombination, Newness, Technology, Improvement, Disruption
137	<p>“... the technical, design, manufacturing, management, and commercial activities involved in the marketing of a new (or improved) product or the first use of a new (or improved) manufacturing process or equipment.”</p> <p>- Chiesa (2001: 3)</p>	Business/ Economics; Technological Innovation	Technology, Commercial Motive, Newness, Improvement
138	<p>“...the process of proposal, adoption, development and implementation of a new idea, generated internally, or taken from outside, relating to a product, process, policy, practice or behaviour, programme or service, which is new for the organisation at the time it is introduced and which will</p>	Management; Innovation Management	Commercial Motive, Social Motive, Implementation, Newness

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	benefit the organisation, or society in general.” - Fernández (2001: 171)		
139	“...creating new knowledge and developing new products.” - Bain, Mann, and Pirola-Merlo (2001: 70)	Psychology; Social Psychology	Newness, Value Creation
140	“...the successful exploitation of new ideas, where ideas are new to a particular enterprise, and are more than just technology related-new ideas can relate to process, market or management.” - Construction Research and Innovation Strategy Panel (CRISP), cited from Manseau and Seaden (2001: 8)	Engineering; Construction Engineering	Ideas, Newness, Technology
141	“...apply innovative design, methods, or materials to improve productivity.” - Civil Engineering Research Foundation, cited from Manseau and Seaden (2001: 8)	Engineering; Construction Engineering	Improvement, Value Creation
142	“...the process of bringing new goods and services to market, or the result of that process.” - Expert Panel on the Commercialisation of University Research, Cited from Seaden and Manseau (2001: 185)	Engineering/ Technology; Construction Innovation	Newness
143	“...is a process through which new ideas, objects, and practices are created, developed, or reinvented.” - Walker, Jeanes, and Rowlands (2001: 14)	Political Science; Public Service Innovations	Newness, Ideas, Transformation
144	“... continuous change, framebreaking rather than framebending and a process of creative destruction.”	Political Science; Public Service Innovations	Change, Disruption

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	- Walker, Jeanes, and Rowlands (2001: 14)		
145	“...the act of introducing and using new ideas, technologies, products, and/or processes aimed at solving problems, viewing things differently, improving efficiency and effectiveness, or enhancing standards of living.” - Civil Engineering Research Foundation (2000: 3)	Engineering/Technology; Construction Engineering	Ideas, Implementation, Problem Solving, Technology, Competitive Advantage, Creativity, Social Motive
146	“...the degree of departure from the preceding product, service, or process, the extent of usefulness of the innovation and, the volume of profitability generated.” - Ravichandran (2000: 694)	Information Systems; Total Quality Management	Differentiation, Commercial Motive, Economic Growth, Value Creation
147	“...creation and development of new ideas and solutions. However, innovation is not completed until its economic impact becomes apparent.” - Papinniemi (1999: 96)	Economics; Management	Value Creation, Ideas, Newness, Economic Growth
148	“Innovation- the transformation of knowledge into new products, processes, and services- involves more than just science and technology. It involves discerning and meeting the needs of customers. Improvements in marketing, distribution, and service are innovations that can be as important as those generated in laboratories involving new products and processes. Indeed, some of the most important innovations today occur in sales and distribution.” - Porter and Stern (1999: 12)	Policy Research; Competitiveness	Transformation, Knowledge Investment, Newness Research, Actualization, Improvement, Commercial Motive
149	“...novelty in the capabilities and knowledges which make up technology.”	Business/Economics; Innovation Management	Creativity, Technology

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	- Smith (1998: 25)		
150	“...making changes to something established by introducing something new.” - Pearsall (1998: 942)	Language; Dictionary	Implementation, Improvement, Newness
151	“...a disruptive force that overcomes previous routines and force participants in the industry or the economy to search for and discover new ones. Eventually, new market leaders appear.” - Christensen (1998: 3.2)	Engineering/Technology; Innovation Management	Creative Destruction, Disruption, Adaptive Search, Competitive Advantage, Goal
152	“...as a noun, innovation relates to an attained quantity of ideas, while as a verb, to innovate denotes the relevant development process (innovation process).” - Grupp (1998: 13)	Business/Economics; Innovation Management	Ideas
153	“...a discontinuous process.” - Osborne (1998: 347)	Organisation Science; Nonprofit Organizations	Differentiation, Disruption
154	“...a disruptive force that creates new market leaders.” - Christensen (1998: 3.2)	Engineering/Technology; Innovation Management	Disruption, Goal
155	“...the adoption of an idea or behavior new to the organisation.” - Damanpour and Gopalakrishnan (1998: 3)	Engineering/Technology; Technology Management	Ideas, Newness
156	“...the adoption and implementation by the enterprise of new forms of training which are considered by the enterprise as novel.” - Darmon et al. (1998: 29)	Learning; Education Technology	Adoption, Implementation, Newness, Perception
157	“... the application of technology that is new to an organisation and that significantly improves the	Engineering/ Technology; Construction Innovation	Technology, Newness, Improvement, Value Creation

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	<p>design and construction of a living space by decreasing installed cost, increasing installed performance, and/or improving the business process, e.g., reduces lead time or increases flexibility.” - Toole (1998: 323)</p>		
158	<p>“...all those scientific, technological, organisational, financial, and commercial steps, including investment in new knowledge, which actually, or are intended to, lead to the implementation of technologically new or improved products or processes.” A firm can be called innovative “if it produces one or more technologically new or significantly improved products or processes in a three-year period.” - OECD (1997: 39)</p>	Business/Economics; Policy Research	Knowledge Investment, Implementation, Newness, Technology
159	<p>“An innovation in the economic sense is accomplished only with the first commercial transaction involving the new product, process system, or device, although the word is used also to describe the whole process.” - Freeman and Soete (1997: 6)</p>	Business/ Economics; Innovation Management	Commercial Motive, Newness
160	<p>“Schumpeter conceptualized the process of innovation as a new combination of resources and skills.” - Wright (1997: 35)</p>	Engineering/ Technology; Semiconductor Industry	Recombination
161	<p>...total set of activities leading to the introduction of something new, resulting in strengthening the defendable competitive advantage of a company. - van der Meer (1996)</p>	Business/Economics; Innovation Management	Implementation, Competitive Advantage, Newness

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
162	<p>...a process associated with discontinuous change and a process of destruction.</p> <p>- Tushman and Nadler (1996)</p>	<p>Business/Economics; Innovation Management</p>	<p>Differentiation, Disruption</p>
163	<p>“...successful implementation of creative ideas within an organisation...Successful innovation depends on other factors as well, and it can stem not only from creative ideas that originate within an organisation but also from ideas that originate elsewhere (as in technology transfer).”</p> <p>- Amabile et al. (1996: 1155)</p>	<p>Management; Creativity and Innovation</p>	<p>Implementation, Creativity, Internal Environment, External Environment,</p>
164	<p>“Innovations are, by definition, unique-one is rarely commensurable with another...Keeping these difficulties in mind, we defined innovative accomplishments very broadly to include any policy, structure, method or process, product, or market opportunity that the manager of the innovating unit perceived to be new. This definition was first advanced by Schumpeter (1926) and has been employed subsequently in several studies.”</p> <p>- Nohria and Gulati (1996: 1251)</p>	<p>Management; Innovation Management</p>	<p>Newness, Perception, Differentiation</p>
165	<p>“...development of something new that has significant value to an individual, a group, an organisation, an industry, or a society.”</p> <p>- Higgins (1995: 9)</p>	<p>Business/Economics; Innovation Management</p>	<p>Newness, Social Motive, Value Creation</p>
166	<p>“...an idea, practice, or object perceived as new by an individual or other relevant unit of adoption, which is communicated through certain channels over time among the members of a social system.”</p>	<p>Business/Economics; Innovation Management</p>	<p>Adoption, Ideas, Social Motive, Communication, Perception</p>

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	- Rogers (1995: 35)		
167	“...any idea that is new to an organisation.” - Shane, Venkataraman, and MacMillan (1995: 937)	Business/Economics; Innovation Management	Ideas, Newness
168	“...the processes by which firms master and get into practice product designs and manufacturing processes that are new to them, if not to the universe or even to the nation.” - Nelson and Rosenberg (1993: 4)	Business/Economics; Knowledge Management	Commercial Motive, Knowledge Investment, Diffusion
169	“...the specific tool of an entrepreneurial manager, the means by which he exploits changes as an opportunity for different businesses or different services.” - Drucker (1993: 19)	Business/Economics; Management	Ecological Rationality, Commercial Motive, Change
170	“...a change in production techniques, may be related to changes in market conditions.” - Morroni (1992: 18)	Business/Economics; Economic Geography	Change, Newness, Technology
171	“...For something to be considered an innovation it must have an impact (or intended impact) on people other than the individual introducing it. Secondly, intentionality of benefit is stipulated to ensure that purely destructive, accidental or maturational changes are not labelled innovative. Thirdly, an innovation must at least challenge the status quo; it may, however, fail to actually effect change. Innovation is thus not synonymous with successful change.” - King (1992: 90-91)	Psychology, Organisational Psychology	Implementation, Social Motive, Ideas, Change

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
172	<p>“...invention implying the development of a new process, product or service, and innovation referring to the adoption of any process, product or service previously foreign to the focal organisation.” - Zajac, Golden, and Shortell (1991: 170)</p>	Management Science; Organisational Behavior	Creativity, Implementation, Invention, Adoption
173	<p>“...intentional introduction and application within a role, group or organisation of ideas, processes, products or procedures new to the relevant unit of adoption designed significantly to benefit the individual, the group, the organisation or wider society.” - West and Farr (1990: 9)</p>	Business/Economics; Innovation Management	Newness, Value Creation, Social Motive
174	<p>“...the firm’s ability to identify, assimilate, and exploit knowledge from the environment.” - Cohen and Levinthal (1989: 569)</p>	Business/Economics; Innovation Management	Creativity, Commercial Motive
175	<p>“An innovation is an innovation if it has implementation and commercial value. It is important to measure the impact of innovation.” - Rhoades (1989: 3)</p>	Agriculture; Farming	Commercial Motive, Implementation
176	<p>...a process that combines science, technology, economics, and management, as it is to achieve novelty and extends from the emergence of the idea to its commercialisation in the form of production, exchange, consumption. - Twiss and Goodridge (1989), also available in Kogabayev and Maziliauskas (2017: 63)</p>	Business; Public Administration	Research, Ideas, Commercial Motive

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
177	<p>“...the implementation of new ideas or changes, big or small, that have the potential to contribute to organisational (business) objectives.” - Schroeder, Scudder, and Elm (1989: 6)</p>	Business/Economics; Operations Management	Ideas, Newness
178	<p>“...generation of a new idea and its implementation into a new product, process or service, leading to the dynamic growth of the national economy and the increase of employment as well as to a creation of pure profit for the innovative business enterprise.” - Urabe (1988: 3)</p>	Business/Economics; Innovation Management	Ideas, Implementation, Newness, Value Creation, Commercial Motive
179	<p>“...a product - either an input (a component) or some type of capital equipment - embodying a technological innovation.” - Karlsson (1988: 9)</p>	Business/ Economics; Innovation Management	Technology
180	<p>“Innovation = invention + exploitation. The invention process covers all efforts aimed at creating new ideas and getting them to work. The exploitation process includes all stages of commercial development, application, and transfer, including the focusing of ideas or inventions toward specific objectives, evaluating those objectives, downstream transfer of research and/or development results, and eventual broad-based utilization, dissemination, and diffusion of the technology-based outcomes.” - Roberts (1988: 13)</p>	Business/ Economics; Innovation Management	Ideas, Implementation, Newness, Technology, Commercial Motive

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
181	<p>“... the first use of a technology within the construction firm. Process innovations are advances in technology that enables greater output per unit of input; these contrast with product innovations, which result in a qualitatively superior product.” - Tatum (1987: 649)</p>	Engineering; Construction Engineering	Technology, Value Creation, Improvement
182	<p>“... the development and implementation of new ideas by people who over time engage in transactions with others within an institutional context.” - Ven (1986: 590)</p>	Management; Innovation Management	Implementation, Newness, Ideas, Commercial Motive
183	<p>“...responses to environmental change or means of bringing about change in an organisation.” - Damanpour and Evan (1984: 393)</p>	Innovation Management; Organisational Innovation	Newness, Adoption, Change
184	<p>“...process of bringing any new, problem-solving idea into use.” - Kanter (1983: 20)</p>	Business/Economics; Innovation and Entrepreneurship	Newness, Ideas, Problem Solving
185	<p>“...a process which uses knowledge and information to create or introduce something that is new and useful to individuals or to organisations.” - Holt (1983), cited from Talukder (2014: 8)</p>	Business/Economics; Innovation Management	Knowledge Investment, Newness, Value Creation
186	<p>“An invention we consider to be a new idea, sketch, or model for a new or improved device, product, process or system. An innovation is accomplished only with the first commercial transaction involving the new product process, etc.” - Stoneman (1983: 25)</p>	Business/Economics; Technology	Differentiation, Improvement, Implementation

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
187	<p>“...new processes, products or procedures, or outcomes.” - Abernathy, Clark, and Kantrow (1983), cited from Calabrò (2011: 97)</p>	<p>Business/Economics; Public Service Organizations</p>	<p>Newness</p>
188	<p>“...the commercial or industrial application of something new- a new product, process, or method of production; a new market or source of supply; a new form of commercial, business, or financial organisation... “carrying out of new combinations,” the putting into practice of the new ideas.” ” - Schumpeter and Elliott (1983: 4)</p>	<p>Business/Economics; Entrepreneurship</p>	<p>Newness, Problem Solving, Recombination</p>
189	<p>“...transformation of an idea into a new or improved saleable product or operational process in industry and commerce or into a new approach to a social service.” - OECD (1981: 15)</p>	<p>Business/Economics; Policy Research</p>	<p>Commercial Motive, Ideas, Transformation, Social Motive</p>
190	<p>“...introduction of something new or a new idea, method, or device.” - Merriam-Webster Dictionary (1981: 624)</p>	<p>Language; Dictionary</p>	<p>Implementation, Newness</p>
191	<p>“...the adoption of electronic data processing for a variety of internal information storage, retrieval, and analytical purposes.” - Kimberly and Evanisko (1981: 692)</p>	<p>Business/Economics; Innovation Management</p>	<p>Goal, Newness</p>
192	<p>“...adoption of an idea or behavior new to the adopting organisation.” - Daft (1978: 197)</p>	<p>Business/Economics; Innovation Management</p>	<p>Adoption, Ideas</p>
193	<p>“...a portmanteau to cover the wide range of variegated</p>	<p>Policy Research; Innovation Management</p>	<p>Multidimensional, Technology</p>

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
	<p>processes by which man's technologies evolve over time.” - Nelson and Winter (1977: 36)</p>		
194	<p>“...the successful utilization of processes, programs or products which are new to an organisation and which are introduced as a result of decisions made within that organisation.” - Rowe and Boise (1974: 285)</p>	Public Administration; Innovation Management	Newness, Internal Environment
195	<p>“Innovation is not a technical term. It is an economic and social term. Its criterion is not science or technology, but a change in the economic or social environment, a change in the behavior of people as consumers or producers, as citizens, as students or as teachers, and so on. Innovation creates new wealth or new potential of action rather than new knowledge.” - Drucker (1973: 532)</p>	Business/Management; Innovation Management	Value Creation, Ecological Rationality, Commercial Motive, Change
196	<p>“...innovation- the provision of different economic satisfactions. It is not enough for the business to provide just any economic goods and services; it must provide better and more economic ones... Innovation can be defined as the task of endowing human and material resources with new and greater wealth-producing capacity.” - Drucker (1973: 49-51)</p>	Business/Management; Innovation Management	Ecological Rationality, Goal, Commercial Motive, Value Creation
197	<p>“...the generation, acceptance, and implementation of new ideas, processes, products, or services for the first time within an organisational setting.” - Aiken and Hage (1971: 64)</p>	Sociology; Organisational Innovation	Ecological Rationality, Newness, Perception

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
198	<p>“An invention is an original solution resulting from the synthesis of information about a need or want and information about the technical means with which the need or want may be met. An invention must be followed by entrepreneurial action before it has significance in economic terms. Thus, innovation will be defined to refer to an invention which has reached market introduction in the case of a new product, or first use in a production process, in the case of a process innovation.”</p> <p>- Utterback (1971: 77)</p>	<p>Management; Innovation Management</p>	<p>Invention, Commercial Motive, Newness</p>
199	<p>“...the successful introduction into an applied situation of means or ends that are new to that situation...in the past, there has been a frequent tendency to combine the idea of adoption or adaptiveness with the idea of invention; occasionally, the term “innovative” has been assigned to mean exclusively what is more generally called “inventive” or “creative.”... Invention implies bringing something new into being; innovation implies bringing something new into use.”</p> <p>- Mohr (1969: 112)</p>	<p>Political Science; Organisational Innovation</p>	<p>Implementation, Problem Solving, Newness, Adoption, Invention, Creativity, Value Creation</p>
200	<p>“...introduction by a firm of a technical change in product or process. Innovation is usually distinguished from imitation, the former being the first use of a technical change which is new to the economy as well as new to the firm. “</p> <p>- Myers and Marquis (1969: 3)</p>	<p>Industrial Innovation; Technological Innovation</p>	<p>Technology, Newness</p>

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
201	<p>“Innovation is not a single action but total process of interrelated subprocesses. It is not just the conception of a new idea, not the invention of a new device, not the development of a new market. The process is all these things acting in an integrated fashion toward a common objective. Innovation may be carried from conception to implementation within a single organisation, but more commonly, it draws on contributions from other sources at different times and places.” - Myers and Marquis (1969: 1)</p>	Industrial Innovation; Technological Innovation	Multidimensional, Ideas, Invention, Commercial Motive, Implementation
202	<p>“...first or early use of an idea by one of a set of organisations with similar goals.” - Becker and Whisler (1967: 463)</p>	Business/ Economics; Innovation Management	Ideas, Goal
203	<p>...a new combination of pre-existing knowledge which satisfies some want. - Based on Schmookler (1966: 10, 12), Also available in Veen (2010: 5)</p>	Archaeology, Agriculture	Knowledge Investment, Recombination
204	<p>“...the doing of new things or the doing of things that are already being done in a new way (innovation)” - Schumpeter (1947: 151)</p>	Business/ Economics; Innovation Management	Implementation, Recombination, Commercial Motive, Goal, Newness
205	<p>“...creation of new products or qualitative improvement in existing products, use of a new industrial process, new market opening, developing of new raw material sources or other new inputs, or new form of industrial organisations.” - Schumpeter (1934), cited from Vyas (2014: 11)</p>	Technology; Food Processing	Newness, Implementation, Improvement

N	Definition	Discipline; Subdiscipline	Sample Open Code(s) Applied
206	<p>“...the total of changes in order to implement and use new types of products, means of production and transport, markets, and forms of organisation of the production process.”</p> <p>- Schumpeter (1934), cited from Feniser, Dusa, and Sadeh (2018: 42)</p>	<p>Tourism Management; Hospitality</p>	<p>Change, Newness, Implementation</p>
207	<p>“...activities that complete the commercialisation of technology so as to obtain the commercial profit and achieve the intended goal through own efforts and explore to produce a technical breakthrough and overcome technical difficulties.”</p> <p>- Fu Jiayi, Professor at Tsinghua University</p>	<p>Business/ Economics; Innovation Management</p>	<p>Commercial Motive, Technology</p>
208	<p>“...the ways in which an organisation updates, changes, and improves its internal processes, manufacturing techniques, and management methods.”</p> <p>- American Society of Quality</p>	<p>Management; Quality Management</p>	<p>Improvement, Internal Environment</p>

Source: Singh et al., 2021

Table 28. The four Innovation types of configuration category.

Categories	Category Detail	Type of Innovation	Type Explanation
<p>CONFIGURATION</p>	<p>These types of innovation are focused on the innermost workings of an enterprise and its business system.</p>	<p>PROFIT MODEL : How you make money</p>	<p>Innovative profit models find a fresh way to convert a firm’s offerings and other sources of value into cash. Great ones reflect a deep understanding of what customers and users actually cherish and where new revenue or pricing opportunities might lie. Innovative profit models often challenge an industry’s tired old assumptions about what to offer, what to charge, or how to collect revenues. This is a big part of their power : in most industries the dominant profit model often goes unquestioned for decades.</p>
		<p>NETWORK : How you connect with others to create value</p>	<p>In today’s hyper-connected world, no company can or should do everything alone. Network innovations provide a way for firms to take advantage of other companies’ processes, technologies, offerings, channels, and brands—pretty much any and every component of a business. These innovations mean a firm can capitalize on its own strengths while harnessing the capabilities and assets of others. Network innovations also help executives to share risk in developing new offers and ventures. These collaborations can be brief or enduring, and they can be formed between close allies or even staunch competitors.</p>

		<p>STRUCTURE: How you organize and align your talent and assets</p>	<p>Structure innovations are focused on organising company assets—hard, human, or intangible—in unique ways that create value. They can include everything from superior talent management systems to ingenious configurations of heavy capital equipment. An enterprise’s fixed costs and corporate functions can also be improved through Structure innovations, including departments such as Human Resources, R&D, and IT. Ideally, such innovations also help attract talent to the organisation by creating supremely productive working environments or fostering a level of performance that competitors can’t match.</p>
		<p>PROCESS: How you use signature or superior methods to do your work</p>	<p>Process innovations involve the activities and operations that produce an enterprise’s primary offerings. Innovating here requires a dramatic change from “business as usual” that enables the company to use unique capabilities, function efficiently, adapt quickly, and build market-leading margins. Process innovations often form the core competency of an enterprise, and may include patented or proprietary approaches that yield advantage for years or even decades. Ideally, they are the “special sauce” you use that competitor simply can’t replicate.</p>

Source: authors’ adaptation based on Keeley et al., (2013); <https://doblin.com/ten-types>(12/06/2021)

Table 29. The two Innovation types of offering category

Categories	Category Detail	Type of Innovation	Type Explanation
<p>OFFERING</p>	<p>These types of innovation are focused on an enterprise's core product or service, or a collection of its products and services.</p>	<p>PRODUCT PERFORMANCE: How you develop distinguishing features and functionality</p>	<p>Product Performance innovations address the value, features, and quality of a company's offering. This type of innovation involves both entirely new products as well as updates and line extensions that add substantial value. Too often, people mistake Product Performance for the sum of innovation. It's certainly important, but it's always worth remembering that it is only one of the Ten Types of Innovation, and it's often the easiest for competitors to copy. Think about any product or feature war you've witnessed—whether torque and toughness in trucks, toothbrushes that are easier to hold and use, even with baby strollers. Too quickly, it all devolves into an expensive mad dash to parity. Product Performance innovations that deliver long-term competitive advantage are the exception rather than the rule.</p>
		<p>PRODUCT SYSTEM How you create complementary products and services</p>	<p>Product System innovations are rooted in how individual products and services connect or bundle together to create a robust and scalable system. This is fostered through interoperability, modularity, integration, and other ways of creating valuable connections between otherwise distinct and disparate offerings. Product System innovations help you build ecosystems that captivate and delight customers and defend against competitors.</p>

Source: authors' adaptation based on Keeley et al., (2013); [https://doblin.com/ten-types\(12/06/2021\)](https://doblin.com/ten-types(12/06/2021))

Table 30. The four Innovation types of experience category.

Categories	Category Detail	Type of Innovation	Type Explanation
EXPERIENCE	<p>These types of innovation are focused on more customer-facing elements of an enterprise and its business system.</p>	<p>SERVICE: How you support and amplify the value of your offerings</p>	<p>Service innovations ensure and enhance the utility, performance, and apparent value of an offering. They make a product easier to try, use, and enjoy; they reveal features and functionality customers might otherwise overlook; and they fix problems and smooth rough patches in the customer journey. Done well, they elevate even bland and average products into compelling experiences that customers come back for again and again.</p>
		<p>CHANNEL: How you deliver your offerings to customers and users</p>	<p>Channel innovations encompass all the ways that you connect your company’s offerings with your customers and users. While e-commerce has emerged as a dominant force in recent years, traditional channels such as physical stores are still important — particularly when it comes to creating immersive experiences. Skilled innovators in this type often find multiple but complementary ways to bring their products and services to customers. Their goal is to ensure that users can buy what they want, when and how they want it, with minimal friction and cost and maximum delight.</p>
		<p>BRAND: How you represent your offerings and business</p>	<p>Brand innovations help to ensure that customers and users recognize, remember, and prefer your offerings to those of competitors or substitutes. Great ones distil a “promise” that attracts buyers and conveys a distinct identity. They are typically the result of</p>

			carefully crafted strategies that are implemented across many touchpoints between your company and your customers, including communications, advertising, service interactions, channel environments, and employee and business partner conduct. Brand innovations can transform commodities into prized products, and confer meaning, intent, and value to your offerings and your enterprise.
		CUSTOMER ENGAGEMENT: How you foster compelling interactions	Customer Engagement innovations are all about understanding the deep-seated aspirations of customers and users, and using those insights to develop meaningful connections between them and your company. Great Customer Engagement innovations provide broad avenues for exploration, and help people find ways to make parts of their lives more memorable, fulfilling, delightful — even magical.

Source: authors' adaptation based on Keeley et al., (2013); [https://doblin.com/ten-types\(12/06/2021\)](https://doblin.com/ten-types(12/06/2021))

Appendix B

List of Items with codification and scale:

1 - General information:

I.1.1 - Gender:

(Male; Female)

I.1.2 - Age:

(Less than 20 years; 20 - 30 years; 31 - 40 years; 41 - 50 years; 51 - 60 years; More than 60 years)

I.1.3 - Income:

(Less than 10,000 DZD; 10,000 DZD - 20,000 DZD; 20,000 DZD - 30,000 DZD; 30,000 DZD - 40,000 DZD; 40,000 DZD - 50,000 DZD; More than 50,000 DZD)

I.1.4 - Type of work:

(Government; Private sector; Daily Wage; Self-employment)

I.1.5 - Number of activities:

(Working in one sector; Working in two sectors; 3 or more sectors)

I.1.6 - Purchasing power before the Corona pandemic:

(Very Weak; Weak; Medium; Good; Very Good)

I.1.7 - Purchasing power during the Corona pandemic:

(Very Weak; Weak; Medium; Good; Very Good)

I.1.8 - Spending behaviour before the Corona pandemic:

(Thrifty; Average Spending; Spendthrift; Spendthrift + Debt)

I.1.9 - Spending behaviour during the Corona pandemic:

(Thrifty; Average Spending; Spendthrift; Spendthrift + Debt)

Scale:

(Strongly Disagree; Disagree; Neutral; Agree; Strongly Agree)

2- Innovation in Algerian products:

I.2.1 - The best foreign product over the Algerian one

I.2.2 - Like and appreciate the Algerian products

I.2.3- Innovative products meet the consumers' needs

I.2.4 - Innovative Algerian products have a reasonable price

I.2.5 - Innovative Algerian products have good quality

I.2.6 - Prefer the old low-priced product instead of the new high-priced product

I.2.7 - Foreign products manufactured under license in Algeria have the same quality

I.2.8 - Foreign products manufactured under license in Algeria have a low price

I.2.9 - Replace the foreign products made in Algeria

3- Marketing of Algerian products:

I.3.1 - Be influenced by advertisements and advertisements for new products

I.3.2 - Dedicate enough time to research and learn more about new products

I.3.3 - Be influenced by the opinions of relatives and friends in buying a new product

I.3.4 - Use social media to search for new products

I.3.5 - Read social media comments about new products

I.3.6 - Communicate with other customers to get their opinion about a new product

I.3.7 - Communicate with manufacturers to give them my opinion about a new product

I.3.8 - Use the Internet to buy inside the country

I.3.9 - Use the Internet to buy outside the country

I.3.10 - Use bank cards to buy online

4- Production in the Algerian enterprise:

I.4.1 - Algerian manufacturers have the necessary experience in production

I.4.2 - Algerian manufacturers offer good product quality

I.4.3 - Algerian manufacturers care about the wishes of their customers

I.4.4 - Algerian manufacturers take into account the purchasing power of the consumer

I.4.5 - The products of the long-established institutions in the market are better than the modern ones

I.4.6 - Best buy low quality products at low price

I.4.7 - Can order products with special specifications directly from the institution

I.4.8 - Can refund the price of a product I did not like or had defects

I.4.9 - Algerian products are available in the market during the Corona crisis

I.4.10 - The price of Algerian products is acceptable during the Corona period

5- Transfer of information and communication with the Algerian enterprise:

I.5.1 - Can provide ideas for Algerian manufacturers to develop their product

I.5.2 - Algerian manufacturers respond to positive comments and feedback

I.5.3 - Algerian manufacturers respond to negative comments and comments

I.5.4 - If do not like the product standards, I file a complaint with the manufacturer

I.5.5 - If do not like the standards of the product, I submit a complaint to the government authorities

I.5.6 - Government authorities respond to consumer complaints

I.5.7 - The manufacturer responds to consumer complaints

I.5.8 - Algerian manufacturers offer incentives to loyal customers

I.5.9 - Algerian manufacturers offer discounts in the price of new products to loyal customers

Results

Results

Structural Equation Modelling

Models Info

Estimation Method	ML
Number of observations	191
Free parameters	40
Converged	TRUE
Loglikelihood user model	-1769.265
Loglikelihood unrestricted model	-1727.71
Model	Endogenous 1= \sim Inn1+Inn2 Endogenous 2= \sim Mrk1+Mrk2 Endogenous 3= \sim Prox1+Prox2 Endogenous 4= \sim KC1+KC2 Endogenous 6= \sim Cvd1+Cvd2

Note. The covariance matrix of latent variables is not positive definite. Please use 'Model-implied latent' option in 'Output options' panel to inspect it.

Syntax examples

Aim	Example	Outcome
Constraints		
Equality constraint	$p1=p2$	Constrain the estimates of p1 and p2 to be equal
Linear constraint	$p1+p2=2$	Constrain the estimates of p1 and p2 to be equal to 2
Linear constraint	$p1+p2+p3=2$	Constrain the estimates for p1,p2, and p3
Constrain coefficients	$p1=0$	Fix the coefficient p1 to 0
Inequality Constraint	$p1>0$	Estimate the coefficient p1 as larger than 0
Inequality Constraint	$p1<3$	Estimate the coefficient p1 as smaller than 3

Syntax examples

Aim	Example	Outcome
Constrain intercepts	y1~0	Fix the y1 intercept to 0
Constrain intercepts	y1~1*0	Fix the y1 intercept to 1
Non linear constraint	p1*p2=0	Constrain the estimates such that p1*p2 equals 0
Defined Parameters		
Linear estimates	dp:=p1+p2	p1 and p2 are free, and their sum is estimated and tested
Linear estimates	dp:=(p1+p2)-p3	p1,p2, and p3 are free, and the specified function is estimated and tested
Non linear estimates	aname:=p1^2	Estimate and test the square of p1
Free structural parameters		
Estimate residual covariances	y1~~y2	Variables y1 and y2 covariance is set free
Estimate exogenous variables covariances	x1~~x2	Variables x1 and x2 covariance is set free
Estimate exogenous variables variances	x1~~x1	Variable x1 variance is set free
Estimate variables covariances	y1~~x1	Variables y1 and x1 covariance is set free. Direct path should not be set
Estimate covariances involving interactions	x1:x2~~x3	The interaction term x1:x2 and x3 variable covariance is set free. Direct path should not be set

Note. Automatic parameters labels are in the form `pN`, where `N` is a number. The parameter labels can be found in the results tables. Please be sure to have the options `Show parameters labels` selected.

Overall Tests

Model tests

Label	X ²	df	p
User Model	83.1	25	< .001
Baseline Model	537.7	45	< .001

Fit indices

AIC	BIC	adj. BIC	TLI	SRMR	RMSEA	RMSEA 95% CI		RMSEA p
						Lower	Upper	
3619	3749	3622	0.882	0.070	0.110	0.085	0.137	<.001

Measurement model

Label	Latent	Observed	Estimate	SE	95% Confidence Intervals		β	z	p
					Lower	Upper			
p1	Endogenous1	Inn1	1.000	0.000	1.000	1.000	0.347		
p2		Inn2	2.392	0.801	0.821	3.963	0.733	2.98	0.003
p3	Endogenous2	Mrk1	1.000	0.000	1.000	1.000	0.656		
p4		Mrk2	0.958	0.207	0.553	1.363	0.547	4.63	<.001
p5	Endogenous3	Prox1	1.000	0.000	1.000	1.000	0.660		
p6		Prox2	1.157	0.125	0.912	1.402	0.790	9.25	<.001
p7	Endogenous4	KC1	1.000	0.000	1.000	1.000	0.917		
p8		KC2	0.665	0.110	0.450	0.880	0.565	6.07	<.001
p9	Endogenous6	Cvd1	1.000	0.000	1.000	1.000	0.725		
p10		Cvd2	0.720	0.102	0.521	0.920	0.625	7.08	<.001

Variances and Covariances

Label	Variable 1	Variable 2	Estimate	SE	95% Confidence Intervals		β	z	p
					Lower	Upper			
p11	Inn1	Inn1	0.27919	0.0311	0.21828	0.3401	0.8797	8.984	< .001
p12	Inn2	Inn2	0.18821	0.0725	0.04604	0.3304	0.4628	2.595	0.009
p13	Mrk1	Mrk1	0.24937	0.0468	0.15757	0.3412	0.5702	5.324	< .001
p14	Mrk2	Mrk2	0.40326	0.0548	0.29591	0.5106	0.7005	7.362	< .001
p15	Prox1	Prox1	0.26135	0.0309	0.20087	0.3218	0.5647	8.469	< .001
p16	Prox2	Prox2	0.16289	0.0265	0.11092	0.2149	0.3765	6.143	< .001
p17	KC1	KC1	0.08814	0.0614	-0.03211	0.2084	0.1596	1.437	0.151
p18	KC2	KC2	0.43886	0.0523	0.33631	0.5414	0.6812	8.387	< .001
p19	Cvd1	Cvd1	0.28132	0.0472	0.18877	0.3739	0.4746	5.958	< .001
p20	Cvd2	Cvd2	0.25269	0.0323	0.18930	0.3161	0.6099	7.813	< .001
p21	Endogenous1	Endogenous1	0.03819	0.0197	-4.17e-4	0.0768	1.0000	1.939	0.053
p22	Endogenous2	Endogenous2	0.18801	0.0538	0.08256	0.2935	1.0000	3.494	< .001
p23	Endogenous3	Endogenous3	0.20144	0.0420	0.11911	0.2838	1.0000	4.795	< .001
p24	Endogenous4	Endogenous4	0.46418	0.0824	0.30260	0.6258	1.0000	5.631	< .001
p25	Endogenous6	Endogenous6	0.31139	0.0652	0.18360	0.4392	1.0000	4.776	< .001
p26	Endogenous1	Endogenous2	0.03225	0.0151	0.00265	0.0619	0.3806	2.135	0.033
p27	Endogenous1	Endogenous3	0.06099	0.0218	0.01829	0.1037	0.6954	2.799	0.005
p28	Endogenous1	Endogenous4	0.06367	0.0241	0.01650	0.1108	0.4782	2.646	0.008
p29	Endogenous1	Endogenous6	0.03164	0.0165	-6.41e-4	0.0639	0.2901	1.921	0.055
p30	Endogenous2	Endogenous3	0.09246	0.0257	0.04209	0.1428	0.4751	3.598	< .001
p31	Endogenous2	Endogenous4	0.18343	0.0371	0.11067	0.2562	0.6209	4.941	< .001
p32	Endogenous2	Endogenous6	0.00917	0.0299	-0.06768	0.0493	0.0379	0.307	0.759
p33	Endogenous3	Endogenous4	0.21429	0.0362	0.14333	0.2852	0.7008	5.919	< .001
p34	Endogenous3	Endogenous6	0.22305	0.0373	0.14987	0.2962	0.8906	5.974	< .001
p35	Endogenous4	Endogenous6	0.10728	0.0386	0.03160	0.1830	0.2822	2.778	0.005

Intercepts

Label	Variable	Intercept	SE	95% Confidence Intervals		z	p
				Lower	Upper		
p36	Inn1	2.776	0.041	2.696	2.856	68.104	<.001
p37	Inn2	3.171	0.046	3.080	3.261	68.714	<.001
p38	Mrk1	2.884	0.048	2.790	2.978	60.263	<.001
p39	Mrk2	3.048	0.055	2.941	3.156	55.521	<.001
p40	Prox1	2.639	0.049	2.542	2.735	53.607	<.001
p41	Prox2	2.703	0.048	2.609	2.796	56.787	<.001
p42	KC1	2.645	0.054	2.540	2.750	49.187	<.001
p43	KC2	2.643	0.058	2.529	2.756	45.503	<.001
p44	Cvd1	2.459	0.056	2.350	2.568	44.142	<.001
p45	Cvd2	2.136	0.047	2.045	2.227	45.867	<.001
p46	Endogenous1	0.000	0.000	0.000	0.000		
p47	Endogenous2	0.000	0.000	0.000	0.000		
p48	Endogenous3	0.000	0.000	0.000	0.000		
p49	Endogenous4	0.000	0.000	0.000	0.000		
p50	Endogenous6	0.000	0.000	0.000	0.000		

Additional outputs

User model versus baseline model

	Model
Comparative Fit Index (CFI)	0.882
Tucker-Lewis Index (TLI)	0.788
Bentler-Bonett Non-normed Fit Index (NNFI)	0.788
Bentler-Bonett Normed Fit Index (NFI)	0.845
Parsimony Normed Fit Index (PNFI)	0.470
Bollen's Relative Fit Index (RFI)	0.722
Bollen's Incremental Fit Index (IFI)	0.887
Relative Noncentrality Index (RNI)	0.882

Other fit indices

	Model
Hoelter Critical N (CN), $\alpha=0.05$	87.531
Hoelter Critical N (CN), $\alpha=0.01$	102.840
Goodness of Fit Index (GFI)	0.994
Parsimony Goodness of Fit Index (GFI)	0.382
McDonald Fit Index (MFI)	0.859

Reliability indices

Variable	α	ω_1	ω_2	ω_3	AVE
Endogenous1	0.403	0.485	0.485	0.485	0.354
Endogenous2	0.524	0.525	0.525	0.525	0.356
Endogenous3	0.685	0.688	0.688	0.688	0.526
Endogenous4	0.681	0.709	0.709	0.709	0.560
Endogenous5	0.616	0.633	0.633	0.633	0.470

Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Prox	<---	KComm	.255	.153	1.667	.096	par_6
Prox	<---	Covid19	.881	.168	5.262	***	par_7
Prox	<---	Mrk	.381	.187	2.040	.041	par_9
Innv	<---	Prox	.610	.112	5.432	***	par_8
Mrk2	<---	Mrk	1.000				
Mrk1	<---	Mrk	1.048	.228	4.593	***	par_1
KC2	<---	KComm	1.000				
KC1	<---	KComm	1.513	.252	5.998	***	par_2
Cvd2	<---	Covid19	1.000				
Cvd1	<---	Covid19	1.331	.192	6.913	***	par_3
Prox1	<---	Prox	1.000				
Prox2	<---	Prox	1.165	.127	9.175	***	par_4
Innv2	<---	Innv	1.000				
Innv1	<---	Innv	.403	.156	2.575	.010	par_5

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
Mrk	<-->	KComm	.116	.032	3.578	***	par_10
KComm	<-->	Covid19	.052	.021	2.501	.012	par_11
Mrk	<-->	Covid19	-.006	.021	-.287	.774	par_12

Correlations: (Group number 1 - Default model)

			Estimate
Mrk	<-->	KComm	.617
KComm	<-->	Covid19	.281
Mrk	<-->	Covid19	-.036

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
Mrk	.172	.056	3.095	.002	par_13
KComm	.204	.055	3.689	***	par_14
Covid19	.169	.040	4.195	***	par_15
e12	.000	.021	.019	.985	par_16
e11	.148	.085	1.734	.083	par_17
e1	.404	.055	7.338	***	par_18
e2	.249	.047	5.267	***	par_19
e3	.440	.053	8.362	***	par_20
e4	.085	.063	1.364	.173	par_21
e5	.246	.033	7.478	***	par_22
e6	.294	.048	6.131	***	par_23
e7	.251	.031	8.228	***	par_24
e8	.146	.026	5.698	***	par_25
e9	.180	.086	2.083	.037	par_26
e10	.281	.032	8.802	***	par_27

Implied Covariances (Group number 1 - Default model)

	Inn1	Inn2	Prox2	Prox1	Cvd1	Cvd2	KC1	KC2	Mrk1	Mrk2
Inn1	.317									
Inn2	.091	.407								
Prox2	.061	.150	.433							
Prox1	.052	.129	.246	.463						
Cvd1	.052	.130	.247	.212	.593					
Cvd2	.039	.097	.186	.160	.224	.414				
KC1	.053	.131	.250	.215	.105	.079	.552			
KC2	.035	.087	.166	.142	.069	.052	.309	.644		
Mrk1	.023	.057	.109	.094	-.008	-.006	.183	.121	.437	
Mrk2	.022	.055	.104	.090	-.008	-.006	.175	.116	.180	.576

Implied Correlations (Group number 1 - Default model)

	Inn1	Inn2	Prox2	Prox1	Cvd1	Cvd2	KC1	KC2	Mrk1	Mrk2
Inn1	1.000									
Inn2	.254	1.000								
Prox2	.163	.358	1.000							
Prox1	.136	.297	.551	1.000						
Cvd1	.120	.264	.489	.405	1.000					
Cvd2	.108	.237	.439	.364	.453	1.000				
KC1	.126	.277	.512	.425	.183	.165	1.000			
KC2	.077	.169	.314	.260	.112	.101	.518	1.000		
Mrk1	.062	.136	.251	.209	-.017	-.015	.373	.228	1.000	
Mrk2	.052	.113	.209	.174	-.014	-.012	.310	.190	.359	1.000

Residual Covariances (Group number 1 - Default model)

	Inn1	Inn2	Prox2	Prox1	Cvd1	Cvd2	KC1	KC2	Mrk1	Mrk2
Inn1	.000									
Inn2	.000	.000								
Prox2	-.007	.006	.000							
Prox1	.017	.046	-.013	.000						
Cvd1	-.038	-.064	.042	-.052	.000					
Cvd2	-.021	-.023	.040	-.066	.000	.000				
KC1	.042	.021	-.032	.074	.029	-.012	.000			
KC2	.000	-.048	-.112	.057	-.088	-.065	.000	.000		
Mrk1	.013	.026	-.013	.047	-.009	.008	-.019	.051	.000	
Mrk2	.025	.003	-.056	.050	-.007	.012	.002	.154	.000	.000

Standardized Residual Covariances (Group number 1 - Default model)

	Inn1	Inn2	Prox2	Prox1	Cvd1	Cvd2	KC1	KC2	Mrk1	Mrk2
Inn1	.000									
Inn2	.000	.000								
Prox2	-.265	.199	.000							
Prox1	.594	1.407	-.357	.000						
Cvd1	-1.214	-1.730	1.017	-1.279	.000					
Cvd2	-.809	-.747	1.198	-1.964	.000	.000				
KC1	1.358	.595	-.792	1.849	.695	-.333	.000			
KC2	.009	-1.286	-2.793	1.384	-1.945	-1.738	.000	.000		
Mrk1	.498	.830	-.388	1.422	-.245	.244	-.506	1.283	.000	
Mrk2	.810	.082	-1.523	1.308	-.166	.341	.046	3.423	.000	.000

الملخص

يساهم هذا البحث في دراسة تأثير الابتكار على نتائج إدارة الإنتاج القائمة على إدارة المعرفة في الشركات الجزائرية. تركز الدراسة على العلاقة بين المفاهيم المختلفة لجوانب الابتكار. إدارة الإنتاج وإدارة المعرفة في السوق الجزائري.

أثبتت العديد من الأبحاث أهمية دور إدارة المعرفة والابتكار في المؤسسة. نظرًا لأن كلا المفهومين يهيمن على غالبية اتجاهات البحث وفيما يتعلق بالتأثير القيم على نظام المؤسسة المختلفة ، ولكن يمكننا ملاحظة أن معظم دراسات نموذج إدارة الإنتاج لا تأخذ في الاعتبار كلا المفهومين بالإضافة إلى التسويق مفهوم . من الصعب للغاية تحديد نموذج شامل للإنتاج فيما يتعلق بالتغيرات المتطرفة في السوق ، خاصة مع أزمة Covid-19 . في مثل هذه حالة ، يكون التنبؤ بالظروف والمخاطر المستقبلية مستحيلًا للغاية.

يجب على الشركات الجزائرية مضاعفة جهودها للبقاء في هذه البيئة المعقدة وعليها تطوير المزيد من الابتكار ونظام إدارة المعرفة لتعزيز إدارة الإنتاج وتحسين علاقتها مع عملائها.

الكلمات المفتاحية: الابتكار ، إدارة المعرفة ، إدارة الإنتاج ، COVID-19 ، المستهلك الجزائري.

Abstract

The contribution of this thesis focuses on the study of the influence of Production Management on Innovation results based on Knowledge Management in the Algerian companies. We study the relationship between the different aspects of Innovation concepts; Production Management and Knowledge Management in the Algerian market. The importance of Knowledge Management and Innovation in the enterprise has been proved by many research. As both of the concepts are dominated by the majority of research trends and regarding the valuable influence on the different enterprise systems, we can notice that most production management model studies do not consider both concepts and the marketing concept. Defining a holistic production model is very hard regarding the extreme changes in the market, especially with the Covid-19 crisis. In such a situation, predicting the future circumstances and risk is impossible. The Algerian enterprises must double their efforts to survive in this complex environment. They have to develop more innovation and knowledge management systems to enhance production management and improve their relationship with their customers.

Keywords: Innovation; knowledge Management; Production Management; COVID-19; Algerian Consumer.

Résumé

La contribution de cette thèse porte sur l'étude de l'influence de la gestion de la production sur les résultats de l'innovation basée sur la gestion des connaissances dans les entreprises algériennes. Nous étudions la relation entre les différents aspects des concepts d'innovation ; la gestion de la production et la gestion des connaissances dans le marché algérien. L'importance de la gestion des connaissances et de l'innovation dans l'entreprise a été prouvée par de nombreuses recherches. Comme les deux concepts sont dominés par la majorité des tendances de recherche et en ce qui concerne l'influence précieuse sur les différents systèmes d'entreprise, nous pouvons remarquer que la plupart des études de modèles de gestion de la production ne prennent pas en compte les deux concepts et le concept de marketing. Définir un modèle de production holistique est très difficile au regard des changements extrêmes du marché, notamment avec la crise de Covid-19. Dans une telle situation, il est impossible de prédire les circonstances et les risques futurs. Les entreprises algériennes doivent redoubler d'efforts pour survivre dans cet environnement complexe. Elles doivent développer plus d'innovation et de systèmes de gestion des connaissances pour améliorer la gestion de la production et améliorer leur relation avec leurs clients.

Mots clés : Innovation ; gestion des connaissances ; gestion de la production ; COVID-19 ; consommateur algérien.