Proposal of a Process Aimed at Guiding the Development of an Idea for its Commercialization

by

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Proposition d'un processus visant à guider le développement d'une idée pour sa commercialisation

Juan Manuel ARIAS PÉREZ

RÉSUMÉ

L'innovation a un pourcentage élevé d'échec en raison du flou du processus. Tentant de contrecarrer ce facteur, des travaux de recherche ont été développés pour conduire les acteurs dans le développement d'un projet d'innovation.

Mais ces recommandations sont trop générales et n'incluent pas toutes les phases du processus, de l'idée à la commercialisation. En effet, ils ne mettent pas suffisamment l'accent sur les outils pratiques pour améliorer efficacement le développement d'idées.

De plus, il existe des méthodologies et des théories qui aident à développer des idées créatives et à résoudre des problèmes, mais elles n'incluent pas suffisamment le processus de développement de projet, créant un écart entre la création d'idées et le développement de projets.

Pour cette raison, cette recherche vise à développer une ligne directrice de méta-processus d'innovation pour amener l'acteur à développer l'idée de commercialisation en considérant chacune des phases du cycle de vie d'un projet et le développement d'idées créatives dans un méta-processus.

Utilisant le diagramme IDEF0, ce référentiel de méta-processus est structuré et représente graphiquement les activités, actions et processus nécessaires au développement d'un projet d'innovation.

Transformer le travail de recherche, les méthodologies et les théories en un méta-processus qui aide les parties prenantes dans le développement du projet, de l'idée à la commercialisation.

Mots-clés: Processus d'innovation; processus de gestion de projet; processus de creation; IDEF0; gestion de project d’innovation

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ABSTRACT

Innovation has a high percentage of failure because of the fuzziness of the process. Trying to counteract this factor of failure, many research works have been developed to guide the stakeholders in the development of an innovation project.

But these recommendations are too general and do not include all the phases of the process, from the idea to the commercialization. Indeed they do not enough emphasis on practical tools to improve idea development efficiently.

Moreover, there are methodologies and theories that help develop creative ideas and solve problems, but they do not include enough of the project development process, creating a gap between the creation of ideas and the development of projects.

For this reason, this research aims to develop an innovation meta-process guideline to lead the stakeholder to develop the idea for commercialization considering each of the phases of the life cycle of a project and the development of creative ideas in one meta-process.

Using the IDEF0 diagram, this meta-process guideline is structured and graphically represents the activities, actions and processes required for the development of an innovation project.

Transforming the research work, methodologies and theories into a meta-process help the stakeholders in the project development from idea to commercialization.

Keywords: Innovation process, project management process, creative process, innovation project management

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LIST OF ABBREVIATIONS AND ACRONYMS

AI	Artificial Intelligence.
ASIT	Advanced Systematic Inventive Thinking.
BMC	Business Model Canvas.
CInO	Chief Innovation Officer.
DSM	Design Structure Matrix.
DTC	Dimension, Time, Cost.
FAST	Function Analysis System Technique.
IDEF	Integration Definition.
Ilabs	Innovation Labs.
IT	Information Technology.
MVP	Minimum Viable Product.
NPD	New Product Development.
PMBOK	Project Management Body of Knowledge.
R&D	Research and Development.
TBI	Technology Business Incubator.
UBI	Universal Basic Income.
UNPC	Usefulness, Newness, Profitability, Concept.
VMOT	Vision, Mission, Objectives, Tactics.

INTRODUCTION

In recent times, the use of the word "innovation" has become increasingly common, as the number of start-ups has increased due to the needs of the economy and new forms of adaptation due to the COVID-19 pandemic (Altun, 2021).

According to Nelson's (2014) research only 25% of innovation projects are successful, and only 1% of these projects reach large financing (Curtis, 2013). These percentages includes the organizational sector and the startup sector due because the launch of a product or service without impact on the market causes great money losses (Ahuja, 2019).

Chow & Cao (2008, as cited in Bergmann & Karwowski, 2019) indicate that some of the reasons for unsuccessful projects are due to 4 aspects; organizationally, people, process and product.

Consequently, several authors have developed research work that explains innovation and the steps to consider to reduce these factors, but these research works are focused on the processes in broad strokes, without considering methods or theories, and without integration which helps to create ideas and execute these activities simultaneously.

Taking into consideration that there is no research work that integrates the process and development of creative ideas, this research is focused on developing an innovation meta-process guideline including both, the creative ideas and the process of project life management.

This innovation meta-process helps the stakeholders to lead innovation projects, following a detailed scheme that can enrich the knowledge and the task execution. And regardless of the type of industry, they can increase the range of success, through an understanding of the market.

CHAPTER 1

PROBLEMATIC AND METHODOLOGY OF RESEARCH

1.1 Introduction

This chapter aims to present the reasons why innovation projects fail, moreover to showing the proposals considered by the authors in a general way and confirm that they do not take into account the theories or methodologies that help to develop creative ideas in order to build a product or service according to the market and the company.

Finally, this chapter presents the study proposal, the methodology, the definitions and the corresponding terminology.

1.2 Statement of the problem

Ramazani & Jergeas (2015) indicate that regardless of the company or industry, there is a low success rate in innovation projects due to the lack of goals aligned with the market, resulting in a loss of money for investors and companies.

H. James & Frank's (2015) research found that 75% of projects fail before the implementation phase, causing a cost of billions of dollars each year (as cited in Horning, 2018).

Horning's (2018) research, indicates that innovation projects fail because companies do not reach their goals. In addition, if we consider that some ideas become start-ups, the investments for their development as venture capital decrease even more since 99% are rejected (Curtis, 2013).

Curtis' (2013) research indicates that of those projects that receive this financing, about 75% never see their return on investment (as cited in Shenhar et al., 2020).

Trying to counteract those issues, many authors have developed research work to explain the causes and procedures that they recommend following so that the innovation project does not fail. However, those research works take general considerations that do not help much for those interested in innovating.

Moreover, some research work helps to create and develop ideas and solve problems following methodologies. Even though these methodologies consider the creation and solution of problems, they do not integrate both methods to consider the procedures that help innovate.

In the same way, there are not existing research work that helps to complement both factors, following a process and creating ideas.

For this reason, it is necessary to create a detailed guide that helps to explain the two essential aspects of innovation, on the one hand, the development of ideas and, on the other hand, the aspects of developing the product and their commercialization.

1.2.1 Reasons why the innovation project fail

Some authors classify the reasons why innovation projects fail as wrong decisions and lack of market orientation.

The wrong decisions are due to the lack of corporate and innovation strategy for decision-making, and the core team selects the ideas based on a poorly detailed business plan (Hengsberger, 2018).

The lack of market orientation is due to the short time invested in customer analysis and the development of specifications, causing a lack of valuable knowledge of the user for solving and creating projects. The companies do not have enough information about them, causing the core team to take wrong decisions (Hengsberger, 2018).

1.2.2 Start-up fails

Without leaving startups aside, there are ten main reasons startups fail, some of them are related to solving an irrelevant problem, an ineffective business model and poor execution, which is related to product life management.

- Founder(s) lack of capacity;
- Founder(s) lack of capability;
- Founder disharmony;
- Ran out of cash;
- Too much funding;
- Investor–founder disharmony;
- Solving an irrelevant problem (desirability);
- Ineffective business model (viability);
- Poor execution (feasibility);
- External threats/competition (adaptability).

According to Pride (2018), those ten reasons are caused by poor planning, a poor team or poor execution within the organization, affecting the project management process. However, innovation projects can fail due to the ideas or the management's control of them.

To reduce these reasons some companies, organizations, and institutions have created innovation centers, called ilabs (Innovation Labs), to guide those stakeholders, giving them tools to develop ideas and accompany them in their process of growth. But even so, this range of success is deficient.

1.2.3 The broad indicators of TBI (Technology Business Incubator)

The broad indicators of TBI performance help define the success or failure of innovation projects in terms of outcomes/achievements are listed as follows organized by Mungila Hillemane, Satyanarayana, & Chandrashekar (2019).

- Success or failure of incubated start-ups to emerge;
- Success or failure to develop/exploit internal and external networking;
- Success or failure to generate jobs;
- Success or failure to generate revenue;
- Success or failure to introduce new products/services;
- Success or failure to generate innovations and their commercialization for new venture creation;
- Success or failure to develop new technologies for transfer;
- Success or failure to obtain patents;
- Success or failure to contribute in R&D (Research and Development) inputs and R&D output;
- Success or failure of emerging start-ups to sustain and grow;
- Success or failure to contribute to exports;
- Success or failure to reduce firm failure rate and unemployment rate;
- Success or failure to contribute to regional economic growth.

We could say that the company is innovating whether the company achieves some of those indicators according to its goals.

1.3 The proposition of the research

The objective of this research is to provide an innovation meta-process guideline and highlight methods to the stakeholders who want and need to innovate, suggesting ways already previously developed by experts following the project life management method, from the idea to the commercialization.

This innovation meta-process guideline will start from a series of methods and theories that help the development of ideas, to continue with their development and commercialization, through stages that will contribute to having a product or service.

1.4 Methodology

This research was carried out based on the general problem, which in this case the general problem is the low percentage of success in innovation projects. Going deeper into the root causes, it was found that one of the reasons why they fail is due to the lack of processes to follow, where the stakeholder does not follow or is not aware of the stages to follow.

This investigation focuses on the cause that can be controlled, and that can give value to the solution, providing tools that can be used, including the stages and the tools that can be used at the same time, to attack the general problem.

This research is focused on the integration of creative development methodologies and the development processes of an innovation project with the goal of guiding stakeholders to develop ideas for commercialization.

For the development of this innovation meta-process guideline, the lack of tools that can lead the innovation process and the product life management will be studied, because of the lack of integrations of both methods, for one hand, the methods of developing creative ideas and for another hand the methods of the development of a project.

To make a more accurate representation of the innovation process, this research will take into account the three main phases. In this case, the beginning, the development and the end will be taken for the innovation process.

For this, the beginning is the development of ideas, in which the development of ideas will take into account the methodologies and/or tools that help create the ideas, in addition to the methodologies for solving problems, and for the development of the product or service. It took into account the methodologies for the development of prototypes, as well as validation and finally, for the closing part a part of commercialization will be taken, a part of commercialization will be taken since this part is more focused on the business part.

Assuming that there are thousands of methodologies, this research will take into account easy-to-learn methodologies, as well as easy-to-apply methodologies, as well as methodologies that do not imply a great cost to the stakeholder and methodologies that have easy access and methodologies that are already validated by other authors.

These methods will be taken into account by researchers related to the creation of ideas, and problem solutions and taking into account methodologies that many know based on the experience acquired, as well as doing research by articles, and books related to the specific topics, which in this case it can be divided into 4 aspects, in the creative development of ideas, in the development of problem solutions, in the development of designs or prototypes, and finally in the commercial development or the fundamentals to be a commercial development.

Development methods are also being taken from the life of a product, to integrate them into a diagram that can integrate the steps to follow and the methods in the same diagram.

This research will be qualitative research since the development of an innovation project requires a lot of time and financial resources.

This research takes into account the research work of other authors in developing and creating ideas, as well as problem-solving considering project management methods too.

Therefore, this research focuses on the creation of ideas using methods and the project development process in an IDEF (Integration Definition) diagram showing the stages for the development of the innovation project, from the idea to the commercialization.

Finally, for the selection of recommended methods, a chart was created following the IDEF0 diagram with the characteristics of the methods and tools to highlight the essential points of these methods, using easily accessible information links and providing more useful information for the stakeholders in order to help them to develop the suggested method developed by experts.

1.5 Limitations of this research

Currently, there are hundreds of methods for solving problems, as well as for identifying them, nevertheless, this research will only take into account a portion of the methodologies that meet the needs of product development and that are used in the field of innovation with easy access and who do not need specialized training or certifications to be an expert like Black Belt of Design for Six Sigma is.

Due to the available resources for this research, the entire process could not be executed in a real project, since it ends with the commercialization of a product or service. Therefore, everything is theoretical.

CHAPTER 2

LITERATURE REVIEW

In this chapter, the goal is to present the theory to define and delimit some definitions starting with project, innovation, start-up, and finally the project management life, as well as the IDEF0 diagram; this will help to further explain the process, the benefits and the tools that will be proposed in the next chapter and will help to create an innovation project with customer value.

2.1 What is a project?

According to PMBOK (Project Management Body of Knowledge), "A project can be considered to be any series of activities and tasks that have a specific objective to be completed within certain specifications, it has a well-defined start and end dates and, funding limits (if applicable), it consumes human and non-human resources, and is multifunctional."(*PMBOK® Guide*, 2021).

A project is a temporary endeavor undertaken to create a unique product, service, or result, indicating a beginning and an end to the project worked, where the projects can stand alone or be part of a program or portfolio (*PMBOK® Guide*, 2021).

We can consider a project a series of activities defined from the beginning to the end. A project needs to meet specific objectives and it contains technical, administrative and financial specifications for developing a product or service in a given time. These activities and tasks help to achieve the organization's goals.

PMBOK® Guide (2021) describes a group of processes that interact within each project life cycle phase. Those groups of the process are divided into Initiating, Planning, Execution, Monitoring & Controlling, and Closing.

- Initiating: Processes performed to define a new project by obtaining authorization to start the project;
- Planning: Processes required to establish the scope of the project, the project's scope in the objectives and define the course of action required;
- Execution: Processes performed to complete the work defined in the project management plan to satisfy the project requirements;
- Monitoring and Controlling: Processes required to track, review, and regulate the progress and performance of the project; identify any areas in which changes to the plan are required, and initiate the corresponding changes;
- Closing: Processes performed to complete or close project phase or contract.

The execution process creates the task or activities covering all kinds of actions, human effort, machine effort, financial effort, etc.

To review and regulate the progress is necessary to control and monitor the execution and the performance of the project to take any decision related to the project and follow the original plan.

And finally, the project will be closed according to the program and specifications on a certain due date.

According to *Agile Practice Guide* (2017), the goal of project management is to produce business value in the best possible way, given the current environment.

Project management is essential to know the tools with which stakeholders can execute these tasks. For this reason, it is necessary to include the development of a product and the development of ideas in the same process.

2.2 Market orientation

One of the most common mistakes in the industry, linked to the lack of market orientation, is the misunderstanding of innovation. Some companies consider innovation as the creation of something new but without a specific objective.

This is due to the misinterpretation of the word innovation. To avoid this misunderstanding, this research provides some examples of innovation in order to better define it.

Prud'homme's (2012) research mentions that "Invention" can be seen as the action of inventing something new, such as a device, service, or method. In contrast, "innovation" is the consecutive, combined process of the invention followed by its (e.g. commercial) exploitation. The cycle considered "innovation" is only completed once the design is applied, e.g. by being introduced to the market and thus given a practical purpose (as cited in Thraen, 2016).

Furthermore, Cropley's (2006) research defines innovation as the commercialization of an idea (as cited in Shenhar et al., 2020). Other authors describe innovation as "proposing and commercializing an idea" (Chen & Zheng, 2019).

Crossan & Apaydin's (2010) research mentions that innovation is the production, adoption and exploitation of a value-added novelty in economic and social spheres, to renew and enlarge products and services. Developing new methods of production, and establishing new management systems (as cited in Inigo, 2019).

The innovation is not limited to only one product/service in only one field, and it can apply in different fields and areas like the construction of new production methods, with the objective to add a value, which could be commercialized.

Webb (2019) defined innovation as the creation of new value that serves your organization's mission and customers. It is vital to consider the value created for the organization and customers, this helps to focus on the target of the objectives.

The process ranges from the inception of new thinking (creative idea), studying development for trial production, to commercialization. It combines technological knowledge, turning vision, knowledge and entrepreneurship into money (Chen & Zheng, 2019).

According to Le Masson, Weil, & Hatchuel (2017), the process of innovation does not just consist of moving from idea to product, we need to take into account four main points:

- Good Ideas: Where it does not matter if there is a large number of ideas. We need to focus on the quality of the ideas instead of the number of ideas;
- Guide and Learn: Where a large portion of ideas will fail, it does not mean that the selection was wrong. Just guide and learn;
- Use of the skills available: It's better to use all skills, internally and externally. The ideas came from everywhere;
- Trial and Error: Test many times before launching the product. Reduce the probability of failing, setting all functions on time.

Table 2.1 compares the “Paradoxes in the Organization of Innovative Design.” (Le Masson et al., 2017).

Table 2.1 Comparison of Innovation and Not innovation

Not Innovation.	**Innovation.**
✗ uantity of ideas.	✓ ood Ideas.

✗ election ratio.	✓ uide and learn.
✗ kills available.	✓ kills are available internally and externally.
✗ rial and Error.	✓ educe the probability of failing.

Bearing in mind that ideas are difficult to come by and that they must be improved, as well as Webb (2019) recommends taking it very seriously if the answer to the following questions is yes:

Can it . . .

- Increase sales and profits?
- Expand our market?
- Deliver more value to our customers?
- Raise the productivity of our employees?
- Reduce our operating expenses?
- Position us as industry leaders?

If the idea can increase sales and profits to position itself among the industry leaders, it is good to take it into account to innovate. It is a process of executing new creative ideas to be commercialized, increasing the value of the organization through a product or service.

Therefore, it is important to properly identify the problem or need and develop possible creative solutions considering the mission and vision of the organization.

Bearing in mind that it is a project and having defined innovation, we can now determine what an innovation project is. It is a series of activities and tasks that aims to create, execute and complete new creative ideas from the invention to their commercialization through a product

or service in order to increase the value of the organization based on its mission and vision with certain specifications and due date.

2.3 VMOT (Vision, Mission, Objectives, Tactics) in an innovation project

To prevent projects from failing is important to have clear objectives and ideas related to the organizational objectives. This is why it is essential to take into account the VMOT. This helps the organization to follow a route to follow.
The VMOT's definition is as follows:

- Vision: "Is what the company aspires to be" (The Standard for Portfolio Management – Fourth Edition, 2017). One question that helps to define the vision is "Why," According to Agile Practice Guide (2017), the question to help to define the vision is "Why are we doing this project?".
- Mission: "What the company is in business to do" (The Standard for Portfolio Management – Fourth Edition, 2017) and Webb (2019). Mentioned that the mission "includes the most important three-letter word in innovation vocabulary "Why" and requires clear eyes, tough questions, and honest answers."
- Objective: According to PMBOK® Guide (2021). "Is a result to be obtained" where the (The Standard for Portfolio Management – Fourth Edition, 2017) developed four questions to validate the essential objectives criteria. Those questions are:
  - Is the objective feasible and achievable?
  - Is the objective measurable and verifiable?
  - Is the objective adaptable and flexible?
  - Is the objective consistent with the rest of the strategic plan?
- Tactics: This is how we will complete the objective. One or more projects can complete the tactics.

The innovation projects need a clear direction, and this is to set goals for any type of innovation, to identify what you want to achieve, how long you have to accomplish it, and

what constitutes success (Webb, 2019). It also needs a detailed process to follow, with methods that help both, to create ideas and to follow the direction of the company according to the needs of the market and the company itself.

2.3.1 Values and Benefits

The product or service created must provide value and benefits to customers. “Many start-ups lack a coherent, let alone compelling, value proposition. The product is only one of many parts of the marketing mix. But if you can't explain what the product offers, what problem it solves, or what benefits might derive from using it, then you'll be lucky ever to sell it” (Richards, 2014).

The lack of value towards the product or service is not only not attractive to investors but also not attractive to employees. “With an incoherent or nonexistent expression of value, a venture will probably fail to attract the required investors, partners, channels, or suppliers, and will also fail to engage and motivate employees” (Richards, 2014).

The value is not limited to one system or private organization. As *PMBOK® Guide* (2021) mentioned, existing projects within a large system, such as government agencies, organizations, or contractual arrangements among the benefits that contribute to creating value, can be defined in quantitative and qualitative terms.

According to *PMBOK® Guide* (2021) some of these examples are:

- Creating a new product, service, or result that meets the needs of customers or end-users;
- Creating positive social or environmental contributions;
- Improving efficiency, productivity, effectiveness or responsiveness;
- Enabling the changes needed to facilitate t organizational transition to its desired future state;

- Sustaining benefits enabled by previous programs, projects, or business operations.

Kim & Mauborgne (2014) consider significant for start-ups the “value of innovation; their objective focuses on giving value to consumers and the company to open space just for them. Focus on making the competition irrelevant by creating a leap in value for buyers and your company, thereby opening up new and uncontested market space”.

To create value is the most important action, but innovation and value creation must go hand in hand because “Value without innovation tends to focus on value creation on an incremental scale. Innovation without value tends to be technology-driven, market pioneering, or futuristic, often shooting beyond what buyers are ready to accept and pay for” (Kim & Mauborgne, 2014).

To create new values, Kim & Mauborgne (2014) built a framework with questions focused on these factors: Eliminating, Reducing, Raising and Creating; these questions will help create and identify the value with their questions. The following Figure 2.1 shows the Four Actions Framework.

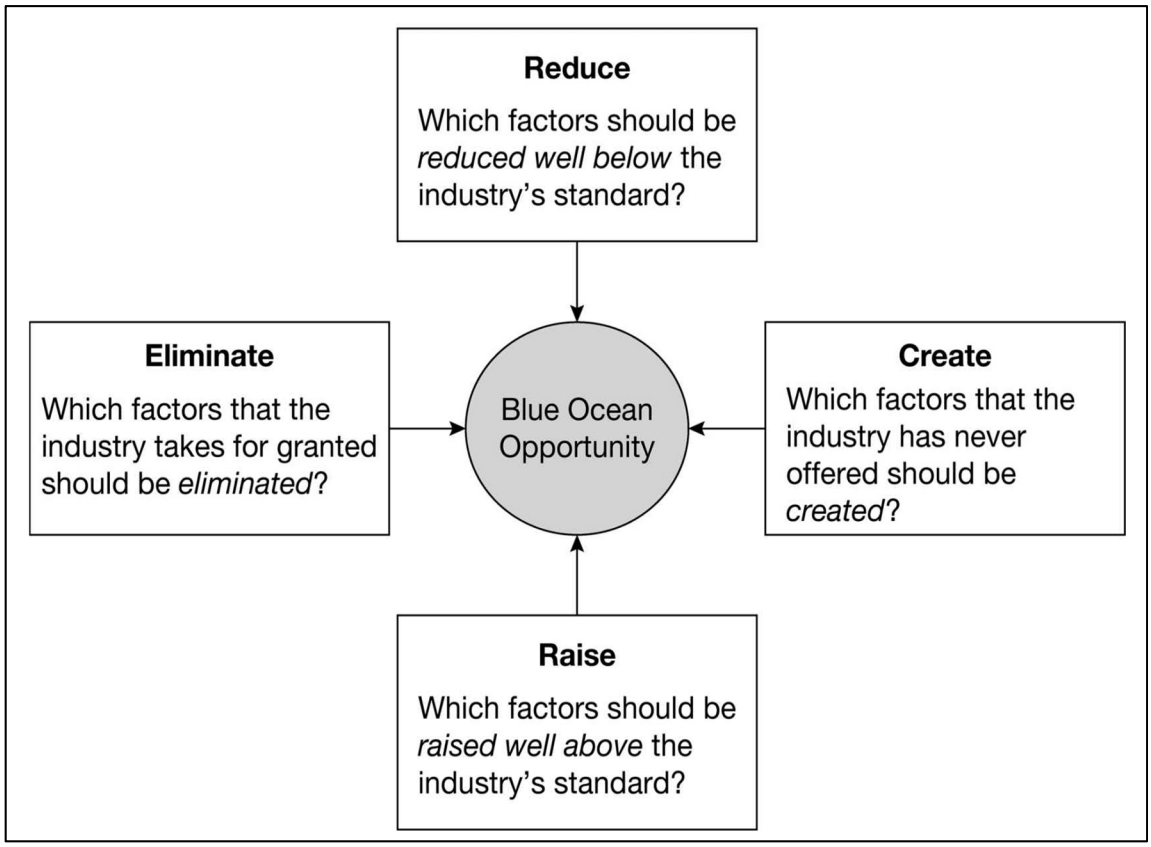

Figure 2.1 Four Actions Framework
Taken from Kim & Mauborgne (2014)

- Which of the factors that the industry takes for granted should be eliminated? This question forces you to consider removing factors that companies in your industry have long competed on;
- Which factors should be reduced well below the industry's standard? This question determines whether products or services have been overdesigned;
- Which factors should be raised well above the industry's standard? This question pushes you to uncover and eliminate the compromises your industry forces customers to make;
- Which factors should be created that the industry has never offered? The response helps you discover entirely new sources of value for buyers and create new demand and shift the strategic pricing of the industry.

As *PMBOK® Guide* (2021) says, “The Value is subjective, in the sense that the same concept can have different values for different people and organizations, this depends on organization’s strategies.”

Some organizations search for financial gains, but others, like governmental agencies, explore to create a positive social or environmental contribution with non-financial benefits.

As well, as there are ilabs that support private organizations and governments to develop ideas, the concept of value can change for each of them. Even if the value is different for each organization, it is essential not to set aside the value.

The value added to the stakeholders is significant for decision-making, if you want to create an innovation project, there are some guides that help to define and create value, for example, BMC (Business Model Canvas) by Kim & Mauborgne (2014), Value Proposition Design by Osterwalder et al (2014) or Blue Ocean Strategy by Kim & Mauborgne (2014), where the model helps to define the sale channels for the product or service.

2.4 Creativity and solution methods

For the development and creation of a variety of ideas, identifying and solving-problem, several guidelines can help. Some of them are the C-K theory.

“C-K is a theory for the creation of new object definitions, and it aims to combine the creative logic (concept), with the sense of modeling and the creation of knowledge by the engineer who proposes a language as unified as possible to facilitate dialogue between them” (Le Masson et al., 2017).

“The process of this theory consists of two facets: the first one is the definition of hitherto unknown objects to bring them into existence then, on known objects, proceed to the propagation and reorganization required for the existence of the hitherto unknown new object

while restoring or maintaining the conditions of existence of what had hitherto been known" (Hatchuel & Weil, 2003).

Definitions of Concept (C) and Knowledge (K). K is for the propositions of knowledge where the space is characterized by the fact that they all have a logical status (true or false). And C is the proposition in which as yet unknown objects are developed (Le Masson et al., 2017).

"The propositions of C space focus on objects whose existence is still undecidable based on the propositions available in K. The propositions of C are undecidable concerning the propositions in the K space. These propositions are known as concepts" (Le Masson et al., 2017).

In other words, a "concept" is a proposition, or a group of propositions that have no logical status in K. This means that when a concept is formulated, it is impossible to prove that it is a proposition of K. In Design, a concept usually expresses a group of qualifying properties.

To extend and joint the concept with the knowledge and vice versa, two operations are used, "disjunction" transforms propositions of K into concepts, going from Knowledge to Concept. And "conjunction" which is the reverse operation, going from Concept to Knowledge (Hatchuel & Weil, 2003). Figure 2.2 shows how it works, from the known to the unknown (see Figure 2.2).

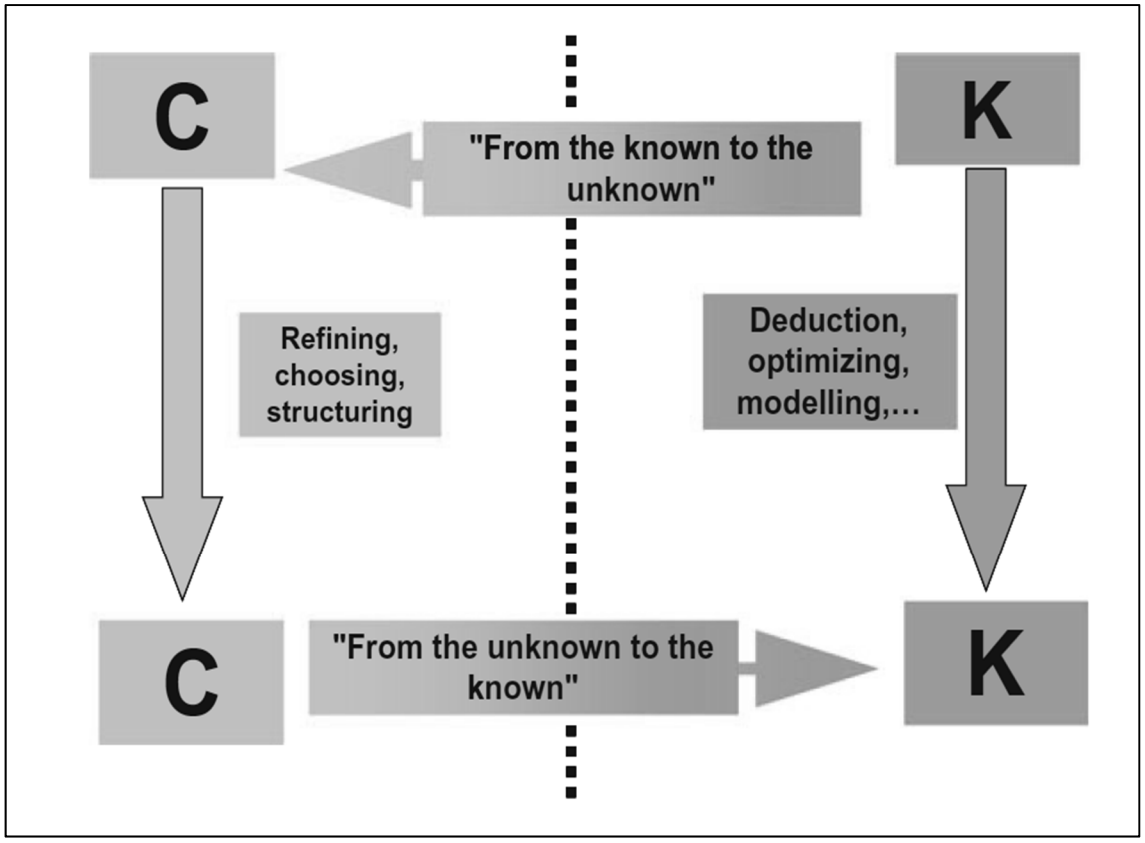

Figure 2.2 The four operators in C-K theory
Taken from Le Masson et al. (2017, p134)

This theory helps the creative development of ideas, it follows a process and makes a precise definition of the design, generating creativity within the same information and unifying the concept and knowledge into a proposal.

Another theory that helps solve problems is the TRIZ method. TRIZ is a problem-solving theory developed by (Altshuller, 1984) and is a Russian acronym for Theory of Inventive Problem Solving (TIPS).

This theory helps to define the problem from the beginning to give it a solution and develop a new creative idea. This theory uses the following tools: 9 screens, Smart Little People, Contradictions, the law of evolution, DTC (Dimension, Time, Cost) operator, and operation zone.

- Nine screens: “Helps to view all aspects of problems and solutions and use our brains and knowledge more effectively to both understand and solve problems. By requiring us to think in Time and Scale in 9 - Boxes, use the vertical axis to focus on and look at the detail, or pull back and see the whole context, and the horizontal axis for time steps of past, present and future” (Gadd, 2011);
- Smart Little people: “Creativity tool for understanding and solving problems where we imagine the elements of our system made up of many small, clever people. Are tiny imaginary beings who represent the different elements of the problem we are trying to understand and solve” (Gadd, 2011);
- Contradictions: “Are at the heart of many problems occur when we have opposite needs (I want a small car for parking and a big car for safety) or when we focus on one need, and it conflicts with another – I want a powerful car, but I also want greater fuel efficiency” (Gadd, 2011);
- Physical Contradiction “Is characterized by having the contradiction derived from the same system parameter – for example, an umbrella needs to be both large (when in use) and not large , e.g. when not in use” (Gadd, 2011);
- Technical Contradiction “Is characterized by having different system parameters that constitute the contradiction, occur when we improve something, and something else gets worse, e.g. strength vs. weight” (Gadd, 2011);
- Contradiction Matrix: Solve the technical and physical contradiction through patents studied before;
- Operation zone: “Is the entire set of components of a system and its environment that are directly related to a contradiction; the operative zone is the epicenter of the problem, where the conflict is concentrated, meaning where the positive and negative functions exist simultaneously” (Michael, 2006);
- Law of evolution: “Development is evolution directed towards increasing effectiveness. The most important aspect of an invention is that a technical system makes a transition into another one in such a way that this transition reflects the process of the further development of technical systems and runs according to objective laws” (Michael, 2006);

- Operator DTC: “Creativity tool for breaking psychological inertia. You imagine how you would solve this problem by expanding the parameters of size, time and cost to infinity and to zero, e.g. how would I solve this problem if I had an unlimited budget or no budget?”(Gadd, 2011);

Another creativity development method is ASIT (Advanced Systematic Inventive Thinking) “(ASIT) is a structured method of creativity with a beginning, a process and an end, invented by Roni Horowitz to streamline the application of the TRIZ theory and increase its scope and effectiveness” (Méthode de créativité ASIT - Innovation Systématique , s.d.).

ASIT makes it possible to solve problems and design new products and services. Through offering five main operators (Unification, Multiplication, Division, Breaking Symmetry, and Object Removal) and two conditions, the qualitative change condition & the closed world condition by (Horowitz, 1999).

For the ASIT’s Operators:

- Unification: directs the problem solver to finding an existing system or neighborhood object to carry out the required operation (Horowitz, 1999).
- Multiplication: New objects of the same type will be added to the system to stop the problem; the new object must be of the same type but different from the original (Horowitz, 1999);
- Division: “Directs the problem solver to select one of the objects that belong to the problem’s world, break it down into its parts and then reorganize the parts in space or in time” (Horowitz, 1999);
- Breaking Symmetry: “Directs the problem solver to search for current symmetries (Symmetries - in general, not limited to geometry or shape) and to try to recognize new states by breaking them, connect two hitherto unrelated attributes” (Horowitz, 1999);

- Object removal: “Directs the problem solver to remove an object from the system and then search for an alternative like the closed world where the objects to assume the function of the removed object if necessary, or to restructure the system so that the operation, carried out by the removed object, will not be needed anymore” (Horowitz, 1999).

For the ASIT’s Conditions:

- The condition of the Qualitative Change, it requires the solution to incorporate a qualitative change in at least a single relation (between an undesired effect, and an attribute that currently increases the severity of the undesired effect) that characterizes the problem (Horowitz, 1999);
- The Closed World Condition “is defined as the set of types of objects that comprise the system and its neighboring objects; the Closed World condition simply states that the solution should not incorporate any objects of a new type” (Horowitz, 1999).

“The ASIT method allows exploiting the innovation mechanisms that constitute the DNA of any innovation (product, service, process)” (Méthode de créativité ASIT - Innovation Systématique , s.d.).

2.5 Success Criteria

To track the success of a project, we need to understand what success is. According to the *PMBOK® Guide* (2021), “The true definition of failure is when the final results are not what was expected, even though the original expectations may or may not have been reasonable.”

Following this definition, an innovation project will fail when the final result has not been achieved. This result could be defined in soft and hard factors, as Cooke-Davies’ (2002) research defines the “hard” factors come from the traditional methodology related to time, cost and quality while the soft factors come from the project management responsibilities or human responsibilities (as cited in Bergmann & Karwowski, 2019).

Motivation and communication are essential for the success of a project as actual people are who execute it (Bergmann & Karwowski, 2019). These skills help to deliver a better experience for the user and stakeholders.

Goedknegt's (2015) research indicates that developing, launching, and adopting a successful outcome requires the perfect formula of innovation, perspiration, calculation, and precision from a project manager (as cited in Daryousef, 2019).

Developing successful products requires project managers to ensure a strategy aligned with the organization's scoping stage agreement with all stakeholders, and less impact on time, cost and quality. This can be achieved by assessing materials, labor costs, legal implications such as trademarks, target price points and target channels since the beginning (Majeed, 2018).

To know if a product or service is meeting the needs of consumers, it is necessary to evaluate the product and ask the one who is using it. For this, the Kano model can be used. It helps to evaluate customer satisfaction by showing the strong points and the opportunity areas that must be provided in which we must be improved.

Kano model: "is a user research technique developed in the 1980s by Professor Noriaki Kano, to help people understand what their users really think about the different features in their product" (Kano model tool - build & analyse surveys for free , s.d.).

Kano categorizes the features into five as shown below: (Kano model tool - build & analyse surveys for free , s.d.).

- Must-have - or "basic expectations";
- Performance - customer satisfaction increases in line with the quality of the feature;
- Delighters - if present, people are surprised and delighted;
- Reverse - actively disliked by customers;
- Indifferent - nobody cares if these features exist or not.

Taking these methods into account, this research proposes using tools that can lead the stakeholders in the development of an innovation project so that they can make better decisions. In addition, this research focuses on developing a process that corresponds to the management, looking for the development of a functional product to deliver a unique value to the final consumer.

Finally, an innovation project is focused on a product linked to the company's objectives and provides value to the consumer and the company.

2.6 Conclusions

The objective of this chapter was to present a definition of innovation since misinterpretation of the word is very common, and also to identify ideas with real high value for the client.

So, for the development of an innovation project, it is necessary to follow several steps, taking into account the added value or benefits for the client, and the organizational objectives and guaranteeing that they are achievable for the company.
These values can be generated by removing or reducing unwanted effects, as well as increasing or creating desired ones, based on building problem-solving methodologies.

Finally, create innovative projects that could increase the percentage of success, defined by various researchers, as increased profits, market expansion, increased productivity, reduced operating costs or position the leading company.

CHAPTER 3

PROPOSITIONS

This chapter aims to present the development of the innovation process using the IDEF0 diagram. A tool that helps to visualize the activities of the process, from the beginning to the end, as expressed by the project life management.

The proposed process aims to lead the stakeholders in the process of the development of an idea for its commercialization, taking into account various tools and methods developed by experts.

This research tries to include project life management because it is related to the product life cycle, it is where the project management and a project innovation follow the evolution of the product or service.

3.1 Project life management and IDEF0 diagram

The IDEF0 Diagram is a modeling language that allows the development of structured graphical representations of a system to build functions' models such as activities, actions, processes or operations within the modeled system or subject area (PUBs, 1993).

IDEF0 is composed of hierarchical series of diagrams that gradually display increasing levels of detail describing functions and their interfaces within the context of a system.

It includes boxes, arrows, rules, and diagrams. The boxes represent functions, defined as activities, processes or transformations. The arrows represent data or objects related to operations, but they. Do not represent flow or sequence as in the traditional process flow model.

Instead, the rules define how the components are used (PUBs, 1993), and the diagrams provide a format for verbally and graphically depicting models (see Figure 3.1).

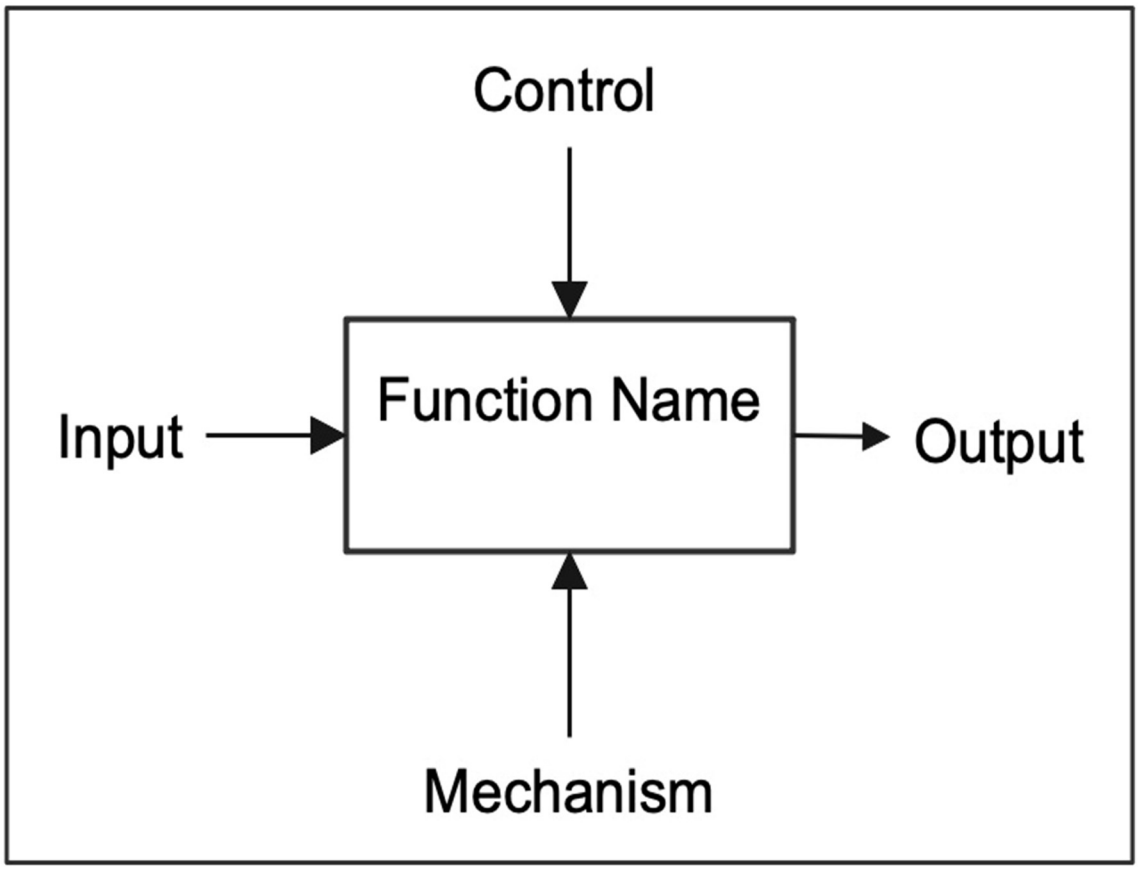

Figure 3.1 Arrow Positions and Roles
Adapted from PUBs, (1993)

The IDEF standard (PUBs, 1993) explains the next concepts:

- Box: A box describes what happens in a designated function. The name shall be an active verb or verb phrase that describes the function;
- Input Arrow: Represent data or objects as constraints transformed by the function into output. Input arrows are associated with the left side of an IDEF0 box;
- Mechanism Arrow: Mechanism arrows are associated with the bottom side of an IDEF0 box, used to perform a function;
- Output Arrow: Output arrows are associated with the right side of an IDEF0 box and express the data or objects produced by a function;
- Function: An activity, process, or transformation identified by a verb or verb phrase that describes what must be accomplished;

- Control Arrow: Express the conditions required to produce the correct output. The Data or objects are modeled as controls that may be transformed by the function, and the control arrows are associated with the top side of an IDEF0 box.

This diagram can help to explain the proposed process for the development of the lead since it explains the inputs and the tools that can be used for the development of ideas. It also takes into account the requirements or controls that will help us to maintain a scope according to the needs to finally get a result or a way out of the whole process.

Furthermore, this helps to visually locate the stage in which we are and the tasks that we must develop.

For example, if we need to perform a detailed design, the input is the preliminary design data, (from where we will start), the control is the design requirements (is the boundary of the design requirements), and the mechanism is the design engineer (who or what will do the task) finally to get a result or put that is the recommended detailed design described in the next figure, (see Figure 3.2).

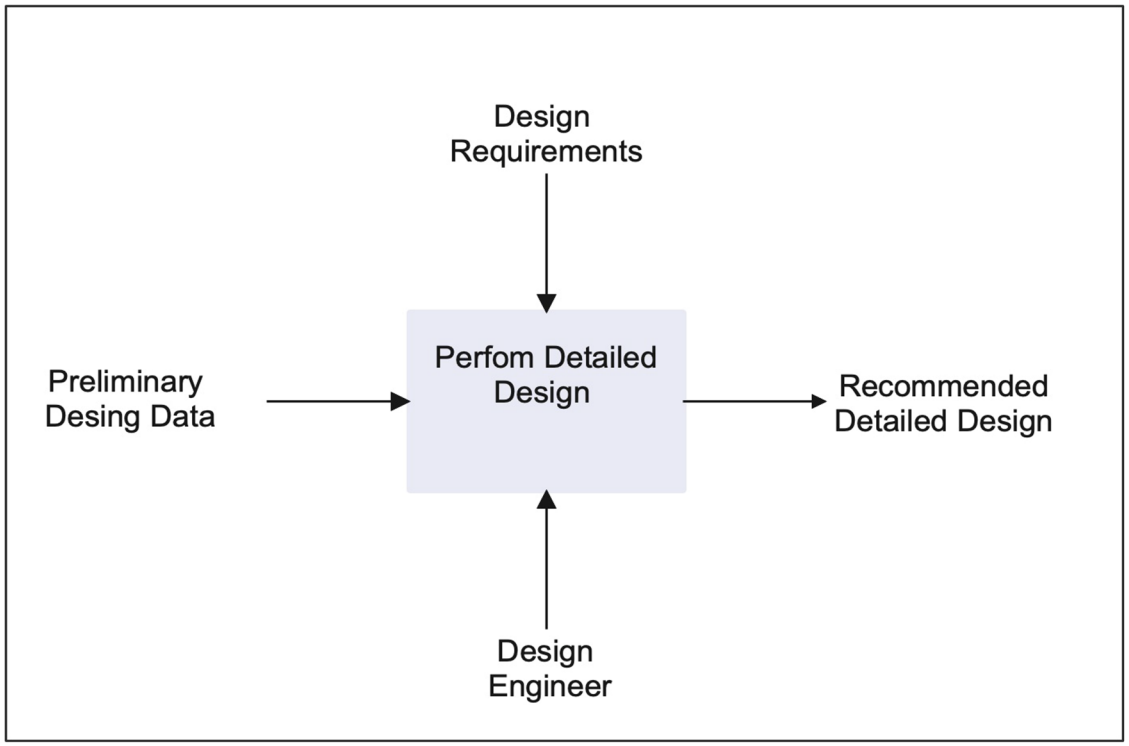

Figure 3.2 IDEF0 Example

3.2 Innovation Process and IDEF0

Based on this function model, it will help to explain the innovation development process, from the identification of the problem to the commercialization.

Figure 3.3 shows the innovation definition using the IDEF0 model, where we had defined it as a series of activities and tasks that aim to satisfy a need (input), taking into account the organizational objectives (control) using methods for the development of ideas (mechanisms) and being able to address the solution through a product or service (output).

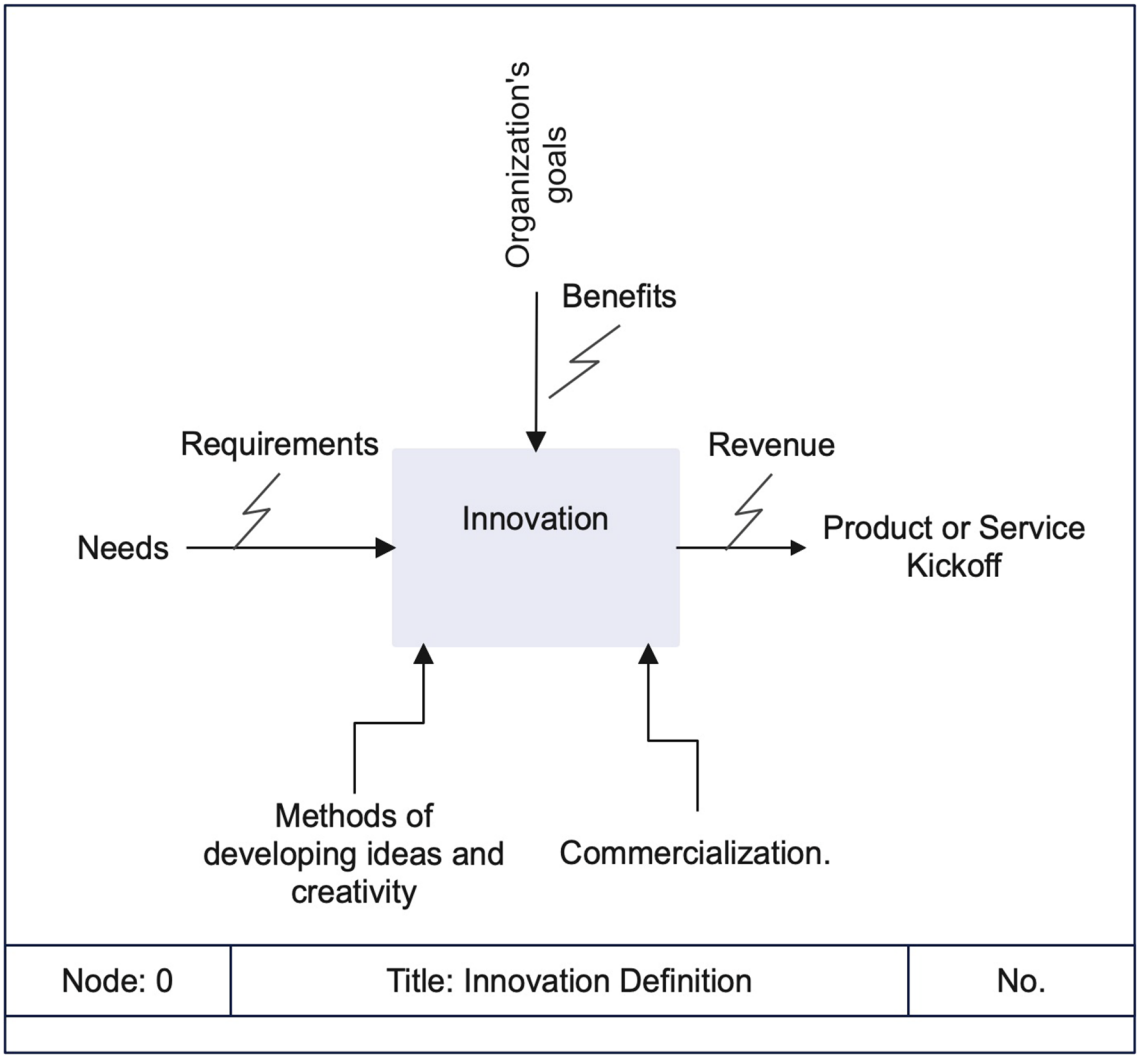

Figure 3.3 Innovation Definition

- Input: Kruchten, P. (2004 as cited in Yannou, Cluzel, & Lamé, 2018) mentioned "Stakeholder request and customer needs and wants." These are the needs that could be a problem, opportunity, or constraint with potential value to stakeholders (Hemmer Gudme & Poissonnier, 2017). It's Something that you must do, or something you need to have.

To start with an innovation project, we have to consider the need to attack and balance the value proposition that will be delivered to consumers and the development of ideas focused on the company's vision.

- Control: The organization's goal is to create long-term business value, to give a helpful or good effect, or something intended to improve and help. Before creating a product or service, it is essential to consider the organization's objectives and the ideas to be developed based on these objectives;
- Mechanism: They are the tasks and activities to create, develop and execute the ideas using methods and tools to market the product or service;
- Output: It is the product or service that satisfies the needs of the stakeholders, providing value to the organization and the consumer.

Innovation must begin by identifying the problem or need and developing possible solutions with creative ideas considering the organization's mission and vision to be commercialized.

3.2.1 Innovation definition and life cycle process (0)

Like any project development, it must have a beginning, a development and an end. In this case, for the development of a product or service, it is necessary to follow a series of steps according to its life cycle; this means that this process represents an evolution of the product, from the concept to the delivery, from its growth, maturity and retirement (*PMBOK® Guide*, 2021).

This product evolution it’s related to feasibility, design, build, test, deployment, and shutdown (see Figure 3.4). In this case, for an innovation project, the feasibility would be validated if the solution of a problem is based on a need in order to determine if it is really necessary to attack this problem. Then, a feasibility on design, which will be related to the creation of ideas according to the objectives of the organizations and to customer requirements.

Once the idea has been created, we must select it to start with the development of a prototype and thus carry out tests to refine the product and achieved to sell it.

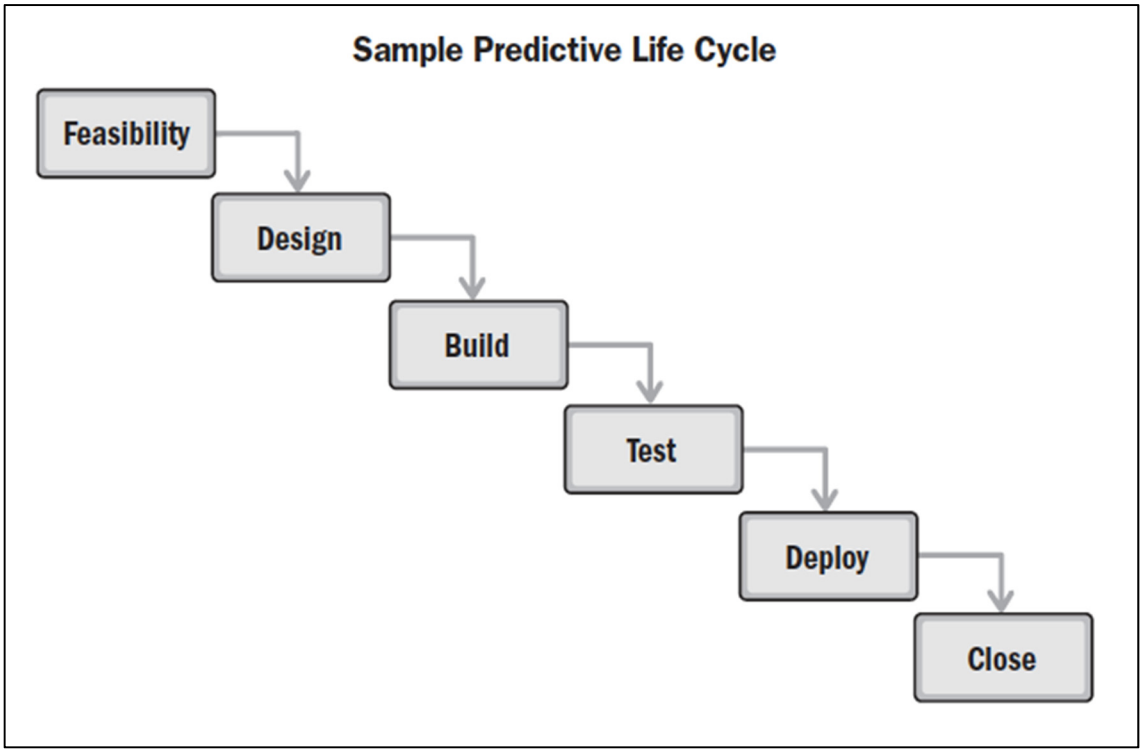

Figure 3.4 Life Cycle
Taken from *PMBOK® Guide* (2021)

The innovation process is divided into six steps. The first one is to define the needs; the needs can come from a problem or a negative effect. The second one is to create ideas using creative methods and follow the company's objectives.

Once several ideas have been made the best one must be selected ; this is the third step and, the best idea can be evaluated according to the values and benefits for the stakeholders and the company.

The fourth step is creating the concept. After the best idea is selected, we need to create a vision of that idea to join all the design and engineering requirements. The fifth and sixth steps are to create a close prototype similar to the final product to correct and adjust the product or service to be produced definitively (see Figure 3.5).

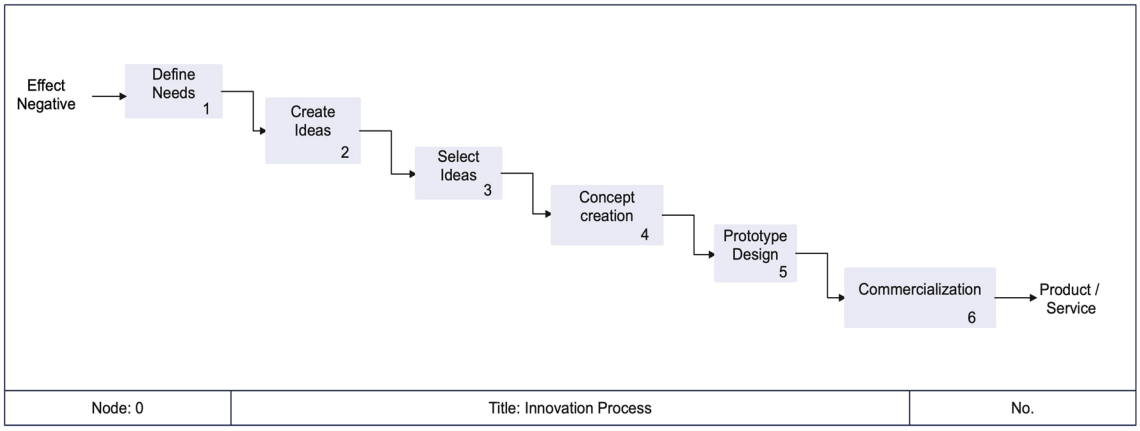

Figure 3.5 Innovation process

Defining the process, we need to begin with identifying the problem or need and developing possible solutions with creative ideas considering the organization's mission and vision to be commercialized.

3.2.2 Needs Process (1)

As mentioned before, the first step in the innovation process is to define the needs, transform it from an adverse effect or a problem into the desired effect with benefits for the stakeholders, using some method of investigation and observation to find the root cause and propose a possible solution (see Figure 3.6).

This process is divided into three steps: “current situation”, “define the problem”, and finally “needs definition”. At “current situation” the observation of the causes of the problem happens, using the 5W method to define the gap between systems and needs, requirements or benefits we want to have caused by an effect undesired.

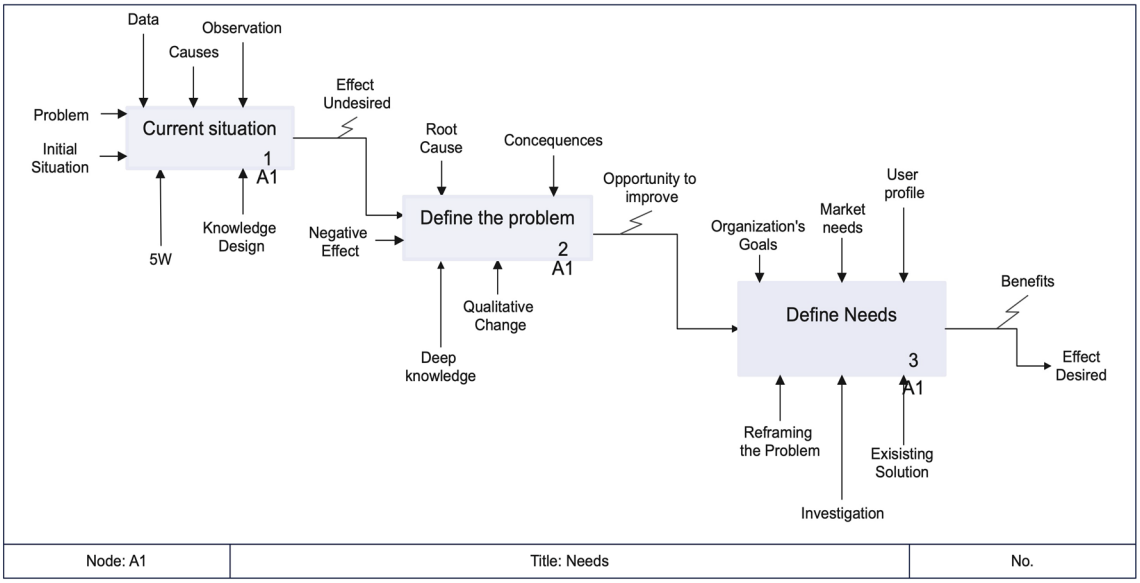

Figure 3.6 Needs

Once we define the gap and the undesired effect, we need to define the problem. For this, we need to understand the root cause and consequences. Finally, to understand the results, we can use the qualitative change that helps to verify and confirm the adverse effect and neutralize it.

This desired effect can counteract a negative impact, having the opportunity to improve, for the stakeholder's needs, reframing the problem, and applying the current solution that helps get a proposal for the effect desired.

3.2.3 Idea Process (2)

The second step is to create the idea; once the desired effect and the need are defined, the next step is to develop ideas to neutralize the undesired effect. To do this, we need to divide the process into three phases. The first step is reframing the problem, taking into account the root cause and observing the use to get to a specific problem and address it at the root cause (see Figure 3.7).

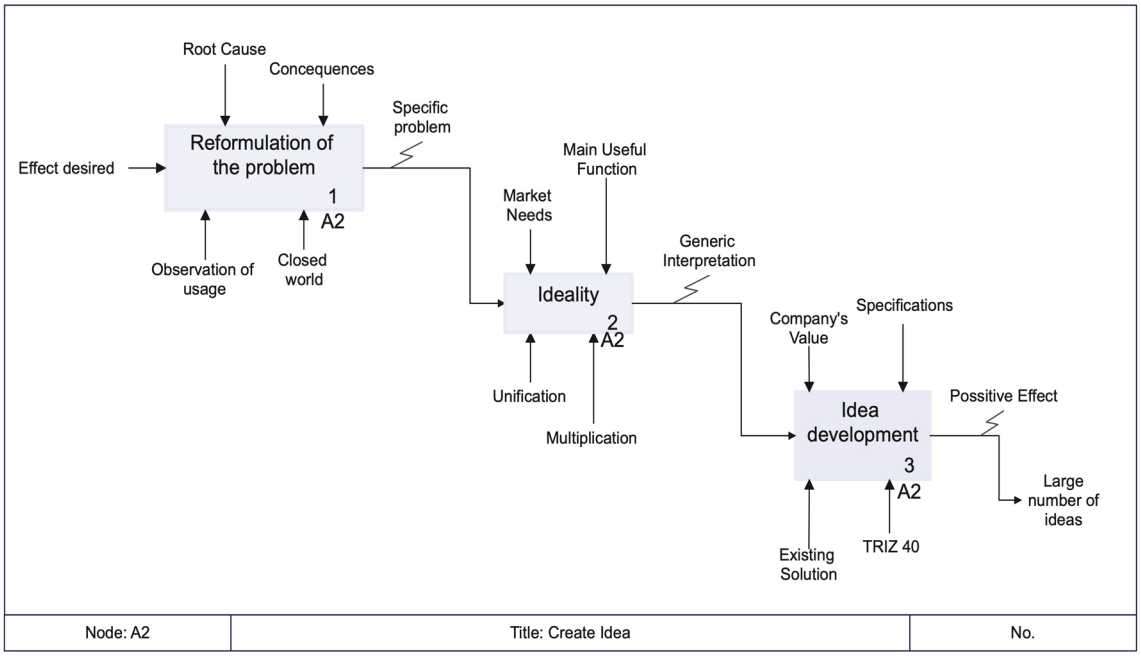

Figure 3.7 Create Idea

After defining the specific problem, the next step is to develop the ideality of how we want the product or service to work by uniting the needs of the market and the main functions of the user, and this will help us to define in broad strokes the product and how it can work.

The last phase is to develop a large number of ideas; taking into account the specifications and objectives of the company to develop these ideas, we can use TRIZ 40 where TRIZ 40 is based on the solution of problems that some inventors used to make patents, and create a benchmarking to give us an idea of how other people solve the same resolution and improve it, or in its case apply the principles to our developing system.

3.2.4 Idea Selection Process (3)

To select the best idea among a large number of proposals, it is essential to take into account some aspects such as the impact on the market, the scope that will have in the market to be commercialized, in addition to the organizational objectives and the client's values.
The UNPC (Usefulness, Newness, Profitability, Concept) tool, will help to separate the proposals with greater scope.

Finally, to select the idea, we must also consider the company's resources to determine if it is necessary to prolong any proposal or to obtain investors for its development (see Figure 3.8).

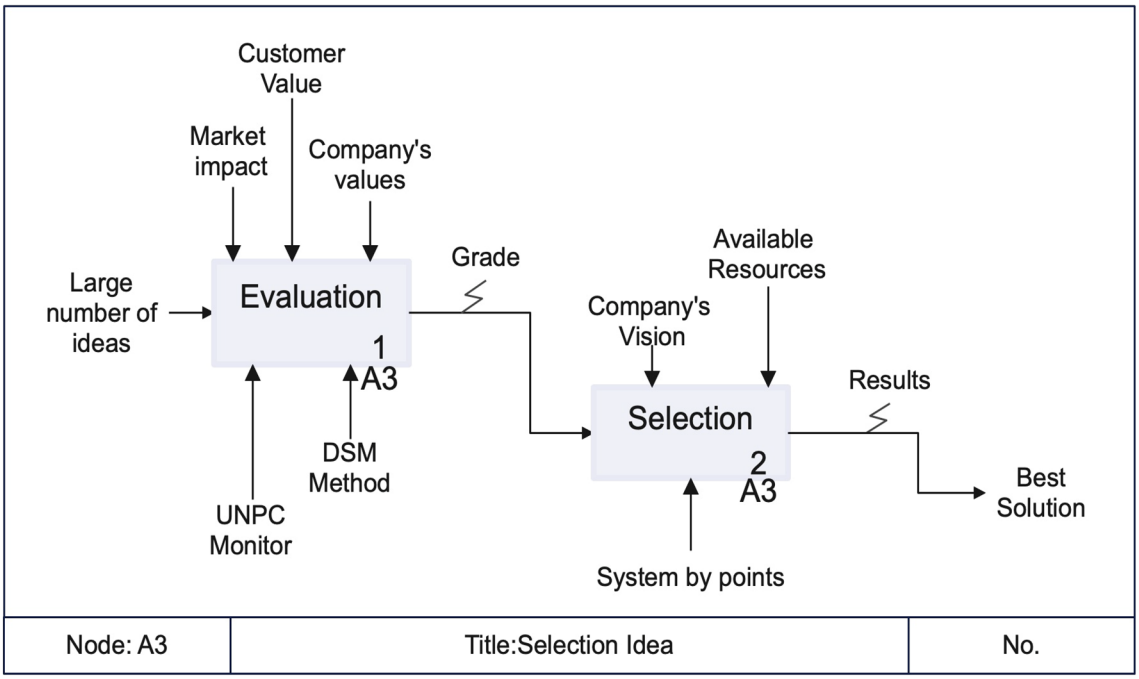

Figure 3.8 Selection Idea

3.2.5 Concept Process (4)

Once the best proposals that deliver excellent value to the stakeholders have been selected, we have to create concepts to gradually unite the user's needs and the product's specifications—connecting the logical aspect with the non-logical.

The concept helps define the general specifications and thus begin developing a prototype for testing (see Figure 3.9).

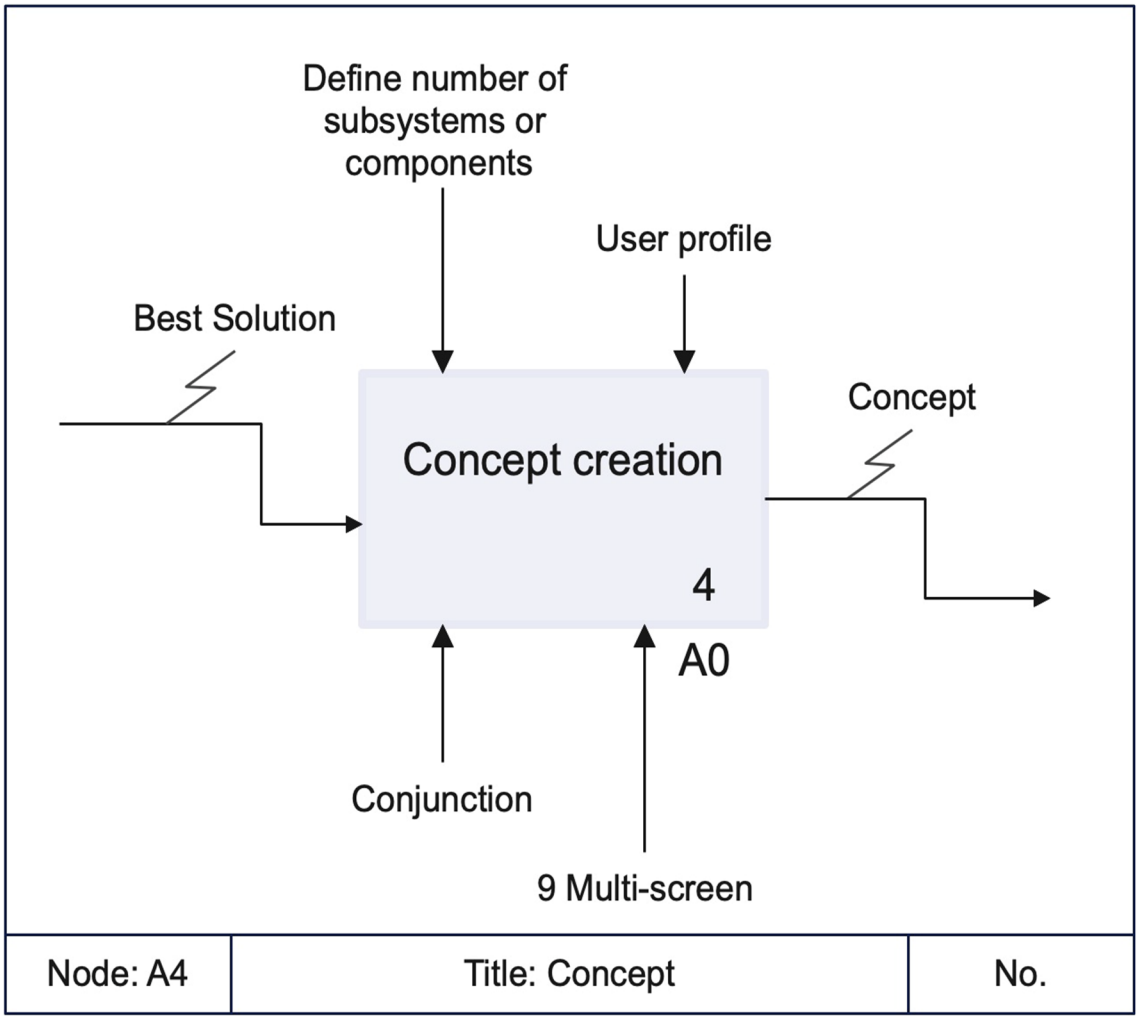

Figure 3.9 Concept

3.2.6 Prototype Process (5)

The available resources must be considered for the prototype, complying with the specifications and primary functions. A prototype helps a lot to start testing how it would work in the real world, and it also helps to simulate these conditions.

For this, it's necessary to consider the technical and legal requirements if it is necessary to comply with any regulation. A prototype must be developed with the main functions that deliver the stakeholder value. This can be done with the development of an MVP (Minimum

Viable Product). This MVP will help gather information before the final sale launch and helps to improve the product or service based on information (see Figure 3.10).

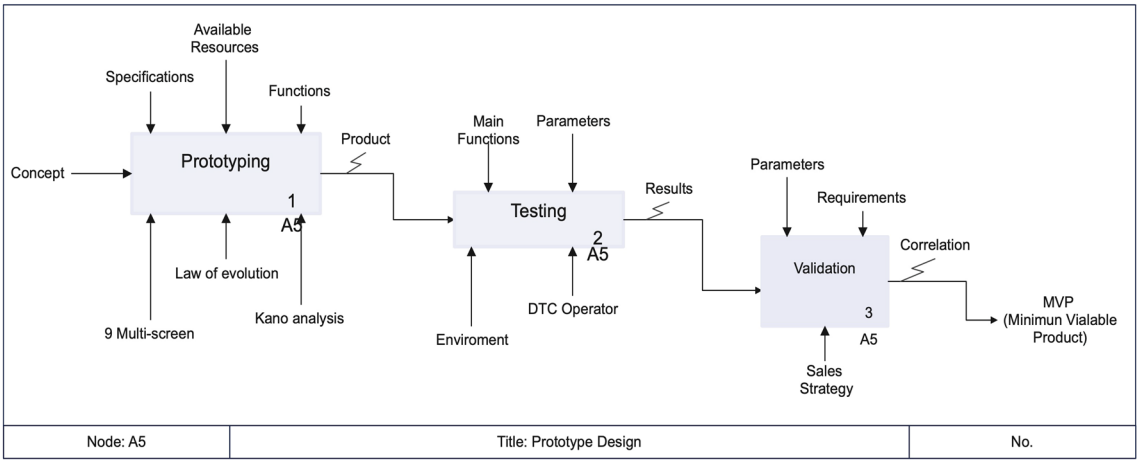

Figure 3.10 Prototype Design

3.2.7 Commercialization Process (6)

The last step for an idea to be considered an innovation is the commercialization of the product or service developed (see Figure 3.11).

For commercialization, the user profile and a market strategy based on BMC must be considered, identifying the values of the stakeholders and providing them with these benefits. In addition, once it is released for sale and commercialized, it is essential to obtain information from consumers to continue improving and delivering a product that exceeds expectations.

For this, we can use tools such as Kano Analysis which helps to carry out focused surveys to find out the consumers' opinions. In addition, this information will help to new obtain opportunities for new needs that can be marketed in new products and start the cycle again to develop an innovation project.

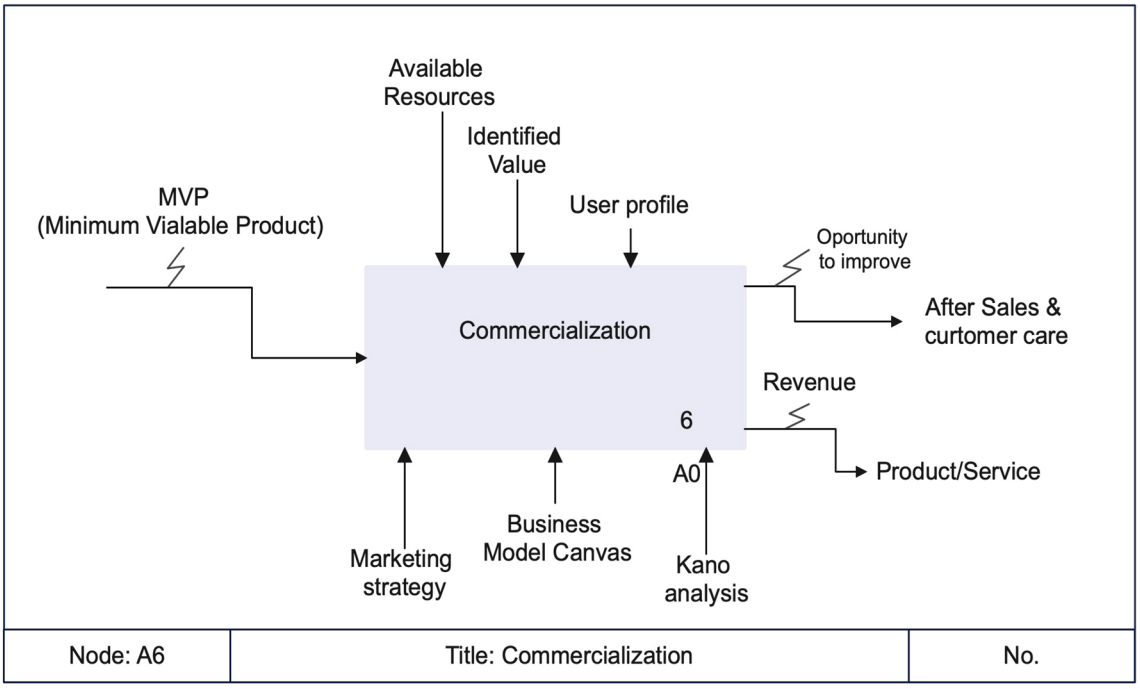

Figure 3.11 Commercialization

3.3 Conclusions

The objective of this chapter was to present the development process of an innovation project in an IDEF0 diagram, graphically showing the stages and tools to be used for the development of a project from the idea to commercialization.

These tools take into account methodologies for the development of creative ideas and problem-solving, as well as methodologies for the development of a product, and thus be able to integrate these methodologies in a meta-process.

Finally, based on this diagram, we can conclude that these methodologies can be integrated graphically and in an orderly manner into a meta-process, which will help guide the stakeholder at each stage of the process or, if applicable, if they need a methodology to use, they can quickly select it.

CHAPTER 4

INNOVATION META-PROCESS

The objective of this chapter is to present, through a chart, the details of the tools that can be used in each stage of the process previously developed in the IDEF0 diagram, as well as information on how to create it with some examples and information on the subject can be deepened.

This chart is a supplement to the IDEF0 diagram with more detailed information, and the chart follows the IDEF0's numbering.

The chart is developed and divided by the following topics:

- Process Name;
- Step;
- IDEF0 Function;
- Item;
- Why;
- Description;
- Subject;
- Expectation;
- Example;
- Extra Material;
- Reference.

In this Chart, I proposed some examples and expectations of the activity, as well as some extra material that helps to give examples and explanations about the activity. Finally, the reference resource where you can find the theory information of the method.

For visual purposes, the chart will show the next columns; Process name, Step, IDEF0 function, Item, Why, Description and Subject (see Table 4.1). Reference links and bibliographical references of the methods are also added. (see APPENDIX I, p 123 to APPENDIX II, p155).

Table 4.1 Chart Description

Step	IDEF0 Function	Item	Why	Description	Subject

- The IDEF Function, is the function of the process that could be Input, Mechanism, Control, or Output;
- The Item, is the topic of analysis in this specific area;
- The Why, is the question of why it is recommendable to use that kind of method or why it is considered;
- Description: This is the resume of the activity.

The process name is divided into six main processes, which are: (see Figure 4.1).

- Needs;
- Idea development;
- Select idea;
- Concept creation;
- Prototype design;
- Commercialization.

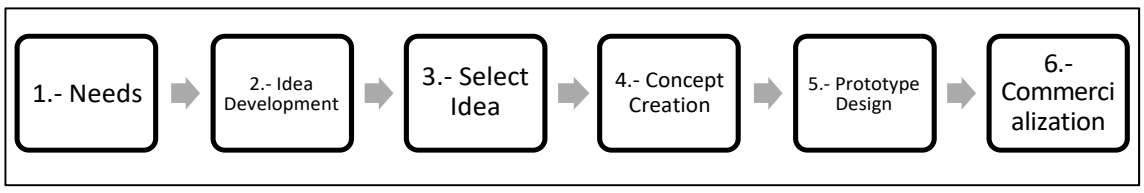

Figure 4.1 Innovation step process

The process is divided into six main steps and eleven sub-steps (see Figure 4.2).

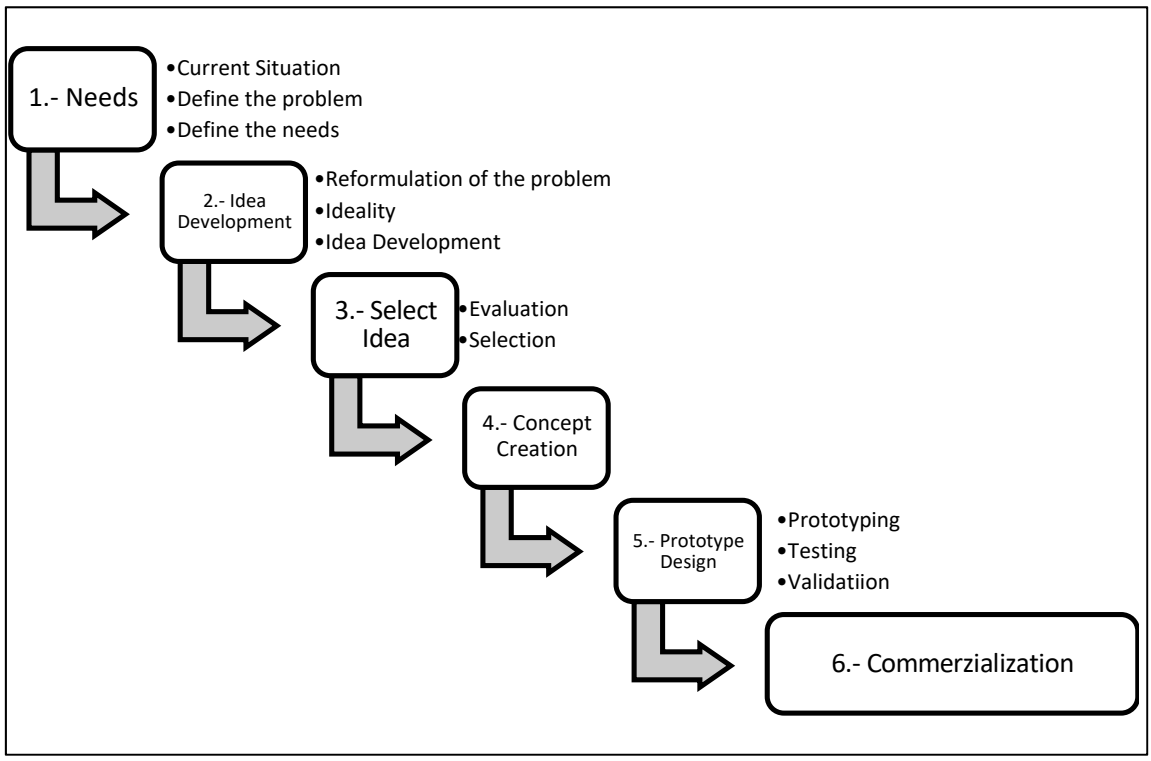

Figure 4.2 Steps

4.1 Innovation Chart Process Tool

Innovation is the process of developing new creative ideas from the invention to be commercialized and increase the organization's value based on its mission and vision through a product or a service.

As seen in the previous chapter, innovation must begin with identifying the problem or need to develop possible solutions with creative ideas, taking into account the mission and vision of the organization to be marketed.

This idea or solution tends to increase in complexity, requiring more creativity to evolve and reveal itself as time goes on. For this reason, the chart helps where the stage in which the project is and the proposals for the development of a suggested method is first identified.

Experts developed these methods, and this research intends to provide an innovative meta-process guideline that can help decide the result of a project, taking various aspects, such as the idea related to organizational objectives. These ideas deliver value to the consumer and tools that can be evaluated to validate their effectiveness (see Figure 4.3).

Innovation Definition					
Step	DEF0 - Function	Item	Why	Description	Subject
0.- Innovation	Input	Needs	Because define what we want to have.	A needs is a problem, opportunity, or constraint with potential value to stakeholders.	Identify the needs.
		Requirements	Because define what we need to have.	Is something that you must do, or something you need have.	Requirements list created
	Control	Organization's goals	Because it visualizes the direction where the organization wants to go by identifying what it wants to achieve.	The organization's goals is to create long-term business value.	The objectives of the organization in the short, medium or long term are related to the needs?
		Benefits	Because shows the improvements for stakeholders of the product or service.	A helpful or good effect, or something intended to help.	List of benefits
	Mechanism	Methods of developing ideas and creativity	Because it seeks to identify how ideas can be developed, defined and improved, using certain tools.	A tool to help you to define, develop, select, and improve the creativity.	Were creative methods used at each stage of the process?
		Commercialization	Because determine how to sell the product or service developed.	Sale the product or service to get revenue.	Was marketing strategy developed?
	Output	Product or service Kickoff	Because expect to have a product or service on time and with success.	It establishes the start of the project, phase or iteration.	Was the product or service launched on time?
		Revenue	Because it generates profits for the organization.	Represents the cash a company generates from each Customer Segment (costs must be subtracted from revenues to create earnings).	Is it generating profits from the product or service launched?

Figure 4.3 Innovation Definition

4.2 Needs Chart Process Tool

- Step 1. Needs: This is a problem, opportunity, or constraint with potential value to stakeholders in a current situation; besides is the first step to follow if we want to develop an idea from the beginning and continue the process of selling this idea to the stakeholders.

Defining the problem or identifying the negative effect will help us understand the customer frustration, develop a product or service that the stakeholders really want to get or really want to do, and explain the benefits of the product or service to sell this solution.

To understand the problem and define the needs, we have to review the data and determine the root cause through observation, using methods like 5W, Knowledge design, Deep knowledge, Qualitative change, and Closed World to get the desired effect but focus on the organization's goals.

The Inputs for defining the needs are: "negative effect," "the problem," and the "initial situation." As described below (see Figure 4.4).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.- Define Needs	Input	Negative Effect	Because they are the actions or situations that we do not want to have.	Are the effect that we do not want in the final result	Was the negative effect found?
		Problem	Because define the gap between systems and needs, requirements or benefits we want to have.	Problems are gaps between requirements and their fulfi lment by systems.	Find the problem
		Initial Situation	Because reach the difference between the current situation and the past situation.	Is the gap between the previus situation and the desired situation. Understand the current situation and the previous one to understand the problem.	Compare current situation against initial situation. (environment-relationship, man-product, man-machine).

Figure 4.4 Define Needs (Input)

The control for defining the needs are the Data, Root cause, Benefits, Organization's goal, Observation, Desired phenomenon and market needs; this control will help us to find the needs (see Figure 4.5).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.- Define Needs	Control	Data	Because it collects all the information related to the problem.	Is the information related to the situation.	Obtain inforamtion related to the initial situation and the current situation.
		Root Cause	Because it analyzes and compares the causes of the problem.	Is the root of the cause to solve the problem from the origin.	Find the root cause that causes the effect undesired.
		Benefits	Because shows the improvements for stakeholders of the product or service.	A helpful or good effect, or something intended to help.	Define the benefits of the initial situation.
		Organization's goals	Because it visualizes the direction where the organization wants to go by identifying what it wants to achieve.	The organization's goals is to create long-term business value.	Organizational objectives are related to the need ?
		Observation	Because it visualizes all the parameters that cause the undesired situation.	Get a deep understanding of the pains/problems possibly occurring in this usage situation, for measuring them (frequency, repeatability, importance, consequences) and carrying out a root cause analysis.	Are the objects and environment problem defined?
		Desired phenomenon	Because identify what we want the system to do.	Is the effect that we wanto to have according to the system.	Is the desired phenomenon possible to achieve?
		Market needs	Because provide the needs of the market.	Outlines market needs and analyzes how well they are served.	Are there more people with the same problem?

Figure 4.5 Define Needs (Control)

To find the needs, we can use tools identified according to the IDEF0 like Closed world (Item 1.2.3), Qualitative change (Item 1.2.2), Existing Solutions (Item 1.3.4), 5-W method (Item 1.1.1), and reframing the problem (Item 1.3.1), from mechanism function (see Figure 4.6).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.- Define Needs	Mechanism	1.2.3.- Closed world	Because the solution elements are within the problem elements.	This method helps to identify the elements of the problem.	Define and list problem elements and formulate the expected action of a good solution.
		1.2.2.- Qualitative change	Because the changes of cause and effect elements neutralize the situation.	Through a graph, helps to neutralize the situation and helps to identify the elements that interact in the problem.	At least one aggravating factor in the problem world is changed to Beneficial or Neutral.
		1.3.4.- Existing solution	Because compare, improve and apply current solutions that already exist in the market.	This method helps to create ideas applying existing solutions or benchmarking helps to observe how other systems are solving the same problem.	Is there a similar solution for the problem? Run and complete a benchmark
		1.1.1.- 5 W method	Because it asks essential questions to decipher a situation.	This method helps to find the root cause of the problem thanks to the question of: What, Where, When, Who, Why and How.	Has the 5 W been completed?
		1.3.1.- Reframing the problem	Because look for unconsidered aspects.	Reformulating the problem helps to confirm that the root cause of the problem has already been found.	Response the question, "for what purpose"

Figure 4.6 Define Needs (Mechanism)

Using these tools, we will find the effect desired (see Figure 4.7).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.- Define Needs	Output	Effect desired	-	Is the effect that we wanto to have according to the system.	Are the Action desired defined?

Figure 4.7 Define Needs (Output)

At detailed, we will have this sub-process that helps us to find the needs; the sub-process is described below.

- 1.1. Current situation: It's the gap between the initial situation and the desired situation caused by a series of uncontrolled elements. To identify these uncontrolled elements, we must have a deep knowledge of the system design and to have this knowledge; we can apply the 5W tool to identify the undesired effect in depth.

The input will be the problem and initial situation (see Figure 4.8).

1.- Needs					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.1.- Current situation	Input	Problem	Because define the gap between systems and needs, requirements or benefits we want to have.	Problems are gaps between requirements and their fulfilment by systems.	Was the problem found?
		Initial situation	Because reach the difference between the current situation and the past situation.	Is the gap between the previus situation and the desired situation.	Compare current situation against initial situation.

Figure 4.8 Current Situation (Input)

For the control, it will be the data, the causes and the observation of the problem, the initial situation or the negative effect (see Figure 4.9).

1.- Needs					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.1.- Current situation	Control	Data	-	Is the information related to the situation.	Obtain inforamtion related to the initial situation and the current situation.
		Causes	-	_	Are the causes identify?
		Observation	Because it visualizes all the parameters that cause the undesired situation.	Get a deep understanding of the pains/problems possibly occurring in this usage situation, for measuring them (frequency, repeatability, importance, consequences) and carrying out a root cause analysis.	Are the objects and environment problem defined?

Figure 4.9 Current Situation (Control)

Mechanism: we can use the 5 W method and knowledge design (see Figure 4.10).

- 1.1.1. 5W 1H: This technique allows you to understand a situation, to discern a problem by analyzing all the aspects. This technique will help us to find the root cause by asking the right questions (What, When, Why, Where, Who, and How);
- 1.1.2. Knowledge design: Identify key knowledge (areas of activity, problems, pains, (non-) users, needs, trends...). This technique helps us to understand the function of the system based on the data and observation.

1.- Needs					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.1.- Current situation	Mechanism	1.1.1.- 5 W method.	Because it asks essential questions to decipher a situation.	This method helps to find the root cause of the problem thanks to the question of: What, Where, When, Who, Why and How.	Run 5 W, What, Where, why, when, who.
		1.1.2.- Knowledge design.	Because describes the functionalities of the design.	Because, the understanding of the design helps us to improve the system and helps to solve the problem.	Identify key knowledge (areas of activity, problems, “pains”, (non-)users, needs, trends...).

Figure 4.10 Current Situation (Mechanism)

Output: Effect undesired; this effect undesired will be our input for defining the problem (see Figure 4.11).

1.- Needs					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.1.- Current situation	Output	Effect undesired	-	Are the effect that we do not want in the final result	Define the effect undesired.

Figure 4.11 Current Situation (Output)

- 1.2. Define the problem: Are the facts or effects undesired that cause pain for the stakeholders. Once identified the root cause and the consequences, we can get the problem in detail thanks to the deep knowledge using qualitative change and the closed world to get an opportunity to improve and thus be able to define the needs of the stakeholders (see Figure 4.12).

1.- Needs					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.2.- Define the problem	Input	Effect undesired	-	Are the effect that we do not want in the final result	Define the effect undesired.
		Negative effect	Because they are the actions or situations that we do not want to have.	Are the effect that we do not want in the final result	Effect negative defined

Figure 4.12 Define the problem (Input)

Control: Our control to find the problem is the root cause; the root cause will provide the control of the effect undesired (see Figure 4.13).

1.- Needs					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.2.- Define the problem	Control	Root Cause	Because it analyzes and compares the causes of the problem.	Is the root of the cause	Find the root cause that causes the effect undesired.
		Consequences	-	Results or effects of whatever nature and order that derive directly or indirectly from referent's existence, occurrence or operation.	Define possible consequences of an existing modification.

Figure 4.13 Define the problem (Control)

The tools that we can use to define the problem are Dee Knowledge, Qualitative change, and Closed World (see Figure 4.14).

- 1.2.1. Deep knowledge: It is the deep knowledge of the problem, of the elements and the effects that are involved in the system of the problem. It feeds on information on the root cause to determine what we are looking for;
- 1.2.2. Qualitative change: This means changing the category of the relation when changing the factor in the problem to a neutral or beneficial factor taking into account the

cause-effect. This method is used when we have the cause and effect identified and, we want to confirm whether the cause-effect is related to each other;

- 1.2.3. Closed World: States that the Closed World of the system in the solution state should be identical to, or entailed in, the Closed World of the system in the problem state. It's the solution inside of the problem; all the elements that cause the problem can cause the solution by themselves.

1.- Needs					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.2.- Define the problem	Mechanism	1.2.1.- Deep knowledge	Because, it collect information and knowledge about the problem or situation.	We need to understand the problem, we need to investigate to have a deep understanding of the system.	Response: What are we looking for? What already exists?
		1.2.2.- Qualitative change	Because the changes of cause and effect elements neutralize the situation.	Through a graph, helps to neutralize the situation and helps to identify the elements that interact in the problem.	At least one aggravating factor in the problem world is changed to Beneficial or Neutral.
		1.2.3.- Closed world	Because, the solution elements are within the problem elements.	Identify the elements of the solution within the problem.	Define and list problem elements and formulate the expected action of a good solution.

Figure 4.14 Define the problem (Mechanism)

When we define the problem, this is the opportunity to change this problem to a solution because we know exactly what the problem is (see Figure 4.15).

1.- Needs					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.2.- Define the problem	Output	Opportunity to Improve	-	–	Identify the pains and try to solve them.

Figure 4.15 Define the problem (Output)

The input for defining the needs is the opportunity to improve because we already know the background of the problem (see Figure 4.16).

- 1.3. Define needs: Is a problem, opportunity, or constraint with potential value to stakeholders in a current situation. Defining the problem or identifying the negative effect will help us to understand the customer frustration according to the user profile to develop

a product or service that the stakeholders want to get or want to do and explain the benefits of the product or service with a benchmark previously set to sell this solution.

To understand the problem and define the needs, we have to review the data, determine the root cause, and reframe the problem through observation. Some methods of research are: 5W, Knowledge design, Deep knowledge, FAST (Function Analysis System Technique) Method, Qualitative change, and Closed World to get the desired effect but focus on the organization's goals.

Step	IDEF0 - Function	Item	Why	Description	Subject
1.3.- Define Needs	Input	Opportunity to improve	-	–	Identify areas for improvement or identify areas of opportunity

Figure 4.16 Define the needs (Input)

As a control for defining the needs, we have the organization's goals. Whether the requirements we want to tackle, are according to the organization's goals and the desired phenomenon, the market needs and the user profile (Gadd, 2011), we can continue developing the idea (see Figure 4.17).

1.- Needs					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.3.- Define Needs	Control	Organization's goals	Because it visualizes the direction where the organization wants to go by identifying what it wants to achieve.	The organization's goals is to create long-term business value.	Organizational objectives are related to the need ?
		Desired phenomenon	-	Is the effect that we wanto to have according to the system.	Define the desired phenomenon, Object A operates the undesirable effect XYZ on object B
		Market needs	-	Outlines market needs and analyzes how well they are served.	Are the markets needs identified?
		User profile	Because it identifies and classifies user needs.	A customer profile is defined by three components: pains, gains and jobs.	Define the user profile

Figure 4.17 Define the needs (Control)

To define the needs of the product or service, we can use some tools like Reframing the problem (Item 1.3.1), Investigation (Item 1.3.2), and FAST Method (Item 1.3.4) described in the next figure (see Figure 4.18).

1.- Needs					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.3.- Define Needs	Mechanism	1.3.1.- Reframing the problem	Because look for unconsidered aspects.	Confirm whether the elements of the problem are the cause of the effect.	Response the question, "for what purpose"
		1.3.2.- Investigation	Because, it collect information and knowledge about the user and marketing.	We need to understand the problem, we need to investigate to have a deep understanding of the system.	Identifies who does what, when, and how
		1.3.3.- FAST method	Because it shows and identifies missing logical relationships between functions.	A technique to develop a graphical representation showing the logical relationships between the functions of a project, product, process or service based on the questions “How” and “Why”.	Define: Why, how, when.
		1.3.4.- Existing solution	Because compare, improve and apply current solutions that already exist in the market.	There is a solution that already exists in the market. This method helps to create ideas applying existing solutions or benchmarking helps to observe how other systems are solving the same problem.	Is there a similar solution for the problem? Run and complete a benchmark

Figure 4.18 Define the needs (Mechanism)

- 1.3.1. Reframing the problem: This method will help us confirm whether the elements of the problem are the cause of the effect;
- 1.3.2. Investigation: Recollected data and understand the data;
- 1.3.3. FAST Method: A technique to develop a graphical representation showing the logical relationships between the functions of a project, product, process or service based on the questions of How and Why. How do you achieve this function? Why do you do this function?

This step it’s focused on the development of the device and how the device could work.

- 1.3.4. Existing solution: There is a solution that already exists in the market. To get a better result, we need to develop a benchmark to review if the answer already exists and how they solve the same problem and have the same trouble but different solutions.

With these methods, our output are the benefits and the effect desired for the stakeholder. These needs will help us find the solution to these needs (see Figure 4.19).

1.- Needs					
Step	IDEF0 - Function	Item	Why	Description	Subject
1.3.- Define Needs	Output	Benefits	Because shows the improvements for stakeholders of the product or service.	A helpful or good effect, or something intended to help.	List the possibles benefits of the needs
		Effect desired	-	Is the effect that we wanto to have according to the system.	List the effect desired.

Figure 4.19 Define the needs (Output)

4.3 Create an idea Chart Process Tool

- Step 2. Create idea: Creating an idea is a process of attacking the needs of the stakeholders; this process occurs when the needs, the root of the problem, and its elements that interact in the cause and effect have been identified.

We must reformulate the problem, and have a deep understanding of the problem, followed by the ideality of what we want the system to do. We can use the following tools: Observation of usage, Closed world, Contradiction, Partition, Unification, Multiplication, Division, Symmetry break, Removal, Brainstorming, and Operation zone, to get a set of ideas.

To create an idea, this process is split into three steps; the first is the reformulation of the problem, the ideality, and finally, the idea development.

Create idea Input: Effect desired previously defined and the elements of the system to work (see Figure 4.20).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.- Create idea	Input	Effect desired	-	Is the effect that we wanto to have according to the system.	Are the Action desired defined?
		Elements	-	Are parts, can include people, hardware, software, facilities, policies and documents; that is, all things required to produce systems - level results.	Objects of the problem and environment of the problem defined

Figure 4.20 Create Idea (Input)

Some controls to develop an idea are the time, the zone of the problem, the consequences, the scope, the observation, and the desired phenomenon. These controls will allow us to propose an idea close that can resolve the problem or the effect negatively (see Figure 4.21).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.- Create idea	Control	Time	Because define when the situation occurs.	Frequency of events, duration of time intervals, order of events in time, value of later or action.	Complete next sentence: at different times, there will be different values for [chosen characteristic] of [chosen item].
		Zone	Because Identify where the problem is.	Solve a problem by turning a symmetrical situation into an asymmetrical one according to the place	Complete next sentences: at different places in [Item] there will be different values for [chosen characteristic].
		Consequences	-	Results or effects of whatever nature and order that derive directly or indirectly from referent's existence, occurrence or operation.	Define possible consequences of an existing modification.
		Scope	-	Define the scope of the idea.	Define to what extent the product or service will be functional.
		Observation	Because it visualizes all the parameters that cause the undesired situation.	Get a deep understanding of the pains/problems possibly occurring in this usage situation, for measuring them (frequency, repeatability, importance, consequences) and carrying out a root cause analysis.	Find the elements to keep in the effect desired
		Desired phenomenon	-	Is the effect that we wanto to have according to the system.	Define the desired phenomenon.

Figure 4.21 Create Idea (Control)

To create and develop a large number of ideas, we can use some methods that experts developed previously; some of these methods are Brainstorming (Item 2.2.7), Observation of usage (Item 2.1.1), Nine Multiscreen method methods (Item 2.3.2), Existing solution (Item

2.3.1), Qualitative change (Item 2.3.5), Closed world (Item 2.1.2), operation zone (Item 2.2.8), TRIZ 40 (Item 2.3.3) and Bucket value (Item 2.3.4), all described below (see Figure 4.22).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.- Create idea	Mechanism	2.2.7.- Brainstorming	Because create a large number of ideas.	A group of people helps to create ideas, based on this method.	Run a brainstorming with boundaries taking into account the elements and effect desireds.
		2.1.1.- Observation of usage	Because it visualizes all the parameters that cause the undesired situation.	Get a deep understanding of the pains/problems possibly occurring in this usage situation, for measuring them (frequency, repeatability, importance, consequences) and carrying out a root cause analysis.	Determine past and present uses, motives, goals, and behaviors of users and interactions with existing solutions, other users, and communities.
		2.3.2.- 9 Multi-screen	Because, compare and explore issues and their potential impacts in time.	Is defined as a method for exploring issues and their potential impacts by examining the past, present, and future of both high-level areas and their related subsections.	Define previous, current and future super system.
		2.3.1.- Existing solution	Because compare, improve and apply current solutions that already exist in the market.	This method helps to create ideas applying existing solutions or benchmarking helps to observe how other systems are solving the same problem.	Develop a benchmark.
		2.3.5.- Qualitative change	Because, the changes of cause and effect elements neutralize the situation.	This method helps to find the relationship between cause and effect.	At least one aggravating factor in the problem world is changed to Beneficial or Neutral.
		2.1.2.- Closed world	Because, the solution elements are within the problem elements.	Identify the elements of the solution within the problem.	Define and list problem elements and formulate the expected action of a good solution.
		2.2.8.- Operation zone	Because, analyze where the problem is with the available resources.	The operative zone is the epicenter of the problem.	Use of available resources and Turn a negative effect into a positive effect.
		2.3.3.- TRIZ 40	Because, gets a hint about the most reasonable solutions.	This method helps to propose solutions with previously determined factors.	Use Methodlogie TRIZ40
		2.3.4.- Value Bucket	Because it classifies the importance of the problem and the value of the solution.	Is an algorithm that combines three dimensions: pains, usage situations (characterized by scenarios) and existing solutions.	Qualifies and quantifies the innovation leads that are worth the effort.

Figure 4.22 Create Idea (Mechanism)

Once the process is developed concerning controls and mechanisms, we will have a lot of ideas and many proposals (see Figure 4.23).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.- Create idea	Output	Large number of ideas	-	–	Define the types of ideas. Funnel idea.

Figure 4.23 Create Idea (Output)

- 2.1. Reformulation of the problem: Confirm whether the elements of the problem are the cause of the effect (see Figure 4.24).

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.1.- Reformulation of the problem	Input	Elements	-	Are parts, can include people, hardware, software, facilities, policies and documents; that is, all things required to produce systems - level results.	Objects of the problem and Environment of the problem defined
		Effect desired	-	Is the effect that we wanto to have according to the system.	List the effect desired.

Figure 4.24 Reformulation of the problem (Input)

The controls for the reformulation of the problem are the root cause, the desired action, time, the consequences, observation, and the Symmetry in space (see Figure 4.25).

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.1.- Reformulation of the problem	Control	Root Cause	Because it analyzes and compares the causes of the problem.	Is the root of the cause	Find the root cause that causes the effect undesired.
		Desired action	-	Is the effect that we wanto to have according to the system.	Prevent object A from acting negatively on object B
		Time	Because define when the situation occurs.	Frequency of events, duration of time intervals, order of events in time, value of later or action.	Complete next sentence: at different times, there will be different values for [chosen characteristic] of [chosen item].
		Consequences	-	Results or effects of whatever nature and order that derive directly or indirectly from referent's existence, occurrence or operation.	Define possible consequences of an existing modification.
		Observation	Because it visualizes all the parameters that cause the undesired situation.	Get a deep understanding of the pains/problems possibly occurring in this usage situation, for measuring them (frequency, repeatability, importance, consequences) and carrying out a root cause analysis.	Are the objects and environment problem defined?
		Symmetry in space	Because Identify where the problem is.	Solve a problem by turning a symmetrical situation into an asymmetrical one. Find the elements of the problem according to the place.	Complete next sentences: at different places in [Item] there will be different values for [chosen characteristic].

Figure 4.25 Reformulation of the problem (Control)

The mechanism and tools for the reformulation of the problems are:

- 2.1.1. Observation of usage: Get a deep understanding of the pains/problems possibly occurring in this usage situation for measuring them (frequency, repeatability, importance, consequences) and carrying out a root cause analysis;
- 2.1.2. Closed world: States that the Closed World of the system in the solution state should be identical to, or entailed in, the Closed World of the system in the problem state. The solution inside of the problem, all the elements that cause the situation, may cause the answer by themselves;
- 2.1.3. Contradiction: Defined as a situation that emerges when two opposing demands have to be met to provide the results required, this method helps confirm whether the elements of the problem are the cause or effect (see Figure 4.26).

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.1.- Reformulation of the problem	Mechanism	2.1.1.- Observation of usage	Because it visualizes all the parameters that cause the undesired situation.	Get a deep understanding of the pains/problems possibly occurring in this usage situation, for measuring them (frequency, repeatability, importance, consequences) and carrying out a root cause analysis.	Determine past and present uses, motives, goals, and behaviors of users and interactions with existing solutions, other users, and communities.
		2.1.2.- Closed world	Because, the solution elements are within the problem elements.	States that the Closed World of the system in the solution state should be identical to, or entailed in, the Closed World of the system in the problem state.	Define and list problem elements and formulate the expected action of a good solution.
		2.1.3.- Contradiction	Because it discovers critical aspects used in patents to solve similar problems.	Find the elements of the problem, Administrative, Technical, Physical.	Build Contradiction Matrix, Technical contradiction, Adminstrative Contradiction

Figure 4.26 Reformulation of the problem (Mechanism)

Whit these tools will help us find a specific problem (see Figure 4.27).

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.1.- Reformulation of the problem	Output	Specific problem	-	_	Problem defined

Figure 4.27 Reformulation of the problem (Output)

Once we have the specific problem, we can continue developing an ideality, transforming it from a particular situation to something that we want to have or a system that we want to do.

- 2.2. Ideality: It helps us define how we want the system to work (see Figure 4.28).

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.2.- Ideality	Input	Specific problem	-	_	Problem defined

Figure 4.28 Ideality (Input)

The controls that will help us develop this ideal system are the "Needs of the market," speaking of the market trend, as well as the "Desired Phenomenon," the "Known object," and the "Main

useful function" with this, we can unite these strategies to focus them on the needs of the market so that they can be marketed.

Likewise, it helps us develop proposals for positive effects, consider known objects and improve them, and develop recommendations with the main functions that add value to the stakeholder (see Figure 4.29).

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.2.- Ideality	Control	Market needs	Because we need to be focused on what the customer wants to have.	Outlines market needs and analyzes how well they are served.	According to the market needs work with the ideality
		Desired phenomenon	-	Is the effect that we wanto to have according to the system.	Object A operates the undesirable effect XYZ on object B
		Object known	-	_	The concept refers to a set of solutions known, whose performance is also known.
		Main useful function	-	_	Is a ability to improve the well-being of humans to reduce their pains and to meet their expectations in different situations.

Figure 4.29 Ideality (Control)

Some methods that will help us to define the ideality and allow us to find the solutions are:

- 2.2.1. Partition: Is a partition that makes use of these identifying properties of the known object or is compatible with them. Main elements: Object know and object unknow;
- 2.2.2. Unification: Solve a problem by assigning a new user to an existing component;
- 2.2.3. Multiplication: Solve a problem by introducing a modified copy of an existing object into the current system;
- 2.2.4. Division: Solve a problem by dividing an object and reorganizing its parts;
- 2.2.5. Symmetry break: Solve a problem by turning an asymmetrical situation into an asymmetrical one;
- 2.2.6. Removal: Solve a problem by removing an object from the system;
- 2.2.7. Brainstorming: This activity will help you produce a large number of ideas;

- 2.2.8. Operation zone: Is the entire set of components of a system and its environment that are directly related to a contradiction. The operative zone is the epicenter of the problem (see Figure 4.30).

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.2.- Ideality	Mechanism	2.2.1.- Partition	Because expand the options to determine a solution.	Is a partition that makes use of these "identifying" properties of the known object or is compatible with them.	Specify the concept while preserving its conceptual identity, adding unexpected attributes
		2.2.2.- Unification	Because connect elements of the system that were previously disconnected.	Match elements to solve problems.	Create the sentence: (The selected object)will (Desired Action).
		2.2.3.- Multiplication	Because find a solution to the system by incrementing the object of the system itself.	Solve the problem with the same elements of the problem.	Create the sentence: An object of the same type as [object] will [Desired Action]
		2.2.4.- Division	Because divide the elements of the problem.	Solve a problem by dividing an object and reorganizing it parts.	Create: [Object] will be divided into [List of parts] and will be rearranged in time or space
		2.2.5.- Breaking symmetry	Select symmetrical objects, to change them to asymmetrical objects.	Solve a problem by turning a symmetrical situation into an asymmetrical one.	Define: Symmetry in Time, Symmetry in Space, Symmetry of group
		2.2.6.- Suppression	Becuase remove an object from the system and then searching for an alternative.	Solve a problem by removing an object from the system.	Create the sentences: [Item x] will be removed from the Problem World, which will prevent [harmful action]
		2.2.7.- Brainstorming	Because create a large number of ideas.	Is an activity that will help you generate more innovative ideas quickly.	Generate many alternative ideas
		2.2.8.- Operation zone	Because, analyze where the problem is with the available resources.	The operative zone is the epicenter of the problem.	Define the use of available resources, Turn a negative effect into a positive effect.

Figure 4.30 Ideality (Mechanism)

The result of these methods is the generic interpretation of the solution, but it will help us refine the idea and possible solutions (see Figure 4.31).

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.2.- Ideality	Output	Generic Interpretation	-	_	Define generic ideas

Figure 4.31 Ideality (Output)

- 2.3. Idea development: This is the process of developing an idea based on the identified elements, tackling the undesired effect and providing desired features as it's described in the next figure (see Figure 4.32).

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.3.- Idea Development	Input	Generic Interpretation	-	_	Define generic ideas

Figure 4.32 Idea Development (Input)

As seen in the previous chapter, the control that we need to take into account to develop an idea is that we need to build the ideas according to the company's values, specifications, and scope of the product or service (see Figure 4.33).

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.3.- Idea Development	Control	Company's value	-	Is the worth, importance, or usefulness of somthing.	Characteristic that makes the company different
		Specifications	-	These are the technical, administrative and physical requirements.	Details and characteristics for the operation of the product or service
		Scope	-	_	To what extent the product or service will be functional.

Figure 4.33 Idea Development (Control)

Some methods and techniques that will help us to develop the ideas are Existing solutions, Nine multi-screen, TRIZ, Value Bucket and Qualitative Change (see Figure 4.34).

- 2.3.1. Existing solution: There is a solution that already exists in the market. To get a better result, we need to develop a benchmark to review if the answer already exists and how they solve the same problem and have the same problem but a different solution;
- 2.3.2. Nine multi-screen methods: It is defined as a method for exploring issues and their potential impacts by examining high-level areas' past, present, and future and their related subsections;
- 2.3.3. TRIZ 40: The TRIZ is a powerful tool that helps brings the insight of years of technological development to your Six Sigma project. Based on the elements and pains of customers, we need to define the three types of contradictions, and this tool is useful when the elements are already identified;

- 2.3.4. Value bucket: Is an algorithm that combines three dimensions: pains, usage situations (characterized by scenarios) and existing solutions. This tool helps to identify the painful usage situations where the current solutions are not at all or not effective enough or satisfactory;
- 2.3.5. Qualitative change: This means changing the category of the relation when changing the factor in the problem to neutral or beneficial. We are taking into account the Cause-Effect. This method is used when we have the cause and effect identified and we want to confirm whether the cause-effect is related to each other.

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.3.- Idea Development	Mechanism	2.3.1.- Existing solution	Because compare, improve and apply current solutions that already exist in the market.	This method helps to create ideas applying existing solutions or benchmarking helps to observe how other systems are solving the same problem.	Is there a similar solution for the problem? Run and complete a benchmark
		2.3.2.- 9 Multi-screen method	Because, compare and explore issues and their potential impacts in time.	Is defined as a method for exploring issues and their potential impacts by examining the past, present, and future of both high-level areas and their related subsections.	Define previous, current and future super system.
		2.3.3.- TRIZ 40	Because, gets a hint about the most reasonable solutions.	This method helps to propose solutions with previously determined factors.	Find possible solution using TRIZ 40 Matrix
		2.3.4.- Value bucket	Because it classifies the importance of the problem and the value of the solution.	Is an algorithm that combines three dimensions: pains, usage situations (characterized by scenarios) and existing solutions.	Qualifies and quantifies the innovation leads that are worth the effort.
		2.3.5.- Qualitative change	Because the changes of cause and effect elements neutralize the situation.	This method helps to find the relationship between cause and effect.	At least one aggravating factor in the problem world is changed to Beneficial or Neutral.

Figure 4.34 Idea Development (Mechanism)

As a result of using these methods, we will have positive effects and a large number of ideas (see Figure 4.35).

2.- Create idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
2.3.- Idea Development	Output	Positive effect	-	Are the effect that we want in the final result	List the positive effects.
		Large number of ideas	-	_	Create a general idea

Figure 4.35 Idea Development (Output)

4.4 Select idea Chart Process Tool

- Step 3. Select idea: Once the set of ideas has been obtained, the next step is to select the idea that provides the most value. This idea must be controlled by the user profile, the company's objectives, the company vision, the time to develop, and the cost and resources that they will need to develop this idea.

This idea selection is very important since it will demand resources, and we have to optimize resources; we have to evaluate the idea with respect to the impact on the market, as well as the value to the client.

We can use the following tools: Action parameter, Solution world, UNPC Monitor, SAPIGE, DSM, Ambition Perimeter Innovation classification, System by points, and Condition of qualitative change (see Figure 4.36).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.- Select Idea	Input	Large number of ideas	-	–	Define the types of ideas. Funnel idea.

Figure 4.36 Select Idea (Input)

The controls that will help to select the idea are the Desired Action, Action parameter, Number of subsystems or components, Customer value, cost, time, Company’s Vision, User Profile, Ideal goal, etc. (see Figure 4.37).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.- Select Idea	Control	Rules	-	_	Does the general idea achieve the rules of the product or service?
		Desired Action	-	Is the effect that we wanto to have according to the system.	Does the general idea achieve the desired action? Prevent object A from acting negatively on object B
		Action parameter	Because, decide when to use a proposed function, depending on the desired action.	A change being made or a 'doing word'	Does the idea has advantages to the object?
		Define number of subsystem or components	-	The term Product or System is very broadly defined and can represent many things.	Define the number of subsystem:
		Customer Value	-	Offer a sustainably differentiated solution for strong, unmet customer needs.	Does the general idea has a utility that can be generated by improving this activity or by its result (compared to current practice and best practices in its class).?
		Dimension	-	Dimension of the system.	Define whether the system is huge or tiny.
		Time	Because define when the situation occurs.	Frequency of events, duration of time intervals, order of events in time, value of later or action.	Define when the general idea operates
		Cost	-	_	Define wether the system of the general idea has a zero cost or is very high
		Organization Value	-	Is the worth, importance, or usefulness of somthing.	The general idea is related to organizational values
		Company's Vision	-	A summarized, high-level description about the expectations for a product or service such as target market, users, major benefits, and what differentiates the product from other in the market.	The general idea is related to company's vision.
		Identified Value	-	Select a customer segment that you want to profile.	Complete next sentence: Our **(produc)** helps **(customer segment)** who wants to **(jobs to be done)** by reducing **(customer pain)** and increasing **(customer gain)**, unlike **(competiting value proposition)**.
		Innovation classification.	Because it orders the category of the idea according to its impact on the user.	Determine the innovation classification, radical (really change the scenery), disruptive (scalable movement that reaches many people at the same time.) or incremental (adding something new).	Define the classification of the innovation.
		User profile	Because it identifies and classifies user needs.	A customer profile is defined by three components: pains, gains and jobs. It is necessary to understand the user profile to provide benefits.	Does the general idea achieve with the user profile?
		Ideal goal	-	Goals can have a window of 5–30 years. Objectives are long- or short-term activities or actions necessary to attain the goals.	Does the general idea is related to the ideal goal ?
		MoSCoW (Must-have, Should-have, Could-have, Won't- have)	Because it prioritizes the needs of the user.	Is used to prioritize each capability.	Define what factors of MoSCoW applies for the general idea.

Figure 4.37 Select Idea (Control)

Some mechanisms that we can use to select the idea are the UNPC method, ambition perimeter, qualitative change, and DSM change (see Figure 4.38).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.- Select Idea	Mechanism	3.1.1 Solution World	Because the solution is within the problem.	Objects that exist in the solution state.	Define the solution of the general idea.
		3.1.2.- UNPC Monitor tool	Because it asses the maturity and value of ideas in order to make decisions.	It helps to asses which idea or solution has more value according to its Usefulness, Newness, Profitability and concept.	Define wether the general idea is Usefulness – Newness – Profitability – Concept.
		3.1.4.- Ambition perimeter	Because provide a visualization of the situation.	Helps determine the big picture of the problem and the solution.	Define the potential for users, overall coherence and strategic importance for the company.
		3.2.2.- Qualitative change	Because the changes of cause and effect elements neutralize the situation.	Through a graph, helps to neutralize the situation and helps to identify the elements that interact in the problem.	At least one aggravating factor in the problem world is changed to Beneficial or Neutral.
		3.1.3.- DSM Methodology	Because highlight important patterns in complex process data.	Helps to evaluate the idea thanks to a matrix.	Choose the higher value.

Figure 4.38 Select Idea (Mechanism)

Finally, our Output will be the best solution (see Figure 4.39).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.- Select Idea	Output	Best Solution	-	The selection of ideas in the convergent part and the monitoring of idea maturities are aided by the so-called UNPC monitor tool.	Best Idea.

Figure 4.39 Select Idea (Output)

- 3.1. Evaluation: It is a process to determine, in a systematic way, the merit, value or meaning of a work (see Figure 4.40).

3.-Select idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.1.- Evaluation	Input	Large number of ideas	-	_	Create a general idea

Figure 4.40 Evaluation (Input)

The control to select and evaluate are related to the market needs, the customer values, the desired action, the rules and the company's value (see Figure 4.41).

3.-Select idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.1.- Evaluation	Control	Market impact	-	_	According to the market needs evaluate the best idea
		Customer value	-	Offer a sustainably differentiated solution for strong, unmet customer needs	Does the general idea has a utility that can be generated by improving this activity or by its result (compared to current practice and best practices in its class).?
		Desired action	-	Is the effect that we wanto to have according to the system.	Does the general idea achieve the desired action? Prevent object A from acting negatively on object B
		Company's value	-	Is the worth, importance, or usefulness of something.	Characteristic that makes the company different
		Rules	-	_	Does the general idea achieve the rules of the product or service?

Figure 4.41 Evaluation (Control)

These tools will help to evaluate the idea (see Figure 4.42).

- 3.1.1. Solution World: The modified unified set of System Objects and Neighboring;
- 3.1.2. UNPC Monitor tool: Provide clear and efficient guidance for better decision-making in innovating for the elderly, taking the criteria of Usefulness, Newness, Profitability and Concept;
- 3.1.3. DSM methodology: This highly flexible networking and modelling method allow engineers, designers, business analysts, and business/project managers in many industries and application fields to gain insights into the structure of complex systems and processes;
- 3.1.4. Ambition perimeter: Important usage situations where significant problems are experienced, and the current solutions provide little or no relief.

3.-Select idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.1.- Evaluation	Mechanism	3.1.1.- Solution World	Because the solution is within the problem.	Objects that exist in the solution state.	Does the general idea solve the problem?
		3.1.2.- UNPC Monitor tool	Because it asses the maturity and value of ideas in order to make decisions.	It helps to asses which idea or solution has more value according to its Usefulness, Newness, Profitability and concept.	Define wether the general idea is Usefulness – Newness – Profitability – Concept.
		3.1.3.- DSM method	Because highlight important patterns in complex process data.	Helps to evaluate the idea thanks to a matrix.	Choose the higher value.
		3.1.4.- Ambition perimeter	Because provide a visualization of the situation.	Helps determine the big picture of the problem and the solution.	Define the potential for users, overall coherence and strategic importance for the company.

Figure 4.42 Evaluation (Mechanism)

The result of the evaluation process is a number or grade, this result helps to choose the best idea (see Figure 4.43).

3.-Select idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.1.- Evaluation	Output	Grade	-	_	Higher Grade

Figure 4.43 Evaluation (Output)

- 3.2. Selection: In this step, the goal is to pick up an idea with more scores. This stage is crucial because it will be the stage where more resources will begin to be allocated for the development of the proposal and be an important decision regarding the organizational objectives and the benefits for the stakeholder (see Figure 4.44).

3.-Select idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.2.- Selection	Input	Grade	-	_	Higher Grade

Figure 4.44 Selection (Input)

The control to select the idea is the company's value, the specifications required and achieved, the resources available to develop the solution, the activity field regarding the company, and the cost and time to develop the idea.

The innovation classification or the impact of the innovation, this classification also helps to decide how much we want to impact, taking into account the customer profile, the ideal goal, the number of subsystems or components, if we can solve many problems with low systems will be the best way to handle the problem.

And finally MoScoW, (Must have, should have, Could have and Won't have), this decision helps us to don't overdesign the product or service (see Figure 4.45).

3.-Select idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.2.- Selection	Control	Company's value	-	Is the worth, importance, or usefulness of somthing.	Characteristic that makes the company different
		Specifications	-	These are the technical, administrative and physical requirements.	List of specifications requireds, legal, financial, rules.
		Available Resources	-	Is the resources to develope something	List the resources available to develop the idea
		Activity field	-	Is focused on leveraging research and development to bring new products and services to market	Does the idea is related to the company field ?
		Cost & time	-	–	According to cost and time select the idea.
		Innovation classification	Because it gives priority to the idea that can have the greatest impact on the client and the market.	Determine the innovation classification, radical (really change the scenery), disruptive (scalable movement that reaches many people at the same time.) or incremental (adding something new).	Define the classification of the innovation.
		Customer profile	Because it identifies and classifies user needs.	At this stage of the process, knowing the user's profile helps to select the best idea.	According to the customer profile select the idea
		Ideal Goal	-	Goals can have a window of 5–30 years. Objectives are long- or short-term activities or actions necessary to attain the goals.	According to the ideal goal select the idea
		Define number of subsystem or components	-	The term Product or System is very broadly defined and can represent many things: whole technologies or the environments – the super-systems (such as a road), the whole system (such as a car) or just one of the components, a sub-system, such as a tyre.	According to the number of subsystem materials, processes, software, human-machine interfaces. Select the easy to teach and easy to learn.
		MoSCoW (Must-have, Should-have, Could-have, Won't- have)	Because it prioritizes the needs of the user.	Is used to prioritize each capability.	Define what factors of MoSCoW applies for the general idea.

Figure 4.45 Selection (Control)

To develop the selection, we need to consider a system by points the highest one using the next methods (see Figure 4.46).

- 3.2.1. System by points: Using UNPC and SAPIGE, we can determine more issues;
- 3.2.2. Condition of qualitative change: This means changing the category of the relation when changing the factor in the problem to a neutral or beneficial factor.

We are taking into account the Cause-Effect. This method is used when we have the cause and effect identified and we want to confirm whether the cause-effect is related to each other. It helps to verify how effective the idea is based on cause-effect.

3.-Select idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.2.- Selection	Mechanism	3.2.1.- System by points	Bacause Categorize the best idea.	Using UNPC, DSM we can determine how has more points. Helps to evaluate the idea.	Run UNPC, DSM method
		3.2.2.- Qualitative change	Because the changes of cause and effect elements neutralize the situation.	Means changing the category of the relation. This method helps to find the relationship between cause and effect. Through a graph, helps to neutralize the situation and helps to identify the elements that interact in the problem.	At least one aggravating factor in the problem world is changed to Beneficial or Neutral.

Figure 4.46 Selection (Mechanism)

As a result of this activity, we will have an idea with the highest score, which will make it easy for us to choose the best one (see Figure 4.47).

3.-Select idea					
Step	IDEF0 - Function	Item	Why	Description	Subject
3.2.- Selection	Output	Results	-	_	Higher value
		Best Solution	-	_	Best Idea.

Figure 4.47 Selection (Output)

4.5 Concept creation Chart Process Tool

- Step 4. Concept creation: It is the proposal or set of proposals without meaning deep knowledge about the functions, specifications or details of the system, but to express qualifying properties based on specific ideas to identify the number of systems and components to build a prototype based on these characteristics (see Figure 4.48).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
4.- Concept Creation	Input	Best Solution	-	The selection of ideas in the convergent part and the monitoring of idea maturities are aided by the so-called UNPC monitor tool.	Best Idea.

Figure 4.48 Concept Creation (Input)

Our control to develop the concept will be the knowledge of the user profile, the number of subsystems or components, the result of the neutral factor and finally, the idea or the proposal of ideas (see Figure 4.49).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
4.- Concept Creation	Control	Define number of subsystem or components.	-	The term Product or System is very broadly defined and can represent many things.	Based on the best idea, create a sybsystem of: material, process, software, human-manchine interfaces.
		User profile	Because it identifies and classifies user needs.	A customer profile is defined by three components: pains, gains and jobs.	Based on the best idea, create the concept according to the user profile
		Neutral Factor	-	Factor that counteracts the consequences.	Create the concept to confirm the neutral factor.
		Concept	-	Is proposition, or a group of propositions that have no logical status in Knowledge	Create the concept based on the best idea.

Figure 4.49 Concept Creation (Control)

The mechanism for these steps we can use for the concept creation is described below (see Figure 4.50).

- 4.1. Little smart people: These are tiny imaginary beings representing the different elements of the problem we are trying to understand and solve. This method helps create the concept, imagining how the main functions have to work;
- 4.2. 4 Law of evolution (Law of the evolution of the growth of the ideality): All types of systems strive to increase their effectiveness ("ideality") in the span of their life cycle;
- 4.3. Conjunction: It means that we have reached a concept characterized by a sufficient number of propositions that can be established as true or false;
- 4.4. 9 Multi-screen methods: It is defined as a method for exploring issues and their potential impacts by examining high-level areas' past, present, and future and their related subsections;
- 4.5. DTC operator: This model is used to successively take changes in the conditions of the task into consideration that depend on three parameters: geometric dimensions - D, time - T, cost - C. this method. This method aims to consider the time, cost and size of the development of the concept, and the prototype does not use many resources;
- 4.6. Ideality: All types of systems strive to increase their effectiveness ("ideality") in their life cycle;
- 4.7. 5 Law of evolution (Law of the uneven development of a system's parts): The object to be improved and its system environment.

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
4.- Concept Creation	Mechanism	4.1.- Little Smart people	Because, It explains the conflict that exists in a problematic situation, through "small people with superpowers" for a better understanding.	Are imaginary tiny beings who represent the different elements of the problem we are trying to understand and solve. Break down the system into smaller parts or at micro level for a better understanding.	Use little smart people method to create the concept, and how the concpet will works.
		4.2.- 4 Law of evolution (Law of the evolution of the growth of the ideality).	Because, increases the value of what we really want.	All types of systems strive to increase their effectiveness ("ideality") in the span of their life cycle.	Evaluate the relationship between yields and consumption.
		4.3.- Conjunction	Because create concepts, based on the knolwdge.	This method helps to put all the knowledge you use or need to imagine or design new concepts.	From unknown to know.
		4.4.- 9 Multi-screen	Because, compare and explore issues and their potential impacts in time.	Is defined as a method for exploring issues and their potential impacts by examining the past, present, and future of both high-level areas and their related subsections.	Create the list of the current, past and future analysis of the service or product.
		4.5.- DTC operator	Because identify and change the parameters of the Dimension, Time and cost of a system.	This model is used to successively take changes in the conditions of the task into consideration that depend on three parameters: geometric dimensions - D, time - T, cost - C.	Develop the Dimension, Cost and Time Analysis of the concept.
		4.6.- Ideality	Because identify and explains what they really want.	Helps to the systems improve over time by providing more benefits with fewer inputs/costs and resulting in fewer harms.	Develop law of increasing degree of ideality.
		4.7.- 5 Law of evolution (Law of the varying development of a system's parts).	Because it generates new contradictions to develop a system.	The object to be improved and its system environment. Develop a concept with more systems.	Is each part at its best technological development compared to the others?.

Figure 4.50 Conception Creation (Mechanism)

The concept will help us to create a prototype to validate and test the idea (see Figure 4.51).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
4.- Concept Creation	Output	Concept	-	Is proposition, or a group of propositions that have no logical status in Knowledge	Create the concept based on the best idea.

Figure 4.51 Concept Creation (Output)

4.6 Prototype Design Chart Process Tool

- Step 5 Prototype: A prototype is the first sample, or first model proposal, based on a concept, taking into account the main characteristics of its operation, such as technical and administrative specifications, as well as technical requirements and benefits.

Prototype design helps to identify areas for improvement, to confirm the operation and the desired effect for a need, thanks to the tools 9 Multi-screen, DTC operator, Testing Validation, Learning, 6 Law of evolution (Law of the transition into a super- system), 7 Law of evolution (Law of the transition from a macro-level to a micro-level), 8 Law of evolution (dynamization), and Kano analysis.

As a result, it is the development of the MVP to test and validate it, so it can be ready for commercialization (see Figure 4.52).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.- Prototype Design	Input	Concept	-	Is proposition, or a group of propositions that have no logical status in Knowledge	Create the concept based on the best idea.

Figure 4.52 Prototype Design (Input)

Some of the controls to develop this prototype is the Specification, the neutral factor, beneficial factor, technical requirements, functions, etc. (see Figure 4.53).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.- Prototype Design	Control	Specifications	-	These are the technical, administrative and physical requirements.	List of specifications requireds, legal, financial, rules.
		Neutral Factor	-	Factor that counteracts the consequences.	Create the prototype according to the neutral factor.
		Beneficial Factor	-	A good output which fulfi ls a need only describes what we want – offers no solutions	Create the prototype according to the benefical factor.
		Available resources	-	Is the resources to develope something	Create the prototype according to the available resoruces.
		Positive effect	-	Are the effect that we want in the final result	Create the prototype according to the Positive effect.
		Administrative contradiction	'Becuase define how resolve the problem	The situation is described using a reference to the inadequacies that should be addressed or to the goals that should be reached.	Answer: I know what, but I don't know how!
		Physical Contradiction	'Because define which means.	The situation is described using a reference to the physical property of an element or of the entire system in which one value of this property is necessary to achieve one certain function of the system while another value is necessary to achieve another.	Answer: I know what and how, but I don't know by which means!
		Technical requirements	-	Are the technical issues that must be considered to successfully complete a project.	Create the prototype according to the technical requirements.
		System requirements	-	Are the requirements of the functions, and systems	Create the prototype according to the system requirements.
		Functions	-	Are the ways we get the outcomes.	Create the prototype according to the functions.

Figure 4.53 Prototype Design (Control)

The methods that will help us to develop the prototype are the nine-screen method, DTC operator, Testing, Validation, Learning, and the law of evolution (see Figure 4.54).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.- Prototype Design	Mechanism	5.1.1.- 9 Multi-screen method	Because, compare and explore issues and their potential impacts in time.	Is defined as a method for exploring issues and their potential impacts by examining the past, present, and future of both high-level areas and their related subsections.	Create the list of the current, past and future analysis of the service or product.
		5.2.2.- DTC operator	Because identify and change the parameters of the Dimension, Time and cost of a system.	This model is used to successively take changes in the conditions of the task into consideration that depend on three parameters: geometric dimensions - D, time - T, cost - C.	Develop the Dimension, Cost and Time Analysis of the prototype.
		5.2.- Testing	Because it inspects the proposed solution.	Is the action of play the problems in an environment controlled to confirm that the proposal can solve these problems.	Test the prototype according to the rules and specifications.
		5.3.- Validation	Becuase it closes the gap between the problem and solution.	It is the action of confirming a desired action under certain parameters, and having a correlation between what we want and what we have	Validate the prototype according to the rules and specifications.
		5.2.3.- Learning	Because collect data from the validation and from testing to improve the system.	Get information and learn from this information	List the issues found in the testing and validation and resolve it.
		5.1.2.- 6 Law of evolution (Law of the transition into a super-system).	Because develop the transtion to super system.	Use this when the system is already defined and we need to create poly-systems	Has the system exhausted its developement ressources (it it at the end of its life)?
		5.1.3.- 7 Law of evolution (Law of the transition from a macro-level to a micro-level).	Because it transfers functionality to the micro level.	The development of the working bodies of technical systems occurs initially at the macro-level, but at the micro-level in a developed system.	Has the system (including the working unit), in its current technological condition, exhausted its development resources?
		5.1.4.- 8 Law of evolution (dynamization and controllability).	Because it transforms a rigid system into a flexible system and makes it controllable.	Make an object (or its parts) moveable, optimize the characteristics of the process (of an object) in every stage.	Does the system of dynamism promote the optimization of the functionality of the service or product?
		5.1.5.- Kano analysis	Because measure customer satisfaction through feedback from surveys.	We need to get feedback from the customers to improve our system.	Define perceived attributes of product or service performance with customer preference categories.

Figure 4.54 Prototype Design (Mechanism)

The output from this process is to get the first sample or the MVP to start with the commercialization and for the market campaign (see Figure 4.55).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.- Prototype Design	Output	MVP (Minimun Vialable Product)	-	Is essentially the product with the minimum number of features that a customer will pay for.	Define the MVP to confirm the idea and market needs.

Figure 4.55 Prototype Design (Output)

The process of this prototype is split into prototyping design, testing and validation.

- 5.1. Prototyping is the act of developing the first example or first model proposal under certain conditions and characteristics (see Figure 4.56).

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.1.- Prototyping	Input	Concept	-	Is proposition, or a group of propositions that have no logical status in Knowledge	Create the concept based on the best idea.

Figure 4.56 Prototyping (Input)

To control the design of the prototype, we need to consider the specifications, the available resources, technical requirements, and the main functions (see Figure 4.57).

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.1.- Prototyping	Control	Specifications	-	These are the technical, administrative and physical requirements.	List of specifications requireds, legal, financial, rules.
		Neutral factor	-	Factor that counteracts the consequences.	Create the concept to confirm the neutral factor.
		Benefical factor	-	A good output which fulfi ls a need only describes what we want – offers no solutions	Factors that improve the situation
		Available resources	-	Is the resources to develope something	List the resources available to develop the prototype
		Positive effect	-	Are the effect that we want in the final result	List of positive effects
		Administrative contradiction	Becuase define how resolve the problem	The situation is described using a reference to the inadequacies that should be addressed or to the goals that should be reached.	Answer: I know what, but I don't know how!
		Physical contradiction	Because define which means.	The situation is described using a reference to the physical property of an element or of the entire system in which one value of this property is necessary to achieve one certain function of the system while another value is necessary to achieve another.	Answer: I know what and how, but I don't know by which means!
		Technical contradiction	Because the improvement of a parameter, worsens another parameter.	The situation is described using a reference to the incompatible functions or functional properties of the system of which one of the these facilitates the useful primary function of the entire system.	I know how, but if I do it, something else is worsening.
		Technical requirements	-	Are the technical issues that must be considered to successfully complete a project. These can include aspects such as performance, reliability, and availability.	Create the prototype according to the technical requirements.
		System requirements	-	Are the requirements of the functions, and systems	Create the prototype according to the system requirements.
		Functions	-	Are the ways we get the outcomes.	Create the prototype according to the functions.

Figure 4.57 Prototyping (Control)

To create the prototype design, we can use some tools like 5.1.1. Nine multi-screen method: is defined as a method for exploring issues and their potential impacts by examining the past, present, and future of both high-level areas and their related subsections (see Figure 4.58).

- 5.1.2. 6 Law of evolution (Law of the transition into a super-system): As soon as a system has exhausted its developmental possibilities, it will be included in a super-system as one of its parts;

- 5.1.3. 7 Law of evolution (Law of the transition from a macro-level to a micro-level): The development of the working bodies of technical systems occurs initially at the macro-level but at the micro-level in a developed system;
- 5.1.4. 8 Law of evolution (dynamization): Make an object (or its parts) moveable, and optimize the characteristics of the process (of an object) in every stage;
- 5.1.5. Kano analysis: This is a simple-looking tool that has grave implications in the field of quality management. In this part of the process is important to create a Kano analysis to review the customer requirements and focus the prototype on these requirements;

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.1.- Prototyping	Mechanism	5.1.1.- 9 Multi-screen method	Because, compare and explore issues and their potential impacts in time.	Is defined as a method for exploring issues and their potential impacts by examining the past, present, and future of both high-level areas and their related subsections. This technique is used to ensure that companies change and evolve without relying on past tactics.	Define previous, current and future super system.
		5.1.2.- 6 Law of evolution (Law of the transition into a super-system).	Because develop the transtion to super system.	As soon as a system has exhausted its developmental possibilities, it will be included in a super-system as one of its parts. Use this when the system is already defined and we need to create poly-systems	Has the system exhausted its developement ressources (it it at the end of its life)?
		5.1.3.- 7 Law of evolution (Law of the transition from a macro-level to a micro-level).	Because it transfers functionality to the micro level.	The development of the working bodies of technical systems occurs initially at the macro-level, but at the micro-level in a developed system.	Has the system (including the working unit), in its current technological condition, exhausted its development resources?
		5.1.4.- 8 Law of evolution (dynamization).	Because it transforms a rigid system into a flexible system and makes it controllable.	Make an object (or its parts) moveable, optimize the characteristics of the process (of an object) in every stage.	Does the system of dynamism promote the optimization of the functionality of the service or product?
		5.1.5.- Kano analysis	Because measure customer satisfaction through feedback from surveys.	Is a simple looking tool that has grave implications of the field of quality management. We need to get feedback from the customers to improve our system.	Define perceived attributes of product or service performance with customer preference categories

Figure 4.58 Prototyping (Mechanism)

As a result of this process, we will have a product or service close to reality. With this prototype, we can start running some tests and some validation. This product will help us to provide information (see Figure 4.59).

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.1.- Prototyping	Output	Product/service	-	_	Prototype

Figure 4.59 Prototyping (Output)

The next step is the testing of the product or service to do this is necessary to set a similar environment.

- 5.2. Testing: This is the action of playing the problems in an environment controlled to confirm that the proposal can solve these problems (see Figure 4.60).

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.2.- Testing	Input	Product/Service	-	_	Prototype

Figure 4.60 Testing (Input)

The control for the testing is the main function and the parameters of the product, simulating a real situation of how the product will work (see Figure 4.61).

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.2.- Testing	Control	Main functions	-	Are the ways we get the outcomes.	Test the main functions of the prototype
		Parameters	-	_	Test the prototype according to the parameters

Figure 4.61 Testing (Control)

The methods that we can develop for the prototype (see Figure 4.62).

- 5.2.1. Environment: Environment refers to the similarity of how the system will work under certain conditions and replicate them. It is necessary to define this operating environment so that the prototype works as expected in real life.

It helps to identify and find failures in the system before launching the product or service.

- 5.2.2. DTC operator: This model is used to successively take changes in the conditions of the task into consideration that depend on three parameters: geometric dimensions - D, time - T, and cost - C. This method aims to take into account the time, cost and dimension for the control of the testing and not use many resources;
- 5.2.3. Learning: Review the information obtained from the tests and thus be able to fix and improve the prototype;

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.2.- Testing	Mechanism	5.2.1.- Environment	Because creates similar conditions where the system goes to work.	Environment refers to the similarity of how the system will work under certain conditions and replicate them. Helps to identify and find fails in the system before launch the product or service.	Test the prototype the entity external to the system
		5.2.2.- DTC operator	Because identify and change the parameters of the Dimension, Time and cost of a system.	This model is used to successively take changes in the conditions of the task into consideration that depend on three parameters: geometric dimensions - D, time - T, cost - C.	Test the prototype according to the dimension, time, cost.
		5.2.3.- Learning	Because collect data from the validation and from testing to improve the system.	Review the information obtained from the tests and thus be able to fix and improve the prototype.	Learn and improve the prototype according to the testing

Figure 4.62 Testing (Mechanism)

Once tested the product or service, we will have information and results that will help us to validate the product (see Figure 4.63).

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.2.- Testing	Output	Results	-	_	Prototype approved

Figure 4.63 Testing (Output)

After testing the product or service, we need to validate the results.

- 5.3. Validation: It's the desired action under certain parameters correlating to what we want and want to have (see Figure 4.64).

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.3.- Validation	Input	Results	-	_	Prototype approved

Figure 4.64 Validation (Input)

The control for validation is the parameters, the main functions and the requirements. Those controls will give us the scope of what is expected to have (see Figure 4.65).

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.3.- Validation	Control	Parameters	-	_	Validate the prototype according to the parameters
		Main Functions	-	Are the ways we get the outcomes.	Validate the prototype according to the main functions
		Requirements	Because we need to define what we need to have.	Is something that you must do, or something you need:	Validate the prototype according to the requirements

Figure 4.65 Validation (Control)

The mechanism that can develop the validation is sale strategy.

- 5.3.1. Sales strategy: Another type of validation of the idea is to make the product known to the interested parties, with the minimum function to identify identifying if they would be willing to pay for the product or service.

The MVP can be developed with the most valuable features workable for stakeholders to do this product validation (see Figure 4.66).

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.3.- Validation	Mechanism	5.3.1.- Sales strategy.	Because it identifies sales channels.	This step helps create a sale strategy to start sale the product or service.	Develop the sales strategy to validate if the idea could get revenue.

Figure 4.66 Validation (Mechanism)

The output of the activities is the correlation and the MVP (see Figure 4.67).

5.- Prototype design					
Step	IDEF0 - Function	Item	Why	Description	Subject
5.3.- Validation	Output	Correlatation	-	Results between what we want and what we planned.	Validate and test the prototype to confirm needs
		MVP (Minimun Vialable Product)	-	Is essentially the product with the minimum number of features that a customer will pay for	Develop MVP to start the sells

Figure 4.67 Validation (Output)

4.7 Commercialization Chart Process Tool

- Step 6. Commercialization: This is the last step of innovation once it is confirmed that the idea is developed and represented by the MVP; the last part is to launch the product or service with all the lessons learned in the prototype stage ready for distribution and sale it generating profits.

We have to consider distribution channels, market strategies, customer feedback, and customer care, to continue improving the product, identifying new needs and opportunities for improvement (see Figure 4.68).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
6.- Commercializa tion	Input	MVP (Minimun Vialable Product)	-	Is essentially the product with the minimum number of features that a customer will pay for	Idea confirmated according to MVP.

Figure 4.68 Commercialization (Input)

To start the commercialization, we can use controls, such as; available resources, user profiles, time, and cost (see Figure 4.69).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
6.- Commercialization	Control	Positive effect	-	Are the effect that we want in the final result	List the positive effects.
		Available resources	-	Is the resources to develope something	Lauch the product or services with the available resources
		Identified value	-	Is the worth, importance, or usefulness of somthing.	Complete next sentence: Our **(produc)** helps **(customer segment)** who wants to **(jobs to be done)** by reducing **(customer pain)** and increasing **(customer gain)**, unlike **(competiting value proposition)**.
		Dimension	-	Helps to get managers thinking from a demand-side perspective.	Define the dimension of the marketing.
		User profile	Because it identifies and classifies user needs.	A customer profile is defined by three components: pains, gains and jobs.	List the users.
		Time	Because define when the situation occurs.	Frequency of events, duration of time intervals, order of events in time, value of later or action.	Lauch the product according to the time planned
		Define activity field	-	Is focused on leveraging research and development to bring new products and services to market	List the activity field
		Cost	-	_	Define the cost of the product or service

Figure 4.69 Commercialization (Control)

The tools that we can use to develop the commercialization are the marketing strategy that helps understand the customers, the ambition perimeters, and the business model canvas to develop a plan (see Figure 4.70).

- 6.1. Marketing strategy: Start promoting the product in the different communication channels, develop the market strategy to obtain customers using the minimally viable product and present it;
- 6.2. Ambition perimeter: Important usage situations where significant problems are experienced, and the current solutions provide little or no relief;
- 6.3. Business model canvas: This method helps gain deep insight into the nature of business models, defining the channels, the customer values, and tackling the customer's pains;

- 6.4. 7 Law of evolution (Law of the transition from a macro-level to a micro-level). The development of the working bodies of technical systems occurs initially at the macro-level but at the micro-level in a developed design;
- 6.5. 8 Law of evolution (dynamization): Make an object (or its parts) moveable and optimize the characteristics of the process (of an object) in every stage;
- 6.6. Kano analysis: This simple-looking tool has graves implications for quality management. In this part of the process, the Kano analysis will help us determine how the customer perceives the product and what we need to change or improve for the current and future developments.

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
6.- Commercialization	Mechanism	6.1.- Marketing strategy	Because Identify potential consumers.	Start promoting the product in the different communication channels, develop the market strategy to obtain customers using the minimally viable product and present it.	Start with the marketing to sell the product.
		6.2.- Ambition perimeter	Because provide a visualization of the situation.	Important usage situations where major problems are experienced and the current solutions provide little or no relief.	Define the rationally good for people, what people want and the voice of the company.
		6.3.-Business model canvas	Because visualize and communicate a simple story of your business model.	Define a business plan and strategy to sell the produc tor service.	Define the Bussiness model canvas.
		6.4.- 7 Law of evolution (Law of the transition from a macro-level to a micro-level).	Because it transfers functionality to the micro level.	The development of the working bodies of technical systems occurs initially at the macro-level, but at the micro-level in a developed system.	Has the system (including the working unit), in its current technological condition, exhausted its development resources?
		6.5.- 8 Law of evolution (dynamization).	Because it transforms a rigid system into a flexible system and makes it controllable.	Make an object (or its parts) moveable, optimize the characteristics of the process (of an object) in every stage.	Does the system of dynamism promote the optimization of the functionality of the service or product?
		6.6.- Kano analysis	Because measure customer satisfaction through feedback from surveys.	Is a simple looking tool that has grave implications of the field of quality management. We need to get feedback from the customers to improve our system.	Define perceived attributes of product or service performance with customer preference categories

Figure 4.70 Commercialization (Mechanism)

The result of the process is to launch the product or service, implement the system, and finally, after-sale customer care is essential to retain the customer. This information will help the opportunity to improve (see Figure 4.71).

Innovation Process					
Step	IDEF0 - Function	Item	Why	Description	Subject
6.- Commercialization	Output	Launch of produt or service	-	–	Revenue
		Implementation	-	–	Lauch the product or services.
		After sales and Customer Care	-	–	Ask the customer about the product or services.
		Opportunity to improve	-	–	Get data from MVP and implementation to improve the product or service.

Figure 4.71 Commercialization (Output)

With the product or service launch and the implementation, we can close this cycle. Still, after the product or service launch, we need to improve continually, collecting data from the users to enhance the system already created. This data will give us information about the new needs of the users.

4.8 Conclusions

This chapter aimed to develop the meta-process describing the steps, the methods and the reasons why a specific tool can be used to develop the idea for its commercialization, providing examples and the reasons why it should be used. a specific tool, plus this chapter explains the inputs and what is expected as a result.

Concluding that there may be an integration of creative methodologies and product development methodologies with different tools that the stakeholder can use for the development of an innovation project.

CHAPTER 5

APPLICATION TO A CASE STUDY

The objective of this chapter is to do an exercise for the use of the meta-process. For this case, it is taking into account that according to NHTSA (National Highway Traffic Safety Administration) the use of navigation devices is one of the main causes of accidents, creating more than 200,000 accidents in 2020 and increasing the risk of handling the device by 23% when driving (Faulty GPS Systems | Chicago Car Accident Lawyers , 2020).

Using this meta-process the intention is to create an idea to counteract this problem, using the tools and following the recommended steps.

One of the limitations will be that a prototype will not be developed nor will it be marketed, but the process will be run as if simulating what has to be done for its commercialization.

5.1 Needs chart process result

As seen in the previous chapter, innovation must begin with identifying the problem or need to develop possible solutions with creative ideas, taking into account the mission and vision of the organization to be marketed.

Following the proposal, we are going to start with the identification of the need, for this, we are going to propose the following example: Being distracted while driving causes accidents; The use and manipulation of navigation devices is a factor that causes this distraction.

Considering the figure above, we can define whether it is a problem or an initial situation. In this case, the problem is a gap between the requirement (concentration) and the benefit (arrive at the destination). Or Driver distraction while using or manipulating the navigation system.

The initial situation is the difference between the current situation (distraction in the moment of the use of the device) and the past situation (when the driver asks the pedestrian for a destination and stops the vehicle). Or before, the driver would stop to ask for directions to his destination (Table 5.1).

Filling the diagram for the current situation, it would be as follows.

Table 5.1 Current Situation (Input)

Step	**IDEF0 Function**	**Item**	**Description**
1.1 Current Situation	Input	Problem	*Driver distraction while using or manipulating the navigation system.*
		Initial Situation	*Before, the driver would stop to ask for directions to his destination.*

The data will help us to support the problem. It will also help us to define the problem as the causes and the effect of this problem. For this same example, there are many reports that show that distraction is one of the most common causes of an accident. The data can be found in related private organizations.

The causes are; The use and manipulation of the navigation device when the driver is driving. In this case, the observation is the studies carried out by experts, asking them and reporting them through a graph of our statistics. The observation of the problem can be identified at the moment or through an investigation (Table 5.2).

Table 5.2 Current Situation (Control)

Step	IDEF0 Function	Item	Description
1.1 Current Situation	Control	Data	*The studies were carried out by experts asked and reporting them.*
		Causes	*The use and manipulation of the navigation device when the driver is driving.*
		Observation	*Graphs and statistics.*

Taking the example previously, we can define the 5w and Knowledge design in the following way (Table 5.3).

Table 5.3 Current Situation (Mechanism)

Step	IDEF0 Function	Item	Description
1.1 Current Situation	Mechanism	1.1.1 5 W Method	*What: Driver's distracted driving.* *When: When the driver uses or manipulates a navigation device while driving.* *Why: Because the driver changes eye level to see instructions.* *Where: In the vehicle.* *Who: The controller and the navigation device.* *How: Movement of the driver's head.*

Table 5.3 Current Situation (Mechanism) (Cont'd)

Step	IDEF0 Function	Item	Description
1.1 Current Situation	Mechanism	1.1.2 Knowledge design.	*The driver has to move his head to use or manipulate the navigation device. The position of the device causes movement of the head. The manipulation of the device is with the hands. The indications received are through a screen and through a voice.*

Ex. Effect undesired is the distraction in the way of moving the head to manipulate and receive instructions due to the position of the device and the attention required to receive instructions (Table 5.4).

Table 5.4 Current Situation (Output)

Step	IDEF0 Function	Item	Description
1.1 Current Situation	Output	Effect undesired	*Distraction in the way of moving the head to manipulate and receive instructions due to the position of the device and the attention required to receive instructions.*

Ex. Effect undesired: the distraction in the way of moving the head to manipulate and receive instructions due to the position of the device and the attention required to receive instructions. Negative Effect: Driver's distraction (Table 5.5).

Table 5.5 Define the problem (Input)

Step	IDEF0 Function	Item	Description
1.2 Define the problem	Input	Effect undesired	*The distraction in the way of moving the head to manipulate and receive instructions due to the position of the device and the attention required to receive instructions.*
		Negative Effect	*Driver's Distraction.*

Table 5.6 shows the control of the current situation, which helps to define the problem, and the root cause.

Table 5.6 Define the problem (Control)

Step	IDEF0 Function	Item	Description
1.2 Define the problem	Control	Root Cause (s).	Movement of the driver's head. Navigation device position. Manipulation of the device. Way of receiving instructions from the navigation device (voice and through a screen).

The tools that we can use to define the problem are Dee Knowledge, Qualitative change, and Closed World (Table 5.7).

- 1.2.1. Deep knowledge:

Ex.

- The position of the navigator makes the driver tilt his head a lot;

- The instructions received by voice are not clear or do not have much detail;
- The instructions received by voice are not the same as those of a human being;
- The navigation screen is too small;
- The navigation device manipulation is by touching a screen.

- 1.2.2. Qualitative change:

Ex.

- The less I manipulate the screen, the more concentration I will have;
- The less I use the navigation device, the more concentration I will have;
- The more detail I have when receiving voice prompts, and the prompt is similar to that of a human being, the less I look at the screen;
- The closer the screen is to the driver's eyes, the fewer head tilts there will be.

- 1.2.3. Closed World:

The solution is within the problem elements. In this case, the elements are the device, the manipulation (hand), the way to receive the instructions (ears and eyes), the way to use the navigation device (fingers), and the way to tilt the head (body).

Ex.

- If the driver does not use the navigation device, but the driver arrives at his destination, it will reduce the driver's distraction;
- If the driver does not touch the screen to manipulate the navigation system, it will increase the concentration;
- If the driver does not tilt his head to use and manipulate the navigation device, it will increase the concentration;
- If the driver listens carefully to the instructions and in a human-like manner, the driver does not need to tilt his head to see the device;
- If the navigation device knows where the driver;
- If the device knows the next destination, the driver will not manipulate it much.

Table 5.7 Define the problem (Mechanism)

Step	IDEF0 Function	Item	Description
1.2 Define the problem	Mechanism	1.2.1. Deep knowledge	*The position of the navigator makes the driver tilt his head a lot.* *The instructions received by voice are not clear or do not have much detail.* *The instructions received by voice are not the same as those of a human being.* *The navigation screen is too small.* *The navigation device manipulation is by touching a screen.*
		1.2.2 Qualitative change	*The less I manipulate the screen, the more concentration I will have.* *The less I use the navigation device, the more concentration I will have.* *The more detail I have when receiving voice prompts, and the prompt is similar to that of a human being, the less I look at the screen.* *The closer the screen is to the driver's eyes, the fewer head tilts there will be.*

Table 5.7 Define the problem (Mechanism) (Cont'd)

Step	IDEF0 Function	Item	Description
1.2 Define the problem	Mechanism	1.2.3. Closed World	*If the driver does not use the navigation device, but the driver arrives at his destination, it will reduce the driver's distraction.* *If the driver does not touch the screen to manipulate the navigation system, it will increase the concentration.* *If the driver does not tilt his head to use and manipulate the navigation device, it will increase the concentration.* *If the driver listens carefully to the instructions and in a human-like manner, the driver does not need to tilt his head to see the device.* *If the navigation device knows where the driver* *If the device knows the next destination, the driver will not manipulate it much.*

Taking the mechanisms into account, we could have many opportunities to improve the device, the way to handle the navigation device (buttons, screen size, the way to receive the instruction like AI, etc.), as well as the position of the device and a device or vehicle that know all the destinations without human interference, all of these are our opportunities to improve the product or service (Table 5.8).

Table 5.8 Define the problem (Output)

Step	IDEF0 Function	Item	Description
1.2 Define the problem	Output	Opportunity to improve	The way to handle the navigation device The position of the device The device or vehicle knows all the destinations without human interference.

The input for defining the needs is the opportunity to improve because we already know the background of the problem.

In this case, we will bring the output from the opportunity to improve (Table 5.9).

Table 5.9 Define needs (Input)

Step	IDEF0 Function	Item	Description
1.3 Define Needs	Input	Opportunity to improve	The way to handle the navigation device The position of the device The device or vehicle knows all the destinations without human interference.

The objectives of the organization are related to the mission and vision of the company. In this case, we could have some options for a company.

For example, a company dedicated to navigation devices, its scope may be to make devices safe while in use. A start-up: Create a new device by improving the programming to provide

better indications. A company dedicated to vehicles. Make vehicles safer, increasing the safety system.

As we can see, each company has the same problem (Driver distraction while using or manipulating the navigation system) but different objectives, each of them will find a solution considering their activities; the Start-up and the company that builds navigation devices cannot change the position of the navigation system because this decision comes from the vehicle's company (Table 5.10).

- The desired phenomenon is: Using and manipulating a navigation device that does not reduce the concentration of the driver;
- The needs of the market. In this case, there is a need because most drivers use a navigation device to reach their destinations, but they also want to get home safely;
- User profile: Anyone who has a car and uses a navigation device to reach their destination while driving.

Table 5.10 Define Needs (Control)

Step	**IDEF0 Function**	**Item**	**Description**
1.3 Define Needs	Control	Organization's goals.	*Make devices safe while in use. (Navigation device company).*
		Desired Phenomenon	*Using and manipulating a navigation device does not reduce the concentration of the driver.*
		Market needs	*Develop navigation devices that do not reduce the concentration of the driver.*

Table 5.10 Define Needs (Control) (Cont'd)

Step	IDEF0 Function	Item	Description
1.3 Define Needs	Control	User profile	*Anyone who has a car and uses a navigation device to reach their destination while driving.*

Some tools that will help to find the needs are, the reframing the problem, Investigation, FAST, and Existing solution (Table 5.11).

- 1.3.1. Reframing the problem: This method will help us confirm whether the elements of the problem are the cause of the effect.

In this case, the original problem was the (Driver distraction while using or manipulating the navigation system), but considering the reason for the distraction, we can say that the problem related is (just considering the device's company) the use and manipulation of the device.

We discarded the position and size of the device because these factors the device's company does not handle.

- 1.3.2. Investigation: Recollected data and understand the data. In this case, we need to get information about why the use and manipulation of a navigation device is a problem?

Some reason could be that the instructions are not really clear for the user, and for this reason, the user needs to see the screen, or because the driver first starts and then the user selects the direction or the use of the navigation device is limited to touch screen, again is to find the reason of the problem.

- 1.3.3. FAST Method is divided by how-why and how-why.
- How: Send directions by voice and by the screen;
- Why: Shows and provides directions easily;
- How: Easy manipulation;

- Why: Less time touching the screen.

Finally, we need a device that shows and provides directions easily, and we need a device with easy manipulation to touch the screen in less time.

- 1.3.4. Existing solution: For the existing solution, we need to review how other systems provide instruction with an easy understanding and how different systems or products reduce the contact on the screen. An existing solution is the voice command of Alexa or Siri, as well as the directions of a person, providing more details or descriptions of the directions.

For the time of touching the screen could be with the substitutions by buttons.

Table 5.11 Define needs (Mechanism)

Step	**IDEF0 Function**	**Item**	**Description**
1.3 Define Needs	Mechanism	1.3.1. Reframing the problem:	*From: Driver distraction while using or manipulating the navigation system.* *To: The use and manipulation of the device.*
		1.3.2. Investigation	*The instructions are not really clear for use.* *The driver first starts, and then the user selects the direction.* *The use of the navigation device*
		1.3.3. FAST Method:	*We need a device that shows and provides directions easily, and we need a device with easy manipulation to touch the screen in less time.*

Table 5.11 Define Needs (Mechanism) (Cont'd)

Step	IDEF0 Function	Item	Description
1.3 Define Needs	Mechanism	1.3.4. Existing solution:	*The voice command of Alexa, or Siri, as well as the directions of a person, provide more details or descriptions of the directions.* *Substitutions by buttons.*

With these methods, our output are the benefits and the effect desired for the stakeholder and the customer (Table 5.12).

- Benefits: Better voice commands, clearer and more detailed instructions, and reduced screen viewing time while using or manipulating the navigation device;
- Effect Desired: Reduce driver distraction when using and handling a navigation device.

Table 5.12 Define needs (Output)

Step	IDEF0 Function	Item	Description
1.3 Define Needs	Output	Benefits	*Better voice commands.* *Clearer and more detailed instructions.* *Reduced screen viewing time while using or manipulating the navigation device.*
		Effect Desired	*Reduce driver distraction when using and handling a navigation device.*

At this stage, it can be highlighted that the initial problem changed due to the fact that it focused on a specific company. In this case, it was the company that is dedicated to making navigation devices for cars; in addition, the limitations only depend on the company, such as software and

hardware, because this company cannot manipulate external factors of this device, such as the position of this device or the size of the screen or the number of speakers for voice commands, or other external systems.

Taking these considerations into account, the problem only focused on the device, and the solutions will only be focused on this device, directly attacking the problem that corresponds to it, knowing the limitations and scope of the same company.

Finally, collecting the root causes, it can be found that the problem may not be the position of the screen, it may be that the instructions received are not reliable, or the handling of the device is not adequate.

5.2 Create an idea chart process result

- Step 2. Create idea: Creating an idea is a process of attacking the needs of the stakeholders; Create idea Input: Effect desired previously defined and the elements of the system to work.

The reformulation of the problem can help to confirm if the problem is the real problem, but each time we execute this step, we will arrive at another problem; each time deeper.

We must take into account the interactions so as not to make too many interactions since it will reach a point where it will again go out of scope of the company.

My recommendation is to use this process if the previous step was not executed or when the factors of the problem cannot be solved and when you want to get more to the root of the problem.

The advantage of doing more iterations of this process is that few will get to the source and it will help you stand out from the competition.

Once we have the specific problem, we can continue developing an ideality (Table 5.13).

- 2.2. Ideality: Ideality helps us define how we want the system to work.

Table 5.13 Ideality (Mechanism)

Step	IDEF0 Function	Item	Description
2.2 Ideality	Input	Specific problem	The use and manipulation of the navigation device.

Some considerations to take for the ideality development is the Market needs, Desired phenomenon , Object known, Main function described it in (Table 5.14).

- The market needs: Develop navigation devices that do not reduce the concentration of the driver;
- Desired phenomenon: Using and manipulating a navigation device does not reduce the concentration of the driver;
- Object Known: Smart voice commands;
- Main Function: The main function of the device is a device easy handling, easy use easy to understand instructions.

Table 5.14 Ideality (Control)

Step	IDEF0 Function	Item	Description
2.2 Ideality	Control	Market needs	*Develop navigation devices that do not reduce the concentration of the driver.*
		Desired phenomenon	*Using and manipulating a navigation device does not reduce the concentration of the driver.*
		Object known	*Smart voice commands*
		Main function	*Easy handling,* *Easy to use* *Easy to understand instructions*

Some methods that will help us to define the ideality and allow us to find the solutions are:

- 2.2.1. Partition: Is a partition that makes use of these. Smart voice commands and AI (Artificial Intelligence) in the navigation device;
- 2.2.2. Unification: Solve a problem by assigning a new user to an existing component. For example, AI from another device like a chat box, and smart voice commands like Siri or Alexa;
- 2.2.3. Multiplication: Solve a problem by introducing a modified copy of an existing object into the current system. The more detail you have of the instructions, the better. The more manipulation and use, the more detailed the indications;
- 2.2.4. Division: Solve a problem by dividing an object and reorganizing its parts. The use and manipulation are separated;
- 2.2.5. Symmetry break: Solve a problem by turning an asymmetrical situation into an asymmetrical one. Only be able to manipulate the device when the vehicle is stopped;

- 2.2.6. Removal: Solve a problem by removing an object from the system. Remove screen touch;
- 2.2.7. Brainstorming: This activity will help you produce a large number of ideas like: Develop AI to improve voice prompts, block manipulation of the navigation device when the car is running, add shortcuts to the navigation device to make it easier to use the device, the device knows your next trip through the location and time, as well as the information collected, the device knows the most convenient route through location and time, the device can connect with the cell phone to share the destination before starting;
- 2.2.8. Operation zone: Is the entire set of components of a system and its environment that are directly related to a contradiction. The operative zone is the epicenter of the problem. The navigation device gives better directions (Table 5.15).

Table 5.15 Ideality (Mechanism)

Step	**IDEF0 Function**	**Item**	**Description**
2.2 Ideality	Mechanism	2.2.1. Partition	*Smart voice commands and AI in the navigation device.*
		2.2.2 Unification	*AI from another device like a chat box, and smart voice commands like Siri or Alexa.*
		2.2.3. Multiplication	*The more detail you have of the instructions, the better. The more manipulation and use, the more detailed the indications.*

Table 5.15 Ideality (Mechanism) (Cont'd)

Step	IDEF0 Function	Item	Description
2.2 Ideality	Mechanism	2.2.4. Division	*The use and manipulation are separated.*
		2.2.5 Symmetry break.	*Only be able to manipulate the device when the vehicle is stopped.*
		2.2.6. Removal:	*Remove screen touch.*
		2.2.7. Brainstorming	*Develop AI to improve voice prompts.* *Block manipulation of the navigation device when the car is running.* *Add shortcuts to the navigation device to make it easier to use the device.* *Add shortcuts to the navigation device to make it easier to use the device.* *The device knows your next trip through the location and time, as well as the information collected.* *The device knows the most convenient route through location and time.* *The device can connect with the cell phone to share the destination before starting.*

Table 5.15 Ideality (Mechanism) (Cont'd)

Step	IDEF0 Function	Item	Description
2.2 Ideality	Mechanism	2.2.8. Operation zone:	*The navigation device gives better directions.*

The result of these methods is the generic interpretation of the solution, but it will help us refine the idea and possible solutions. Generic interpretation, in this example, we can have a device where the instructions are provided by AI voice command (Table 5.16).

Table 5.16 Ideality (Mechanism)

Step	IDEF0 Function	Item	Description
2.2 Ideality	Output	Generic interpretation	*A device where the instructions are provided by AI voice command.*

- 2.3. Idea development: This is the process of developing an idea based on the identified elements (Table 5.17).

Table 5.17 Idea development (Input)

Step	IDEF0 Function	Item	Description
2.3 Idea Development	Input	Generic interpretation	*A device where the instructions are provided by AI voice command.*

The control for the idea development is the company values, specifications and scope as it's described in the next table (Table 5.18).

- Company values: For a company that wants to give more experience with the use of its smart devices, it can have more profits;
- Specifications: The specifications could be developing a voice command through AI;
- Scope: Implement this technology in the next devices.

Table 5.18 Idea development (Control)

Step	**IDEF0 Function**	**Item**	**Description**
2.3 Idea Development	Control	Company Values	*A device where the instructions are provided by AI voice command.*
		Specifications	*The specification could be developing a voice command through AI*
		Scope	*Implement this technology in the next devices.*

Some methods and techniques that will help us to develop the ideas (Table 5.19).

- 2.3.1. Existing solution: There is a solution that already exists in the market. For this example, we can use the AI command voice like Siri, Alexa, and Ok Google;
- 2.3.2. Nine multi-screen methods: For this example, in the past, the maps were printed, through books, this was the way to get directions from an address, in the present is the digital devices with maps, in the future, could be a digital device with AI voice commands;
- 2.3.3. TRIZ 40: Based on the elements and pains of customers, we need to define the three types of contradictions, and this tool is useful when the elements are already identified. For this example, the administrative contradictions: I know what, but I don't know-how, the technical contradiction: I know how, but if I do it, something else is worsening;

- 2.3.4. Value bucket: Is an algorithm that combines three dimensions: pains, usage situations (characterized by scenarios) and existing solutions. For example, the pains is the distractions, the usage situation is while driving and the existing solutions is voice commands used by another devices;
- 2.3.5. Qualitative change: This means changing the category of the relation when changing the factor in the problem to neutral or beneficial. We are taking into account the Cause-Effect, for the cause is the bad indications, resulting the effect of distraction, while driving. If the driver misreceives directions, it causes distraction.

Table 5.19 Idea development (Mechanism)

Step	IDEF0 Function	Item	Description
2.3 Idea Development	Mechanism	2.3.1. Existing solution.	*AI command voices like Siri, Alexa, Ok Google.*
		2.3.2. Nine multi-screen methods.	*Past: Maps printed, through books.* *Present: Digital devices with maps.* *Future: Digital device with AI voice commands.*
		2.3.3. TRIZ 40	Administrative Contradictions: *I know what, but I don't know-how!* Technical Contradiction: *I know how, but if I do it, something else is worsening.*
		2.3.4. Value bucket	Pains: *Distractions* Usage situation: *While driving.* Existing solutions: *Voice Commands*

Table 5.19 Idea development (Mechanism) (Cont'd)

Step	IDEF0 Function	Item	Description
2.3 Idea Development	Mechanism	2.3.5. Qualitative change	Cause: *Bad indications*. Effect: *Distraction.* *If the driver misreceives directions, it causes distraction.*

As a result of using these methods, we will have positive effects and a large number of ideas (Table 5.20).

- Positive Effect: Reduce driver distraction when using and handling a navigation device;
- A large number of ideas:
  - Develop AI to improve voice prompts;
  - Block manipulation of the navigation device when the car is running;
  - Add shortcuts to the navigation device to make it easier to use the device;
  - The device knows your next trip through the location and time, as well as the information collected;
  - The device knows the most convenient route through location and time;
  - The device can connect with the cell phone to share the destination before starting.

Table 5.20 Idea development (Output)

Step	IDEF0 Function	Item	Description
2.3 Idea Development	Output	Positive Effect	*Reduce driver distraction when using and handling a navigation device.*
		A large number of ideas:	*Develop AI to improve voice prompts.* *Block manipulation of the navigation device when the car is running.* *Add shortcuts to the navigation device to make it easier to use the device.* *The device knows your next trip through the location and time, as well as the information collected.* *The device knows the most convenient route through location and time.* *The device can connect with the cell phone to share the destination before starting.*

5.3 Select idea chart process result

- Step 3. Select idea: Once the set of ideas has been obtained, the next step is to select the idea that provides the most value. This idea must be controlled by the user profile, the company's objectives, the company vision, the time to develop, and the cost and resources that they will need to develop this idea (Table 5.21).

Table 5.21 Evaluation (Input)

Step	IDEF0 Function	Item	Description
3.1 Evaluation	Input	A large number of ideas:	*Develop AI to improve voice prompts.* *Block manipulation of the navigation device when the car is running.* *Add shortcuts to the navigation device to make it easier to use the device.* *The device knows your next trip through the location and time, as well as the information collected.* *The device knows the most convenient route through location and time.* *The device can connect with the cell phone to share the destination before starting.*

The control to select and evaluate are related to the market needs, the customer values, the desired action, the rules and the company's value (Table 5.22).

- Market Impact: There is a very large need in the market, and it could place the company as the pioneer in the development of AI in voice commands to give instructions;
- Customer Value: Arrive safely and quickly at the destination, improve the driver experience and reduce distractions;
- Desired Action: Provide more driver-friendly directions;

- Company's Value: Improve the experience in the use of navigation devices;
- Rules: Data privacy rules.

Table 5.22 Evaluation (Control)

Step	IDEF0 Function	Item	Description
3.1 Evaluation	Control	Market Impact:	*There is a very large need in the market, and it could place the company as the pioneer in the development of AI in voice commands to give instructions.*
		Customer Value	*Arrive safely and quickly at the destination*, *improve the driver experience a*nd r*educe distractions*
		Desired Action	*Provide more driver-friendly directions.*
		Company's Value	*Improve the experience in the use of navigation devices*
		Rules	*Data privacy rules.*

These tools will help to evaluate the idea (Table 5.23).

- 3.1.1. Solution World: The problem is the voice command; the solution is related to the voice command;
- 3.1.2. UNPC Monitor tool: Usefulness: Yes, it is easy to handle. Newness: Yes, no navigation device has AI in voice command. Profitability: Yes, not too many physical changes, and could be improved in the new devices. Concept: Yes, the idea could be developed easily;
- 3.1.3. DSM methodology: Change the buttons or improve the voice commands;

- 3.1.4. Ambition perimeter: This new technology will impact all users and all new all-new devices.

Table 5.23 Evaluation (Mechanism)

Step	IDEF0 Function	Item	Description
3.1 Evaluation	Mechanism	3.1.1. Solution World	*The problem is the voice command; the solution is related to the voice command.*
		3.1.2. UNPC Monitor tool	*Usefulness: Yes, it is easy to handle. Newness: Yes, no navigation device has AI in voice command Profitability: Yes, not too many physical changes, and could be improved in the new devices. Concept: Yes, the idea could be developed easily.*
		3.1.3. DSM methodology	*Change the buttons or improve the voice commands.*
		3.1.4. Ambition perimeter	*This new technology will impact all users and all new all-devices.*

The result of the evaluation process is a number or grade to help pick the best idea. As a result of this activity, we will have an idea with the highest score, which will make it easy for us to choose the best one, for theorical propose and about this exercise, this research will skip the step 3.1 Evaluation (Output), 3.2 Selection (Input), 3.2 Selection (Control), 3.2 Selection (Mechanism), to get the final result of 3.2 Selection (Output) as it's presented in the Table 5.24.

Table 5.24 Selection (Output)

Step	IDEF0 Function	Item	Description
3.2 Selection	Output	Result	*There is a very large need for it.*
		Best Solution	*A device that prevents navigation from being manipulated while the vehicle is in motion, connected to the phone and with GPS location to know directions and with voice commands using AI.*

5.4 Concept creation chart process result

- Step 4. Concept creation: It is the proposal or set of proposals without meaning deep knowledge about the functions, specifications or details of the system, Our control to develop the concept will be the knowledge of the user profile, the number of subsystems or components, the result of the neutral factor and finally, the idea or the proposal of ideas (Table 5.25).

Define the number of sub-systems or components:

- Development of programming based on best routes according to time and place, more friendly prompts, neutral tone of voice, and processing chips;
- User profile: Defines the age of the user, the language, etc.
- Neutral Factor: Better indications avoid seeing the screen;
- Concept: Develop the first program of voice command.

Table 5.25 Concept creation (Control)

Step	IDEF0 Function	Item	Description
4 Concept Creation	Control	Define the number of subsystems or components.	*Development of programming based on best routes according to time and place, more friendly prompts, neutral tone of voice, and processing chips.*
		User profile	*Defines the age of the user, the language, etc.*
		Neutral Factor	*Better indications avoid seeing the screen.*
		Concept	*Develop the first program of voice command.*

The mechanism for these steps that we can use is described below (Table 5.26).

- 4.1. Little Smart people: Ex. Several Little smart people change the way they speak, their tone of voice and the instructions that help give directions to the driver;
- 4.2. 4 Law of evolution: All types of systems strive to increase their effectiveness ("ideality") in the span of their life cycle. Ex. The device can provide a clear indication;
- 4.3. Conjunction: Ex. Join the AI with the device to provide better indications;
- 4.4. 9 multi-screen methods: It is defined as a method for exploring issues and their potential impacts by examining high-level areas' past, present, and future and their related subsections. For this example, the past maps were printed, through books, in the present is the use of digital devices with maps, in the future could be a digital device with AI voice commands;
- 4.5. DTC operator: This method aims to consider the time, cost and size of the development of the concept, and the prototype does not use many resources. For dimension: Physically, the device can have the same dimension, the time of development

could take more because it needs to get information about what is the best way to give directions. The cost could impact a high cost of development but will be the first navigation command with AI;

- 4.6. Ideality: Ex. I want a navigation device that does not cause distractions while providing directions to a destination;
- 4.7. 5 Law of evolution: The object to be improved and its system environment. Ex. First navigation device that will use AI.

Table 5.26 Concept creation (Mechanism)

Step	IDEF0 Function	Item	Description
4 Concept Creation	Mechanism	4.1. Little Smart people.	*Several Little smart people change the way they speak, their tone of voice and the instructions that help give directions to the driver.*
		4.2. 4 Law of evolution	*The device can provide a clear indication.*
		4.3. Conjunction	*Join the AI with the device to provide better indications.*
		4.4. 9 multi-screen methods	*Past: Maps printed, through books.* *Present: Digital devices with maps.* *Future: Digital device with AI voice commands.*

Table 5.26 Concept creatiom (Mechanism) (Cont'd)

Step	IDEF0 Function	Item	Description
4 Concept Creation	Mechanism	4.5. DTC operator	Dimension: *Physically, the device can have the same dimension.* Time: *The time of development could take more because it needs to get information about what is the best way to give directions.* Cost: *This could impact a high cost of development but will be the first navigation command with AI.*
		4.6. Ideality	*I want a navigation device that does not cause distractions while providing directions to a destination.*
		4.7. 5 Law of evolution	*The device will use AI.*

The concept will help us to create a prototype to validate and test the idea.

5.5 Prototype design chart process result

A prototype is the first sample, or first model proposal.

The prototype could be the first version of the software, containing the first basic indications with AI, to start defining if there is a change of understanding in the indications. This version does not need to have many detailed functions, or great functions, but the main ones that make it functional and different (Table 5.27).

Table 5.27 Prototyping (Output)

Step	IDEF0 Function	Item	Description
5.1 Prototyping	Output	Product/service	*The first version of the software, containing the first basic indications with AI.*

The next step is the testing of the product or service to do this; we need to set a similar environment.

We need to test the prototype, since it is necessary to simulate the real situation where it will operate, and thus be able to collect information in order to continue improving the software according to the established specifications and requirements.

In this case, the tests must be carried out in an environment controlled by experts, where the programming and the device can be tested, to verify if the device could have any errors, in addition, it must be carried out under certain conditions, certain specifications, in this case, with certain and defined routes, to observe the variations and correct the errors that it may have before launching the final version.

The control for validation is the parameters, the main functions and the requirements. The mechanism that can develop the validation is 5.3.1.Sales strategy: Another type of validation of the idea is to make the product known to the interested parties, with the minimum function to identify identifying if they would be willing to pay for the product or service. An MVP can be developed with the most valuable features workable for stakeholders to do this product validation.

The output of the activities is the correlation and the MVP.

The validation will help kick off full-scale device development by pinpointing bugs in the program. The proof consists of two parts; the first is related to the device validating the software in natural conditions and with more variables, such as locating if the screen block works while driving, validating the response time or if a function performs another function.

The second validation is related to the driver to confirm if the driver does not need to see the screen when driving to reach a destination. For this, we need to compare the initial situation in which the driver touches the screen and sees the directions to the destination and the case in which he only receives orders and has screen locks so that he can only use the navigation device when the car is stopped.

This comparison will help the marketing team identify the value, advantages, and benefits of this new device, and promote it, highlighting less distraction in the use and manipulation of the driver to arrive on time and safely using the navigation device but without distractions.

5.6 Commercialization chart process result

- Step 6. Commercialization: This is the last step of innovation once it is confirmed that the idea is developed and represented by the MVP; the last part is to launch the product or service with all the lessons learned in the prototype stage ready for distribution and sale it generating profits.

We have to consider distribution channels, market strategies, customer feedback, and customer care, to continue improving the product, identifying new needs and opportunities for improvement.

In this section, you can promote the product to create interest in consumers; the idea of the MVP is also to continue testing the product with more variants but taking into account the main functionalities. In addition, it is necessary that more people know it and tries it to improve the device.

Once the device is released for sale, it is necessary to continue improving it, collecting information on the problems encountered by consumers, and thus correct and identify new needs.

5.7 Conclusions

This chapter aimed to test the meta-process, taking as a general problem the distraction that exists when using and manipulating a navigation device, taking into account the tools and objectives of each company.

In this case, I take into account 3 types of possible companies, one of them is the start-up, the other is a company dedicated to the creation of navigation devices and the last company is the one who manufactures the complete car.

Taking these considerations into account, we can conclude that each company can develop different solutions for the same problem, considering their scope and organizational objectives.

Likewise, if this integration of ideas and companies can have a better impact in solving the problem.
It can also be concluded that the deeper the search for the root cause is, there may be a time when the possible root cause is beyond the scope of the company.

CHAPTER 6

DISCUSSION

This research work aimed at the integration of methods for the development of creative ideas, as well as methods of developing a project carried out by experts, considering the most appropriate methods and their application.

For this reason, this research the problem used for the exercise was completely theoretical as well as the proposed solution were not developed or commercialized.

This innovation meta-process can be complemented with more processes that help the development of ideas and the development of the project, focusing on the main needs of the company.

At the moment there is only one experimentation exercise and this exercise and solution were completely theoretical.

CONCLUSION AND NEXT STEPS

This research aimed to integrate creative and project development methodologies to develop an innovation meta-process guideline to reduce the gap between innovative idea development methodologies and project development methodologies, to guide the stakeholder in the development process of an innovation project, from the development of the idea to its commercialization.

Taking into account the IDEF0 diagram to graphically represent the process, tools, inputs and outputs to obtain the integration of creative development methods developed by experts and project development methods.

Based on this integration of methodologies and theories, it can be concluded that there may be multiple ways to attack and create an idea to solve the same problem because we can have different levels of the root cause.

This means that the more we delve into the root cause, we may have more solution proposals, but the deeper we go, we may limit the solution of the company itself, due to the main activities.

The advantage that can be had by going deeper is that we can provide a more significant impact on the solution of the problem, in addition, if we unite the variety of ideas, a better solution can be created for the development of the product or service and thus provide more value to the client.

It is worth exploring to what extent this meta-process could continue to improve the development of ideas and solutions to a level where the failure rate of innovation projects decreases.

6.1 Next steps

To improve the guideline and provide results about this guideline, several tracks could be relevant. First is necessary to define the institution. In this case, my recommendation is to provide this guideline to the innovation centers, where they could have the resources, and experience to test and improve the guideline in different stages of the processes.

And the last aspect it's to include the sub-process of commercialization. This guideline is more focused on the find and problem-solving due the problem proposed couldn't be commercialized and I could not test and validate more methods for commercialization, additionally because commercialization is not my field of research.

APPENDIX I

CHART DESCRIPTION

The purpose of this appendix is to show the bibliographic references of each method used, a general description of the methods to facilitate the location of a specific method, and why it is recommended to use that method.

Table 6.1 Chart Description

Item	Why	Description	Expectation	Reference
1.1.1.- 5 W method.	Because it asks essential questions to decipher a situation.	This method helps to find the root cause of the problem thanks to the question of: What, Where, When, Who, Why and How.	Is a method irreplaceable problem resolution tool because this allows you to understand a potentially problematic situation by asking the right questions	(Michael, 2006)
1.1.2.- Knowledge design.	Because describes the functionalities of the design.	Because, the understanding of the design helps us to improve the system and helps to solve the problem.	Define how the design system works.	(Lamé, Yannou, & Cluzel, 2018a)
1.2.1.- Deep knowledge.	Because, it collect information and knowledge about the problem or situation.	We need to understand the problem, we need to investigate to have a deep understanding of the system.	Response: What are we looking for? What already exists?	(Lamé et al., 2018a)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
1.2.2.- Qualitative change.	Because the changes of cause and effect elements neutralize the situation.	Through a graph, helps to neutralize the situation and helps to identify the elements that interact in the problem.	Any problem can be modeled as a set of undesired effects (UDEs).	(Horowitz, 1999 ; Michael, 2006)
1.2.3.- Closed world.	Because the solution elements are within the problem elements.	This method helps to identify the elements of the problem.	Identifying the types of objects that form the given engineering system and those residing in its neighborhood B.	(Horowitz, 1999)
1.3.1.- Reframing the problem.	Because look for unconsidered aspects.	Reformulating the problem helps to confirm that the root cause of the problem has already been found.	Find the purpose of the problem and solution. Response the question, "for what purpose"	(Bekhradi, Yannou, Cluzel, & Vallette, 2017)
1.3.2.- Investigation.	Because, it collect information and knowledge about the user and marketing.	We need to understand the problem, we need to investigate to have a deep understanding of the system.	Identifies who does what, when, and how.	(Yannou & Cluzel, 2015)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
1.3.3.- FAST method.	Because it shows and identifies missing logical relationships between functions.	A technique to develop a graphical representation showing the logical relationships between the functions of a project, product, process or service based on the questions "How" and "Why".	How do you achieve this function? Why do you do this function? When you do this function, what other functions must you do?	(Bytheway, 2007)
1.3.4.- Existing solution.	Because compare, improve and apply current solutions that already exist in the market.	This method helps to create ideas applying existing solutions or benchmarking helps to observe how other systems are solving the same problem.	Develop a benchmark.	(Hemmer Gudme & Poissonnier, 2017)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
2.1.1.- Observation of usage.	Because it visualizes all the parameters that cause the undesired situation.	Get a deep understanding of the pains/problems possibly occurring in this usage situation, for measuring them (frequency, repeatability, importance, consequences) and carrying out a root cause analysis.	Practically, a pre-screening of problems is made and a first version of the causal graph of problems sketched.	(Yannou, Cluzel, et al., 2018)
2.1.2.- Closed world.	Because, the solution elements are within the problem elements.	Identify the elements of the solution within the problem.	Identifying the types of objects that form the given engineering system and those residing in its neighborhood B.	(Horowitz, 1999)
2.1.3.- Contradiction.	Because it discovers critical aspects used in patents to solve similar problems.	Find the elements of the problem, Administrative, Technical, Physical.	Identifying contradictions and selecting approaches to offset the negative parts of the contradictions are a basic principle that the TRIZ methodology is based upon. Develop Matrix contradiction	(Gadd, 2011 ; Harrington, 2017 ; Michael, 2006)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
2.1.3.- Contradiction.	Because it discovers critical aspects used in patents to solve similar problems.	Find the elements of the problem, Administrative, Technical, Physical.	Identifying contradictions and selecting approaches to offset the negative parts of the contradictions are a basic principle that the TRIZ methodology is based upon. Develop Matrix contradiction	(Gadd, 2011 ; Harrington, 2017 ; Michael, 2006)
2.2.1.- Partition.	Because expand the options to determine a solution.	Is a partition that makes use of these "identifying" properties of the known object or is compatible with them.	Specify the concept while preserving its conceptual identity, adding unexpected attributes	(Johnson, Christensen, & Kagerman n, 2008 ; Le Masson et al., 2017)
2.2.2.- Unification.	Because connect elements of the system that were previously disconnected.	Match elements to solve problems.	The object <system object list & neighborhood object list>@SelectedObject will carry out the operation ^SimpleOperation^. To do this, the object must be modified in the following way: [how the object will be modified]. Create the sentence: (The selected object)will (Desired Action).	(Horowitz, 1999)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
2.2.3.- Multiplication.	Because find a solution to the system by incrementing the object of the system itself.	Solve the problem with the same elements of the problem, but different object.	New object(s) of the same type will be added to the system. The new object(s) will carry out the operation ^simple operation^. To do this, the new object(s) must be different from the original ^SelectedObject^ in the following way: [In what way the new object(s) are different from the original one].	(Horowitz, 1999)
2.2.4.- Division	Because divide the elements of the problem.	Solve a problem by dividing an object and reorganizing it parts.	The object will be divided into {its basic parts or elements of the same type}. And it will be rearranged in time or space.	(Horowitz, 1999)
2.2.5.- Breaking symmetry.	Select symmetrical objects, to change them to asymmetrical objects.	Solve a problem by turning a symmetrical situation into an asymmetrical one.	Select an object, and form a list of important object parameters. The object will be modified so that the object's parameter which is currently unrelated to the objects parameter will be related increasing function or decreasing function.	(Horowitz, 1999)
2.2.6.- Object removal.	Becuase remove an object from the system and then searching for an alternative.	Solve a problem by removing an object from the system.	Create the sentences: [Item x] will be removed from the Problem World, which will prevent [harmful action]	(Horowitz, 1999)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
2.2.7.- Brainstorming.	Because create a large number of ideas.	A group of people helps to create ideas, based on this method.	Produce a large number of ideas Generate ideas quickly Expand your portfolio of alternatives Get people unstuck Inject insights from a broader group Build enthusiasm Solve tricky problems Improve team collaboration	(Tischler, 2001)
2.2.8.- Operation zone.	Because, analyze where the problem is with the available resources.	The operative zone is the epicenter of the problem.	The OZ should be described in such a way that a structure arises with a minimum number of elements	(Horowitz, 1999)
2.3.1.- Existing solution.	Because compare, improve and apply current solutions that already exist in the market.	This method helps to create ideas applying existing solutions or benchmarking helps to observe how other systems are solving the same problem.	Develop a benchmark	(Hemmer Gudme & Poissonnier, 2017)
2.3.2.- 9 Multi-screen.	Because, compare and explore issues and their potential impacts in time.	Is defined as a method for exploring issues and their potential impacts by examining the past, present, and future of both high-level areas and their related subsections.	Review each window on timescales best suited for achieving future solutions and ideal outcomes to make sure that the system, super-system, and subsystem will develop to achieve the expected results.	(Haines-Gadd, 2016 ; Michael, 2006)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
2.3.3.- TRIZ 40.	Because, gets a hint about the most reasonable solutions.	This method helps to propose solutions with previously determined factors.	Develop the matrix 40	(Pascal, 2020)
2.3.4.- Value Bucket.	Because it classifies the importance of the problem and the value of the solution.	Is an algorithm that combines three dimensions: pains, usage situations (characterized by scenarios) and existing solutions.	Identifies the painful usage situations where the existing solutions are not at all or not enough effective or satisfactory.	(Yannou, Cluzel, & Farel, 2018)
2.3.5.- Qualitative change.	Because, the changes of cause and effect elements neutralize the situation.	This method helps to find the relationship between cause and effect.	Any problem can be modeled as a set of undesired effects (UDEs).	(Horowitz, 1999 ; Michael, 2006)
3.1.1.- Solution World.	Because the solution is within the problem.	Objects that exist in the solution state.	[The relation <problem characteristics list>@prob_char will change from an increasing relation to {decreasing½unchanging}, if the following operation: [simple operation]@SimpleOperation is performed, ,].	(Horowitz, 1999)
3.1.2.- UNPC Monitor tool.	Because it asses the maturity and value of ideas in order to make decisions.	It helps to asses which idea or solution has more value according to its Usefulness, Newness, Profitability and concept.	Define wether the general idea is Usefulness – Newness – Profitability – Concept.	(Yannou, Farel, Cluzel, Bekhradi, & Zimmer, 2016)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
3.1.3.- DSM Method.	Because highlight important patterns in complex process data.	Helps to evaluate the idea thanks to a matrix.	Choose the higher value.	(Yannou, Farel, & Cluzel, 2015)
3.1.4.- Ambition perimeter.	Because provide a visualization of the situation.	Helps determine the big picture of the problem and the solution.	Define the potential for users, overall coherence and strategic importance for the company.	(Yannou, Lamé, & Cluzel, 2018)
3.2.1.- System by points.	Bacause Categorize the best idea.	Using UNPC, DSM we can determine how has more points. Helps to evaluate the idea.	Run UNPC, DSM method	(Yannou et al., 2016)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
3.2.2.- Qualitative change.	Because the changes of cause and effect elements neutralize the situation.	Means changing the category of the relation. This method helps to find the relationship between cause and effect. Through a graph, helps to neutralize the situation and helps to identify the elements that interact in the problem.	Any problem can be modeled as a set of undesired effects (UDEs).	(Horowitz, 1999 ; Michael, 2006)
4.1.- Little Smart people.	Because, It explains the conflict that exists in a problematic situation, through "small people with superpowers" for a better understanding.	Are imaginary tiny beings who represent the different elements of the problem we are trying to understand and solve. Break down the system into smaller parts or at micro level for a better understanding.	They are Smart because they have the ability and insight to create/solve problems and be anywhere, doing anything. Little means they are as tiny as necessary – molecular level if required. Rival teams of smart little people can be created and some can cause the problem and others solve it	(Gadd, 2011)
4.2.- 4 Law of evolution (Law of the evolution of the growth of the ideality).	Because, increases the value of what we really want.	All types of systems strive to increase their effectiveness ("ideality") in the span of their life cycle.	Same or better benefits, less costs, less harms. Ideality=benefits/(cost +harms).	(Michael, 2006)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
4.3.- Conjunctio n.	Because create concepts, based on the knolwdge.	This method helps to put all the knowledge you use or need to imagine or design new concepts.	Defining the object we want to design is equivalent to saying that we have designed it.	(Johnson et al., 2008 ; Le Masson et al., 2017)
4.4.- 9 Multi-screen.	Because, compare and explore issues and their potential impacts in time.	Is defined as a method for exploring issues and their potential impacts by examining the past, present, and future of both high-level areas and their related subsections.	Review each window on timescales best suited for achieving future solutions and ideal outcomes to make sure that the system, super-system, and subsystem will develop to achieve the expected results.	(Haines-Gadd, 2016 ; Michael, 2006)
4.5.- DTC operator.	Because identify and change the parameters of the Dimension, Time and cost of a system.	This model is used to successively take changes in the conditions of the task into consideration that depend on three parameters: geometric dimensions - D, time - T, cost - C.	Develop the Dimension, Cost and Time Analysis of the concept.	(Michael, 2006)
4.6.- Ideality.	Because identify and explains what they really want.	Helps to the systems improve over time by providing more benefits with fewer inputs/costs and resulting in fewer harms.	Develop law of increasing degree of ideality.	(Michael, 2006)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
4.7.- 5 Law of evolution (Law of the varying developme nt of a system's parts).	Because it generates new contradictions to develop a system.	The object to be improved and its system environment. Develop a concept with more systems.	The development of a system's parts occurs in different ways and the more complicated a system is, the more the development of its parts varies.	(Michael, 2006)
5.1.1.- 9 Multi-screen method.	Because, compare and explore issues and their potential impacts in time.	Is defined as a method for exploring issues and their potential impacts by examining the past, present, and future of both high-level areas and their related subsections.	Review each window on timescales best suited for achieving future solutions and ideal outcomes to make sure that the system, super-system, and subsystem will develop to achieve the expected results.	(Haines-Gadd, 2016 ; Michael, 2006)
5.1.2.- 6 Law of evolution (Law of the transition into a super-system).	Because develop the transtion to super system.	As soon as a system has exhausted its developmental possibilities, it will be included in a super-system as one of its parts. Use this when the system is already defined and we need to create poly-systems	To achieve a particular benefi t at the super - system even when we have the opposite benefi t at the system level.	(Michael, 2006)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
5.1.3.- 7 Law of evolution (Law of the transition from a macro-level to a micro-level).	Because it transfers functionality to the micro level.	The development of the working bodies of technical systems occurs initially at the macro-level, but at the micro-level in a developed system.	Try to change the system so that there is no need to measure/detect.	(Michael, 2006)
5.1.4.- 8 Law of evolution (dynamization and controllability).	Because it transforms a rigid system into a flexible system and makes it controllable.	Make an object (or its parts) moveable, optimize the characteristics of the process (of an object) in every stage.	Shape the effects in various was so the location of their installation is difficult to find	(Michael, 2006)
5.1.5.- Kano analysis.	Because measure customer satisfaction through feedback from surveys.	Is a simple looking tool that has grave implications of the field of quality management. We need to get feedback from the customers to improve our system.	The Kano analysis brought about this change from changing the measurement of quality from one-dimensional to two dimensional.	(« Kano model tool - build & analyse surveys for free », s.d.)
5.2.- Testing.	Because it inspects the proposed solution.	Is the action of play the problems in an environment controlled to confirm that the proposal can solve these problems.	Test the prototype according to the rules and specifications.	(Osterwalder et al, 2014)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
5.2.1.- Environment.	Because creates similar conditions where the system goes to work.	Environment refers to the similarity of how the system will work under certain conditions and replicate them. Helps to identify and find fails in the system before launch the product or service.	Test the prototype the entity external to the system	(Gadd, 2011)
5.2.2.- DTC operator.	Because identify and change the parameters of the Dimension, Time and cost of a system.	This model is used to successively take changes in the conditions of the task into consideration that depend on three parameters: geometric dimensions - D, time - T, cost - C.	Develop the Dimension, Cost and Time Analysis of the prototype.	(Michael, 2006)
5.2.3.- Learning.	Because collect data from the validation and from testing to improve the system.	Review the information obtained from the tests and thus be able to fix and improve the prototype. Get information and learn from this information	Learn and improve the prototype according to the testing. List the issues found in the testing and validation and resolve it.	(Osterwalder et al, 2014)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
5.3.- Validation.	Becuase it closes the gap between the problem and solution.	It is the action of confirming a desired action under certain parameters, and having a correlation between what we want and what we have	Validate the prototype according to the rules and specifications.	(Osterwalder et al, 2014)
5.3.1.- Sales strategy.	Because it identifies sales channels.	This step helps create a sale strategy to start sale the product or service.	Describe the cash a company generates from each customer segment.	(Osterwalder et al, 2014)
6.1.- Marketing strategy.	Because Identify potential consumers.	Start promoting the product in the different communication channels, develop the market strategy to obtain customers using the minimally viable product and present it.	Start with the marketing to sell the product.	(Osterwalder & Pigneur, 2010)
6.2.- Ambition perimeter.	Because provide a visualization of the situation.	Important usage situations where major problems are experienced and the current solutions provide little or no relief.	The company's identity, and elements of market expectations.	(Lamé, Yannou, & Cluzel, 2018b ; Yannou, Lamé, et al., 2018)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
6.3.- Business model canvas.	Because visualize and communicate a simple story of your business model.	Define a business plan and strategy to sell the produc tor service.	Develop Business model canvas template	(Osterwalder & Pigneur, 2010)
6.4.- 7 Law of evolution (Law of the transition from a macro-level to a micro-level).	Because it transfers functionality to the micro level.	The development of the working bodies of technical systems occurs initially at the macro-level, but at the micro-level in a developed system.	Try to change the system so that there is no need to measure/detect.	(Michael, 2006)
6.5.- 8 Law of evolution (dynamization).	Because it transforms a rigid system into a flexible system and makes it controllable.	Make an object (or its parts) moveable, optimize the characteristics of the process (of an object) in every stage.	Shape the effects in various was so the location of their installation is difficult to find	(Michael, 2006)
6.6.- Kano analysis.	Because measure customer satisfaction through feedback from surveys.	Is a simple looking tool that has grave implications of the field of quality management. We need to get feedback from the customers to improve our system.	The Kano analysis brought about this change from changing the measurement of quality from one-dimensional to two dimensional.	(« Kano model tool - build & analyse surveys for free », s.d.)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Action parameter.	Because, decide when to use a proposed function, depending on the desired action.	A change being made or a 'doing word'	-Useful actions which deliver something you want -Insufficient useful actions which deliver somethin-g you want but not enough of it -Excessive useful actions which deliver too much of something you want -Harmful actions which deliver something you don't want	(Gadd, 2011 ; Haines-Gadd, 2016)
Activity field.	-	Is focused on leveraging research and development to bring new products and services to market	Is your business model expiring? Do you need to add new resources or activities? Do the existing ones offer an opportunity to expand your business model? Could you bolster your existing business model or should you build completely new ones? Is your business model portfolio fit for the future?	(Osterwalder et al, 2014)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Administrative contradiction.	Becuase define how resolve the problem	The situation is described using a reference to the inadequacies that should be addressed or to the goals that should be reached.	I would like that____ but I don't know how. The goal is set but the means are not yet clear. Answer: I know what, but I don't know how!	(Gadd, 2011 ; Harrington, 2017 ; Michael, 2006 ; Pascal, 2020)
After sales and Customer Care.	-	–	Look for gaps in what the customer wants and expects the product to do versus what it does in reality. Customer feedback is relatively weak evidence, but it is helpful in determining unmet needs to explore.	(Osterwalder et al, 2014)
Available resources.	-	Is the resources to develope something	Seeking resources and support for develop the project	(*PMBOK® Guide*, 2021)
Beneficial Factor.	-	A good output which fulfi ls a need only describes what we want – offers no solutions	Set a list of benefical factors	(Haines-Gadd, 2016 ; Horowitz, 1999)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Benefits.	Because shows the improvements for stakeholders of the product or service.	A helpful or good effect, or something intended to help.	Set a list of benefits for customers	(Gadd, 2011)
Best Solution.	-	The selection of ideas in the convergent part and the monitoring of idea maturities are aided by the so-called UNPC monitor tool.	1 pre-selection and 2 selection jurys « problem setting » and « problem solving » with the aid of an UIPC scoring chart	(Yannou et al., 2016)
Causes.	-	–	Are the causes identify?	(Ries, 2011)
Commercialization.	Because determine how to sell the product or service developed.	Sale the product or service to get revenue.	Build the channels block by bussiness model canvas: how a company communicates with and reaches its Customer Segments to deliver a Value Proposition	(Osterwalder & Pigneur, 2010)
Company's value.	-	Is the worth, importance, or usefulness of somthing.	Characteristic that makes the company different	(Hemmer Gudme & Poissonnier, 2017)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Company's Vision.	-	A summarized, high-level description about the expectations for a product or service such as target market, users, major benefits, and what differentiates the product from other in the market.	The general idea is related to company's vision.	(*PMBOK® Guide*, 2021)
Concept.	-	Is proposition, or a group of propositions that have no logical status in Knowledge	In Design, a concept usually expresses a group of properties qualifying one or several entities	(Hatchuel & Weil, 2008 ; Johnson et al., 2008 ; Le Masson et al., 2017)
Consequences.	-	Results or effects of whatever nature and order that derive directly or indirectly from referent's existence, occurrence or operation.	Investigate the consequences of the use of possibilities that result from the appearance of positive side effects.	(Gadd, 2011 ; Michael, 2006)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Correlatation.	-	Results between what we want and what we planned.	Validate and test the prototype to confirm needs	(Osterwalder et al, 2014)
Cost.	-	–	Define wether the system of the general idea has a zero cost or is very high. Define the cost of the product or service	(Kim & Mauborgne, 2017 ; Michael, 2006)
Customer profile.	Because it identifies and classifies user needs.	At this stage of the process, knowing the user's profile helps to select the best idea.	According to the customer profile select the idea	(Osterwalder et al, 2014)
Customer Value.	-	Offer a sustainably differentiated solution for strong, unmet customer needs.	For [INSERT: target customer segments] dissatisfied with [INSERT: existing solution] due to [INSERT: unmet needs], [INSERT: venture name] offers a [INSERT: product category] that provides [INSERT: key benefits of your defensible, differentiated solution].	(Pride, 2018)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Data.	Because it collects all the information related to the problem.	Is the information related to the situation.	Obtain inforamtion related to the initial situation and the current situation.	(Ries, 2011)
Define activity field.	-	Is focused on leveraging research and development to bring new products and services to market	List the activity field	(Osterwalder & Pigneur, 2010)
Define number of subsystem or components.	-	The term Product or System is very broadly defined and can represent many things.	Create function list of all components and their interactions (prime system and its components.	(Gadd, 2011)
Desired Action.	-	Is the effect that we wanto to have according to the system.	The function we want to achieve for our product/system, and then simply match from the effects a function. Does the general idea achieve the desired action? Prevent object A from acting negatively on object B	(Horowitz, 1999)
Desired phenomenon.	Because identify what we want the system to do.	Is the effect that we wanto to have according to the system.	The function we want to achieve for our product/system, and then simply match from the effects a function.	(Gadd, 2011 ; Horowitz, 1999)
Dimension.	-	Helps to get managers thinking from a demand-side perspective.	Helps managers identify the full range of utility spaces that a product or service can potentially fill.	Hachette Books.(Kim & Mauborgne, 2017)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Effect desired.	-	Is the effect that we wanto to have according to the system.	The function we want to achieve for our product/system, and then simply match from the effects a function.	(Horowitz, 1999)
Effect undesired.	-	Are the effect that we do not want in the final result	Define the effect undesired.	(Horowitz, 1999)
Elements.	-	Are parts, can include people, hardware, software, facilities, policies and documents; that is, all things required to produce systems - level results.	Objects of the problem and Environment of the problem defined	(Gadd, 2011)
Functions.	-	Are the ways we get the outcomes.	Add something to the components to overcome insufficiency Change/evolve the components to overcome insufficiency Get a better or another action – achieve more effective actions	(Osterwalder et al, 2014)
Generic Interpretation.	-	_	Define generic ideas	(Horowitz, 1999)
Ideal Goal.	-	Goals can have a window of 5–30 years. Objectives are long- or short-term activities or actions necessary to attain the goals.	According to the ideal goal select the idea	(Webb, 2019)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Identified value.	-	Is the worth, importance, or usefulness of something.	Complete next sentence: Our (produc) helps (customer segment) who wants to (jobs to be done) by reducing (customer pain) and increasing (customer gain), unlike (competiting value proposition).	(Osterwalder et al, 2014)
Implementation.	-	–	Lauch the product or services.	(*PMBOK® Guide*, 2021)
Initial Situation.	Because reach the difference between the current situation and the past situation.	Is the gap between the previus situation and the desired situation. Understand the current situation and the previous one to understand the problem.	Develop a chart of comparation, Initial situation Vs current situation	(Hemmer Gudme & Poissonnier, 2017)
Innovation classification.	Because it orders the category of the idea according to its impact on the user.	Determine the innovation classification, radical (really change the scenery), disruptive (scalable movement that reaches many people at the same time.) or incremental (adding something new).	Categorize and select ideas according to the problem to be solved	(Balachandra, 2000 ; Yannou, Lamé, & Cluzel, 2017)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Launch of produt or service.	-	_	Revenue	(Osterwalder & Pigneur, 2010)
Main Functions.	-	Are the ways we get the outcomes.	Add something to the components to overcome insufficiency Change/evolve the components to overcome insufficiency Get a better or another action – achieve more effective actions	(Osterwalder et al, 2014)
Market impact.	-	_	According to the market needs evaluate the best idea	(Osterwalder et al, 2014)
Market needs.	Because provide the needs of the market.	Outlines market needs and analyzes how well they are served.	What do customers need? Where are the biggest unsatisfied customer needs? What do customers really want to get done? Where is demand increasing? Declining?	(Osterwalder & Pigneur, 2010)
MoSCoW (Must-have, Should-have, Could-have, Won't-have).	Because it prioritizes the needs of the user.	Is used to prioritize each capability.	Define what factors of MoSCoW applies for the general idea.	(*PMBOK® Guide*, 2021)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
MVP (Minimun Vialable Product).	-	Is essentially the product with the minimum number of features that a customer will pay for	Is to determine and start with the single most important feature. Develop MVP to start the sells	(Pride, 2018)
Needs.	Because define what we want to have.	A needs is a problem, opportunity, or constraint with potential value to stakeholders.	What is the biggest customer frustration? What do customers really want to get done? What we want our system to do (all requirements and their contradictions).	(Hemmer Gudme & Poissonnier, 2017)
Negative Effect.	Because they are the actions or situations that we do not want to have.	Are the effect that we do not want in the final result	List the negatives effects of the situation	(Gadd, 2011)
Neutral Factor.	-	Factor that counteracts the consequences.	Create the concept to confirm the neutral factor.	(Horowitz, 1999)
Object known.	-	–	The concept refers to a set of solutions known, whose performance is also known.	(Johnson et al., 2008 ; Le Masson et al., 2017)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Observation.	Because it visualizes all the parameters that cause the undesired situation.	Get a deep understanding of the pains/problems possibly occurring in this usage situation, for measuring them (frequency, repeatability, importance, consequences) and carrying out a root cause analysis.	Practically, a pre-screening of problems is made and a first version of the causal graph of problems sketched.	(Gadd, 2011 ; Yannou, Lamé, et al., 2018)
Opportunity to Improve.	-	–	Identify the pains and try to solve them. Collect feedback from your users. Identify the areas of improvement or identify the areas of opportunity	(Osterwalder et al, 2014)
Organization Value.	-	Is the worth, importance, or usefulness of somthing.	The general idea is related to organizational values	(*PMBOK® Guide*, 2021)
Organization's goals.	Because it visualizes the direction where the organization wants to go by identifying what it wants to achieve.	The organization's goals is to create long-term business value.	Set goals, both large and small, long term and short term. For any type of innovation—from saving time in a process to improving a product—identify what you want to achieve, how long you have to get it accomplished, and what constitutes success. Develop a SMART rule.	(Kerzner, 2019 ; Webb, 2019)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Parameters.	-	–	Validate the prototype according to the parameters. Test the prototype according to the parameters.	(Gadd, 2011)
Physical contradiction.	Because define which means.	The situation is described using a reference to the physical property of an element or of the entire system in which one value of this property is necessary to achieve one certain function of the system while another value is necessary to achieve another.	Both factors are positive. They work against each other because they are in conflict over a certain resource that they both need but that they cannot use simultaneously or to the degree needed. Answer: I know what and how, but I don't know by which means!	(Gadd, 2011 ; Harrington, 2017 ; Michael, 2006 ; Pascal, 2020)
Positive effect.	-	Are the effect that we want in the final result	Create the prototype according to the Positive effect.	(Horowitz, 1999)
Problem.	Because define the gap between systems and needs, requirements or benefits we want to have.	Problems are gaps between requirements and their fulfi lment by systems.	Find and list the problem.	(Gadd, 2011)
Product or service Kickoff.	Because expect to have a product or service on time and with success.	It establishes the start of the project, phase or iteration.	Set a meeting with the team members and stakeholders to establish the expectations and scope of the project to launch the product or service on time.	(*PMBOK® Guide*, 2021)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Requirements.	Because define what we need to have.	Is something that you must do, or something you need have.	List the requirements: -Manufacturing requirements. (define whether the needs has to be manufactured in a specific way). -Legal requirements (verify whether the needs affect any legal topic). -Design requirments (define how the desig hast to be design). -Functional requirements (benefits we want provided by functions). -Technical requirements (benefits we want to provide by system). -Customer requirements (scope want the customer wants).	
Revenue.	Because it generates profits for the organization.	Represents the cash a company generates from each Customer Segment (costs must be subtracted from revenues to create earnings).	Answer the question: For what value are our customers really willing to pay? For what do they currently pay? How are they currently paying? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues?	(Osterwalder & Pigneur, 2010)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Root Cause.	Because it analyzes and compares the causes of the problem.	Is the root of the cause to solve the problem from the origin.	Find the root cause that causes the effect undesired.	(Ries, 2011)
Rules.	-	–	Does the general idea achieve the rules of the product or service?	(Johnson et al., 2008 ; Le Masson et al., 2017)
Scope.	-	Define the scope of the idea.	Setting up boundaries related to the strategy so that reasonable goals can be established for the projects	(Kerzner, 2019)
Specific problem.	-	–	Problem defined	(Gadd, 2011)
Specifications.	-	These are the technical, administrative and physical requirements.	List of specifications requireds, legal, financial, rules. Details and characteristics for the operation of the product or service	(Johnson et al., 2008 ; Le Masson et al., 2017)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Symmetry in space.	Because Identify where the problem is.	Solve a problem by turning a symmetrical situation into an asymmetrical one. Find the elements of the problem according to the place.	Connects two previously unconnected variables (say Z and W) resulting in the formation of a new variable (dZ/dW) Complete next sentences: at different places in [Item] there will be different values for [chosen characteristic].	(Horowitz, 1999)
System requirements.	-	Are the requirements of the functions, and systems	Create the prototype according to the system requirements.	(Gadd, 2011)
Technical contradiction.	Because the improvement of a parameter, worsens another parameter.	The situation is described using a reference to the incompatible functions or functional properties of the system of which one of the these facilitates the useful primary function of the entire system.	If I improve __ from __ it should also __ One of the factors corresponds to and supports the useful mail function of the system (positive factor or plus-factor), the other one does not correspond to this function and even hinders it (negative factor or minus-factor) I know how, but if I do it, something else is worsening.	(Gadd, 2011 ; Harrington, 2017 ; Michael, 2006 ; Pascal, 2020)
Technical requirements.	-	Are the technical issues that must be considered to successfully complete a project. These can include aspects such as performance, reliability, and availability.	Create the prototype according to the technical requirements.	(Gadd, 2011)

Table 6.1 Chart Description (Cont'd)

Item	Why	Description	Expectation	Reference
Time.	Because define when the situation occurs.	Frequency of events, duration of time intervals, order of events in time, value of later or action.	Connects two previously unconnected variables (say Z and W) resulting in the formation of a new variable (dZ/dW) Complete next sentence: at different times, there will be different values for [chosen characteristic] of [chosen item].	(Horowitz, 1999)
User profile.	Because it identifies and classifies user needs.	A customer profile is defined by three components: pains, gains and jobs. It is necessary to understand the user profile to provide benefits.	Create the user profile: what is the user's pain? What is the user's gains and what is the user's job?	(Osterwalder et al, 2014)
Zone.	Because Identify where the problem is.	Solve a problem by turning a symmetrical situation into an asymmetrical one according to the place	Complete next sentences: at different places in [Item] there will be different values for [chosen characteristic].	(Horowitz, 1999)

APPENDIX II

LINKS FOR EXTRA MATERIAL

This appendix aims to show some internet sites where you can find more references to the methods that were mentioned, it will also help you find more information with different examples and different explanations.

Table 6.2 Links For Extra Material

Item	Links
1.1.1.- 5 W method.	https://kanbanize.com/lean-management/improvement/5-whys-analysis-tool https://www.isixsigma.com/implementation/basics/using-five-ws-and-one-h-approach-six-sigma/ https://www.wimi-teamwork.com/blog/the-5w1h-method-project-management-defined-and-applied/#:~:text=Definition,by%20analysing%20all%20the%20aspects.
1.2.2.- Qualitative change.	https://www.toolshero.com/problem-solving/systematic-inventive-thinking-sit/ https://drewboyd.com/how-to-use-the-closed-world-principle-of-creativity/
1.2.3.- Closed world.	https://www.toolshero.com/problem-solving/systematic-inventive-thinking-sit/ https://drewboyd.com/how-to-use-the-closed-world-principle-of-creativity/
1.3.3.- FAST method.	https://www.valueanalysis.ca/fast.php https://www.npd-solutions.com/va.html
1.3.4.- Existing solution.	https://www.oberlo.com/ecommerce-wiki/benchmarking
2.1.2.- Closed world.	https://www.toolshero.com/problem-solving/systematic-inventive-thinking-sit/ https://drewboyd.com/how-to-use-the-closed-world-principle-of-creativity/

Table 6.2 Links For Extra Material (Cont'd)

Item	Links
2.1.3.- Contradiction.	https://www.opensourcetriz.com/index.php/triz-books/triz-skills/resolving-contradictions https://medium.com/uxssr/the-theory-of-inventive-problem-solving-101-a5d4592297d6 https://www.solidcreativity.com/Livres.php http://www.triz40.com/TRIZ_GB.php http://creatingminds.org/tools/triz/triz_contradiction_analysisht m#:~:text=For%20example%20in%20a%20car,in%20the%20T RIZ%20Contradictions%20list.
2.2.1.- Partition.	'https://www.ck-theory.org/?lang=en
2.2.2.- Unification.	https://www.toolshero.com/problem-solving/systematic-inventive-thinking-sit/ https://drewboyd.com/how-to-use-the-closed-world-principle-of-creativity/ https://www.metodolog.ru/triz-journal/archives/2001/09/b/index.htm
2.2.3.- Multiplication.	https://www.toolshero.com/problem-solving/systematic-inventive-thinking-sit/ https://drewboyd.com/how-to-use-the-closed-world-principle-of-creativity/ https://www.metodolog.ru/triz-journal/archives/2001/09/b/index.htm
2.2.4.- Division.	https://www.toolshero.com/problem-solving/systematic-inventive-thinking-sit/ https://drewboyd.com/how-to-use-the-closed-world-principle-of-creativity/ https://www.metodolog.ru/triz-journal/archives/2001/09/b/index.htm
2.2.5.- Breaking symmetry.	https://www.toolshero.com/problem-solving/systematic-inventive-thinking-sit/ https://drewboyd.com/how-to-use-the-closed-world-principle-of-creativity/ https://www.metodolog.ru/triz-journal/archives/2001/09/b/index.htm

Table 6.2 Links For Extra Material (Cont'd)

Item	Links
2.2.6.- Object Removal.	https://www.toolshero.com/problem-solving/systematic-inventive-thinking-sit/ https://drewboyd.com/how-to-use-the-closed-world-principle-of-creativity/ https://www.metodolog.ru/triz-journal/archives/2001/09/b/index.htm
2.2.7.- Brainstorming.	https://www.ideou.com/pages/brainstorming
2.3.1.- Existing solution.	https://www.oberlo.com/ecommerce-wiki/benchmarking
2.3.2.- 9 Multi-screen method.	https://asq.org/quality-resources/nine-windows
2.3.3.- TRIZ 40.	https://www.opensourcetriz.com/index.php/triz-books/triz-skills/resolving-contradictions https://medium.com/uxssr/the-theory-of-inventive-problem-solving-101-a5d4592297d6 https://www.solidcreativity.com/Livres.php http://www.triz40.com/TRIZ_GB.php http://wbam2244.dns-systems.net/EDB/index.php https://www.managementstudyguide.com/triz-matrix.htm
2.3.5.- Qualitative change.	https://www.toolshero.com/problem-solving/systematic-inventive-thinking-sit/ https://drewboyd.com/how-to-use-the-closed-world-principle-of-creativity/
3.1.3.- DSM Method.	http://projectdsm.com/dsm-method/ https://en.wikipedia.org/wiki/Design_structure_matrix' https://dsmweb.org/introduction-to-dsm/
3.2.2.- Qualitative change.	https://www.sitsite.com/method/qualitative-change/#:~:text=The%20Qualitative%20Change%20(QC)%20principle,instrumental%20to%20the%20problem's%20solution.
4.1.- Little Smart people.	https://www.benchmarksixsigma.com/forum/topic/36245-smart-little-people/
4.2.- 4 Law of evolution (Law of the evolution of the growth of the ideality).	https://www.triz.co.uk/structured-innovation https://www.sparkrail.org/Pages/HSTriz.aspx
4.3.- Conjunction.	https://www.ck-theory.org/?lang=en

Table 6.2 Links For Extra Material (Cont'd)

Item	Links
4.4.- 9 Multi-screen.	https://asq.org/quality-resources/nine-windows
4.7.- 5 Law of evolution (Law of the varying development of a system's parts).	https://www.triz.co.uk/structured-innovation https://www.sparkrail.org/Pages/HSTriz.aspx
5.1.1.- 9 Multi-screen method.	https://asq.org/quality-resources/nine-windows
5.1.2.- 6 Law of evolution (Law of the transition into a super-system).	https://www.triz.co.uk/structured-innovation https://www.sparkrail.org/Pages/HSTriz.aspx
5.1.3.- 7 Law of evolution (Law of the transition from a macro-level to a micro-level).	https://www.triz.co.uk/structured-innovation https://www.sparkrail.org/Pages/HSTriz.aspx
5.1.4.- 8 Law of evolution (dynamization and controllability).	https://www.triz.co.uk/structured-innovation https://www.sparkrail.org/Pages/HSTriz.aspx
5.1.5.- Kano analysis.	https://www.managementstudyguide.com/triz-matrix.htm https://www.kanosurveys.com/
6.2.- Ambition perimeter.	https://www.kanosurveys.com/
6.3.-Business model canvas.	https://www.strategyzer.com/canvas/business-model-canvas
6.4.- 7 Law of evolution (Law of the transition from a macro-level to a micro-level).	https://www.triz.co.uk/structured-innovation https://www.sparkrail.org/Pages/HSTriz.aspx
6.5.- 8 Law of evolution (dynamization).	https://www.triz.co.uk/structured-innovation https://www.sparkrail.org/Pages/HSTriz.aspx

Table 6.2 Links For Extra Material (Cont'd)

Item	Links
6.6.- Kano analysis.	https://www.managementstudyguide.com/triz-matrix.htm https://www.kanosurveys.com/
Administrative contradiction.	https://www.opensourcetriz.com/index.php/triz-books/triz-skills/resolving-contradictions https://medium.com/uxssr/the-theory-of-inventive-problem-solving-101-a5d4592297d6 https://www.solidcreativity.com/Livres.php http://www.triz40.com/TRIZ_GB.php
Commercialization.	https://www.strategyzer.com/business-model-canvas/channels
Concept.	https://www.ck-theory.org/?lang=en
Consequences.	https://www.opensourcetriz.com/index.php/triz-books/triz-skills/resolving-contradictions https://medium.com/uxssr/the-theory-of-inventive-problem-solving-101-a5d4592297d6 https://www.solidcreativity.com/Livres.php http://www.triz40.com/TRIZ_GB.php http://wbam2244.dns-systems.net/EDB/index.php
Customer Value.	https://www.helpscout.com/blog/value-proposition-examples/ https://www.decisionlink.com/what-is-a-customer-value-proposition/
Dimension.	https://www.blueoceanstrategy.com/tools/buyer-utility-map/ http://www.drypen.in/marketing/the-six-stages-of-buyer-experience-cycle.html https://ariel-lim.com/blog/buyer-utility-map/
Ideal Goal.	https://www.atlassian.com/blog/productivity/how-to-write-smart-goals 'https://www.impraise.com/blog/smart-goals-in-the-workplace-what-how-and-why
Identified value.	https://www.helpscout.com/blog/value-proposition-examples/ https://www.decisionlink.com/what-is-a-customer-value-proposition/
MoSCoW (Must-have, Should-have, Could-have, Won't-have).	https://www.productplan.com/glossary/moscow-prioritization/ https://www.techtarget.com/searchsoftwarequality/definition/MoSCoW-method
MVP (Minimun Vialable Product).	https://clearbridgemobile.com/planning-a-minimum-viable-product-a-step-by-step-guide/

Table 6.2 Links For Extra Material (Cont'd)

Item	Links
Organization's goals.	https://www.atlassian.com/blog/productivity/how-to-write-smart-goals 'https://www.impraise.com/blog/smart-goals-in-the-workplace-what-how-and-why
Physical contradiction.	https://www.opensourcetriz.com/index.php/triz-books/triz-skills/resolving-contradictions https://medium.com/uxssr/the-theory-of-inventive-problem-solving-101-a5d4592297d6 https://www.solidcreativity.com/Livres.php http://www.triz40.com/TRIZ_GB.php http://wbam2244.dns-systems.net/EDB/index.php
Product or service Kickoff.	https://www.atlassian.com/work-management/project-management/project-kickoff
Revenue.	https://www.strategyzer.com/business-model-canvas/revenue-streams
Symmetry in space.	https://www.metodolog.ru/triz-journal/archives/2001/09/b/index.htm
Technical contradiction.	https://www.opensourcetriz.com/index.php/triz-books/triz-skills/resolving-contradictions https://medium.com/uxssr/the-theory-of-inventive-problem-solving-101-a5d4592297d6 https://www.solidcreativity.com/Livres.php http://www.triz40.com/TRIZ_GB.php
Time.	https://www.metodolog.ru/triz-journal/archives/2001/09/b/index.htm
Zone.	https://www.metodolog.ru/triz-journal/archives/2001/09/b/index.htm

BIBLIOGRAPHY

Agile Practice Guide. (2017). (S.l.) : (s.n.). Repéré à https://www.pmi.org/pmbok-guide-standards/practice-guides/agile

Ahuja, S. B. (2019, 22 juillet). Why Innovation Labs Fail, and How to Ensure Yours Doesn't. *Harvard Business Review*. Repéré à https://hbr.org/2019/07/why-innovation-labs-fail-and-how-to-ensure-yours-doesnt

Altshuller, G. S. (1984). *Creativity as an exact science: the theory of the solution of inventive problems*. (S.l.) : Gordon and Breach Science Publishers.

Altun, Y. B. (2021). Council Post: Pandemic Fuels Global Growth Of Entrepreneurship And Startup Frenzy. *Forbes*. Repéré à https://www.forbes.com/sites/forbestechcouncil/2021/04/09/pandemic-fuels-global-growth-of-entrepreneurship-and-startup-frenzy/

Balachandra, R. (2000). An expert system for new product development projects. *Industrial Management & Data Systems*, *100*(7), 317-324. https://doi.org/10.1108/02635570010291784

Bekhradi, A., Yannou, B., Cluzel, F., & Vallette, T. (2017). CATEGORIZING USERS PAINS, USAGE SITUATIONS AND EXISTING SOLUTIONS IN FRONT END OF INNOVATION: THE CASE OF SMART LIGHTING PROJECT. Dans *21st International Conference on Engineering Design (ICED 17)*. Vancouver, Canada. Repéré à https://hal.archives-ouvertes.fr/hal-01665096

Bergmann, T., & Karwowski, W. (2019). Agile Project Management and Project Success: A Literature Review. Dans J. I. Kantola, S. Nazir, & T. Barath (Éds), *Advances in Human Factors, Business Management and Society* (pp. 405-414). Cham : Springer International Publishing. https://doi.org/10.1007/978-3-319-94709-9_39

Bytheway, C. W. (2007). *FAST creativity and innovation: Rapidly improving processes, product development and solving complex problems*. (S.l.) : J. Ross Publishing.

Chen, J., & Zheng, G. (2019). Innovation Management: Systemic Framework and China's Exploration. *Books24x7*. Repéré à https://library.books24x7.com/assetviewer.aspx?bookid=146308&chunkid=641302699&rowid=17

Curtis, L. (2013, 13 novembre). The Millennial Startup Revolution. *Forbes*. Repéré à https://www.forbes.com/sites/85broads/2013/11/18/the-millennial-startup-revolution/

Daryousef, M. (2019). *Exploring the Strategies Project Managers Need for Business Transformation and Sustainability for New Product Development*. D.M. Colorado Technical University, United States -- Colorado. Repéré à https://search.proquest.com/pqdtglobal/docview/2325353205/abstract/D0818F5039124311PQ/53

Faulty GPS Systems | Chicago Car Accident Lawyers. (2020, 12 mars). Repéré à https://stromlawyers.com/blog/2020/03/faulty-gps-systems/

Gadd, K. (2011). TRIZ for Engineers: Enabling Inventive Problem Solving. *Books24x7*. Repéré à http://library.books24x7.com/toc.aspx?bookid=41714.

Haines-Gadd, L. (2016). *TRIZ for Dummies*. (S.l.) : John Wiley & Sons.

Harrington, H. J. (2017). *Lean TRIZ: how to dramatically reduce product-development costs with this innovative problem-solving tool*. (S.l.) : Productivity Press.

Hatchuel, A., & Weil, B. (2003). A new approach of innovative Design: an introduction to CK theory. Communication présentée au DS 31: Proceedings of ICED 03, the 14th International Conference on Engineering Design, Stockholm.

Hatchuel, A., & Weil, B. (2008). C-K design theory: an advanced formulation. *Research in Engineering Design*, *19*(4), 181. https://doi.org/10.1007/s00163-008-0043-4

Hemmer Gudme, O., & Poissonnier, H. (2017). *Valeur(s) & management:Des méthodes pour plus de valeur(s) dans le management.* (EMS). (S.l.) : (s.n.). Repéré à https://doi.org/10.3917/ems.dehem.2017.01

Hengsberger, A. (2018, 27 avril). 4 reasons why innovations fail. Repéré à https://www.lead-innovation.com/english-blog/why-innovations-fail

Horning, T. M. (2018). *Successful Project Management*. D.B.A. Walden University, United States -- Minnesota. Repéré à https://search.proquest.com/pqdtglobal/docview/2024272533/abstract/D0818F5039124311PQ/67

Horowitz, R. (1999). Creative problem solving in engineering design. *PhD. diss., Tel-Aviv University*.

Inigo, E. A. (2019). Sustainable Innovation: Creating Solutions for Sustainable Development. Dans W. Leal Filho, A. M. Azul, L. Brandli, P. G. Özuyar, & T. Wall (Éds), *Decent Work and Economic Growth* (pp. 1-11). Cham : Springer International Publishing. https://doi.org/10.1007/978-3-319-71058-7_51-1

Johnson, M., Christensen, C., & Kagermann, H. (2008). Reinventing Your Business Model. Harvard Business Review, December.

Kano model tool - build & analyse surveys for free. (s.d.). Repéré à https://www.kanosurveys.com/

Kerzner, H. (2019). *Innovation Project Management - Methods, Case Studies, and Tools for Managing Innovation Projects - 8. Business Models - Knovel*. (S.l.) : John Wiley & Sons. Repéré à https://app.knovel.com/web/view/khtml/show.v/rcid:kpIPMMCST2/cid:kt0125JH01/viewerType:khtml/root_slug:innovation-project-management/url_slug:business-models?&kpromoter=marc&b-toc-cid=kpIPMMCST2&b-toc-url-slug=introduction-innovation&b-toc-title=Innovation%20Project%20Management%20-%20Methods%2C%20Case%20Studies%2C%20and%20Tools%20for%20Managing%20Innovation%20Projects&page=1&view=collapsed&zoom=1

Kim, W. C., & Mauborgne, R. (2014). *Blue ocean strategy, expanded edition: How to create uncontested market space and make the competition irrelevant*. (S.l.) : Harvard business review Press.

Kim, W. C., & Mauborgne, R. (2017). *Blue ocean shift: Beyond competing-proven steps to inspire confidence and seize new growth*. (S.l.) : Hachette Books.

Lamé, G., Yannou, B., & Cluzel, F. (2018a). Analyzing RID methodology through the lens of innovative abduction (pp. 1879-1890). https://doi.org/10.21278/idc.2018.0322

Lamé, G., Yannou, B., & Cluzel, F. (2018b). Usage-driven problem design for radical innovation in healthcare. *BMJ Innovations*, *4*(1). https://doi.org/10.1136/bmjinnov-2016-000149

Le Masson, P., Weil, B., & Hatchuel, A. (2017). *Design Theory - Methods and Organization for Innovation.* (S.l.) : Springer. Repéré à https://link.springer.com/book/10.1007/978-3-319-50277-9

Majeed, I. (2018). *The Experiences of Project Leaders with Project Retrospective and Planning Processes: A Case Study*. D.P.A. Capella University, United States -- Minnesota. Repéré à https://www.proquest.com/docview/2019938704/abstract/CC65E7F6D3624253PQ/1

Méthode de créativité ASIT - Innovation Systématique. (s.d.). *ASIT.info*. Repéré à https://www.asit.info/

Michael, O. (2006). *Inventive Thinking through TRIZ - A Practical Guide*. (S.l.) : (s.n.). Repéré à https://link.springer.com/book/10.1007/978-3-540-33223-7

Mungila Hillemane, B. S., Satyanarayana, K., & Chandrashekar, D. (2019). Technology business incubation for start-up generation: A literature review toward a conceptual framework. *International Journal of Entrepreneurial Behavior & Research*, *25*(7), 1471-1493. https://doi.org/10.1108/IJEBR-02-2019-0087

Nelson, D. (2014). New Open Source Models for Innovation… Harnessing the Power of Social Networking by Crowdfunding, Crowdsourcing & Crowdvoting. *Innovation Crescendo*. Repéré à https://innovationcrescendo.wordpress.com/2014/03/30/new-open-source-models-for-innovation-harnessing-the-power-of-social-networking-by-crowdfunding-crowdsourcing-crowdvoting/

Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. *Books24x7*. Repéré à https://library.books24x7.com/toc.aspx?bookid=36516

Osterwalder et al, A. (2014). Value Proposition Design: How to Create Products and Services Customers Want. *Books24x7*. Repéré à https://library.books24x7.com/toc.aspx?bookid=80658

Pascal, J. (2020). Créativité Structurée - Des Principes TRIZ à la Méthode ASIT. Repéré à https://www.solidcreativity.com/Livre%20TRIZ%20a%20ASIT/Livre%20de%20TRIZ%20a%20ASIT.php

PMBOK® Guide. (2021) (Seventh). (S.l.) : (s.n.). Repéré à https://www.pmi.org/pmbok-guide-standards/foundational/pmbok?s_kwcid=AL!8620!3!593839342472!p!!g!!the%20project%20management%20body%20of%20knowledge&utm_job_number=5&utm_region_name=latin_america&utm_funnel_stage=customer_acquisition&utm_marketing_channel=paid_media&utm_marketing_subchannel=search_ppc_nonbranded&utm_start_date=04142022&utm_end_date=12312023&utm_source=google&utm_custom_field_one=pmbok_guide_latin_america&utm_custom_field_two=pmbok_seventh_edition&utm_custom_field_three=%7Bad_id%7D&utm_custom_field_four=the%20project%20management%20body%20of%20knowledge&utm_custom_field_five=%7Bmatch_type%7D&gclid=Cj0KCQjwyYKUBhDJARIsAMj9lkEnkvPF4LgdmJ_deEzUK-HzoxCkh3Pb6wzi4LBdg9z23jYzc3Czd9waAsXzEALw_wcB

Pride, J. (2018). Unicorn tears: Why startups fail and how to avoid it. *Books24x7*. Repéré à http://library.books24x7.com/toc.aspx?bookid=139101.

PUBs, F. (1993). Integration definition for function modelling (IDEF0). *Federal information processing standards publication*, *183*.

Ramazani, J., & Jergeas, G. (2015). Project managers and the journey from good to great: The benefits of investment in project management training and education. *International Journal of Project Management*, *33*(1), 41-52. https://doi.org/10.1016/j.ijproman.2014.03.012

Richards, D. (2014). The Seven Sins of Innovation: A Strategic Model for Entrepreneurship. *Books24x7*. Repéré à http://library.books24x7.com/toc.aspx?bookid=89462

Ries, E. (2011). *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*. (S.l.) : Crown Business.

Shenhar, A., Holzmann, V., Dvir, D., Shabtai, M., Zonnenshain, A., & Orhof, O. (2020). If You Need Innovation Success, Make Sure You've Got the Right Project. *IEEE Engineering Management Review*, *48*(1), 113-126. https://doi.org/10.1109/EMR.2020.2974698

The Standard for Portfolio Management – Fourth Edition. (2017) (Fourth Edition). (S.l.) : (s.n.). Repéré à https://www.pmi.org/pmbok-guide-standards/foundational/standard-for-portfolio-management

Thraen, J. (2016). *Mastering Innovation in China*. (S.l.) : (s.n.). https://doi.org/10.1007/978-3-658-14556-9

Tischler, L. (2001). Seven Secrets to Good Brainstorming. *Fast Company*. Repéré à https://www.fastcompany.com/63818/seven-secrets-good-brainstorming

Webb, N. J. (2019). The Innovation Mandate: The Growth Secrets of the Best Organizations in the World. *Books24x7*. Repéré à http://library.books24x7.com/toc.aspx?bookid=147490

Yannou, B., & Cluzel, F. (2015). Débuter un projet d'innovation – Le carnet de bord de l'investigation. Dans *Déployer l'innovation : Méthodes, outils, pilotage et cas d'étude*. (S.l.) : Techniques de l'Ingénieur. Repéré à https://hal.archives-ouvertes.fr/hal-01683497

Yannou, B., Cluzel, F., & Farel, R. (2018). Capturing the relevant problems leading to pain and usage driven innovations: the DSM Value Bucket algorithm. *Concurrent Engineering: Research and Applications*, *26*(2), 131-146. https://doi.org/10.1177/1063293X16666311

Yannou, B., Cluzel, F., & Lamé, G. (2018). Adapting the FBS Model of Designing for Usage-Driven Innovation Processes. https://doi.org/10.1115/DETC2018-86166

Yannou, B., Farel, R., & Cluzel, F. (2015). The DSM Value Bucket Tool. Dans A. Chakrabarti (Éd.), *ICoRD'15 – Research into Design Across Boundaries Volume 2* (pp. 49-61). New Delhi : Springer India. https://doi.org/10.1007/978-81-322-2229-3_5

Yannou, B., Farel, R. F., Cluzel, F., Bekhradi, A. B., & Zimmer, B. (2016). The UNPC innovativeness set of indicators for idea or project selection and maturation in healthcare. *International Journal of Design Creativity and Innovation*, *5*(3-4), 205-221. https://doi.org/10.1080/21650349.2016.1161562

Yannou, B., Lamé, G., & Cluzel, F. (2017). *Radical Innovation Design* (Vol. 2). (S.l.) : EMS Editions. (Bibliographie_available: 1Cairndomain: www.cairn.infoCite Par_available: 1page: 263-281container-title: Valeur(s) & management). Repéré à https://www.cairn.info/valeurs-et-management--9782376870722-page-263.htm

Yannou, B., Lamé, G., & Cluzel, F. (2018). Radical Innovation Design: Innover par les usages grâce à l'identification de poches de valeur. (pp. 269-287). (S.l.) : (s.n.).