

Final Degree Project

**Degree in Industrial Technology Engineering**

**Analysis of new products development in a  
consumer goods industry**

**MEMORY**

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## SUMMARY

This Final Degree Project is based on an Internship experience at the Kraft Foods Company. Kraft represents a global snacking powerhouse. It is an American multinational confectionery, food and beverage based business. The company manages well-known brands from all categories, starting from snacks such as Oreo or Chips Ahoy to gums and candy like Trident or Halls.

The Project is focused on the Gum and Candy department located in Spain (Barcelona) and it is based on the Product Change Management Team (PCM) role that serves the entire Iberia region (Spain and Portugal). At present, launching a brand-new product may seem simple and not very puzzling, although, the process involves a laborious and troublesome background which requires a careful analysis and observation.

Therefore, the principal objective of this Final Degree Project is to analyze the current Kraft Foods process of developing a new product and to propose improvement opportunities that could be implemented to ameliorate its efficiency from a PCM perspective.

The methodology used throughout this Project to accomplish the main objective is to; describe the execution of the Kraft Foods product development process, analyze the obstacles that have occurred using a real product development example and propose improvement alternatives to increase the probabilities of success. The proposed improvement opportunities throughout the project have strong probabilities of ameliorating the efficacy in the performance of the process.

All in all, leading the process of a new output calls for an accurate organization, an optimized way of working and the aptitude to solve the issues that may come up along the journey. This Project represents a new efficient proposal to overcome the current obstacles and to guarantee the success of the product development.



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## **GLOSSARY**

### **Available to Order (ATO)**

Defined date in which the product has been processed and it is ready to be ordered in the warehouse. It represents a requested deadline that needs to be achieved and it is settled before the launching process begins. The cross-functional team must have reached to previous agreement in order to establish the ATO deadline.

### **Bill of Material (BOM)**

List that includes all necessary components in order to manufacture a new gum or candy, the packaging involved and exhibitor.

### **Child sub-item**

Sub-item based on the minor next level element of a product. It can be an order unit or the purchasing unit for a customer in the market.

### **Consumer Unit (CU)**

Level of packaging of the product that a client can purchase in a retail store.

### **Cross-Functional Team**

Group of people with different functional expertise that work towards a common goal. It may include members from the finance, marketing or operations department to support the Project Manager in a particular project.

### **Four-Woodlock model Forecasting**

Product forecasting method that describes the volumes required by a particular client per unit time.

**Global Trade Identification Number (GTIN)**

Barcode of the products that provides a global solution in identifying any commercial article, especially, for the main customers.

**Go/Kill decisions**

Critical decisions made to determine if the product development should proceed to the next phase, where “Go” represents the statement to proceed and “Kill” stops the progress of the product.

**Improvement Opportunity (IO)**

Suggestions to help companies to improve their quality systems. An Improvement Opportunity represents advantageous circumstances to raise a process to a more desirable or more excellent quality or condition.

**Innovation Charter (IC)**

Stage Gate Document based on exploring and identifying opportunities. The IC document conducts the Idea Generation; it takes a significant part in the Idea Development Phase.

**Kick-Off Meeting (KOM)**

Reunion organized by the Project Manager which takes place between the Idea Development and the Project Development. It is based on a robust process to ensure comprehensive scope definition to facilitate effective project management. Additionally, establishes team alignment at the onset of the project.

**Kraft Item Code (KIC)**

Intern exclusive code assigned to the Kraft Foods own products. The RING system provides two codes that can be used depending on the selling country: KNAC-14 (USA or Canada) or KIC-7 (other countries). Every component that builds a finished good has a unique exclusive KNAC-14 or KIC-7.

**Launch Request (LR)**

Mandatory request defined by the execution of plans during the Project Development phase that represents the product launching. After the LR approval, discussions can commence with customers, materials and equipment can be ordered and commercial production planned.

**Marketing, Operations and Research (MOR) Meeting**

Meeting based on aligning strategies and resources at a region/country level. It is not mandatory but recommended when projects offer considerable complexity. It determines the Region business strategy, ensures that product development is in line with Kraft strategy and manages the development of growth quality and productivity.

The Go/Kill decisions made throughout the MOR meeting determine the complete progress of a product. Consequently, decisions made at the MOR meeting are superior to the ones defined at the PAM.

**Parent sub-item**

Sub-item based on a component of a product that has a child associated. The link established between the components of a product requires having a defined related parent of a minor component level.

**PCM: Product Change Manager**

Project Manager that represents the leadership of a Project based on the launching of a new or changing product. This person is involved in the management of the total Project timeline for on-time delivery and works closely with members from Marketing, Sales, Manufacturing, Research & Development, Quality, Finance, Procurement and Customer Service & Logistics. The Product Change Manager will be hereinafter referred to as Project Manager during this Final Degree Project.

**Product Approval Meeting (PAM)**

Meeting focused on aligning projects at a local level. It is based on providing project approval recommendations, ensuring shared understanding of strategies, enabling alignment of new product ideas with the country strategies and securing resources. During this meeting, Go/Kill decisions are determined.

**Product Component Linkage (PCL)**

Link between the different components that compose a finished good, also known as Parent/Child relationship.

**Product Development Request (PDR)**

Mandatory request for the project based on the details of the concepts to be developed, associated financial targets and action standards that need to be delivered in order to be successful.

**Product Label Request (PLR)**

Mandatory request for all projects which is arranged by the Regulatory department. It is used to refer to printed information affixed to a product. It identifies type, size, product line, manufacturer and other product-specific information in order to inform the consumer.

Additionally, in the context of consumer products, the PLR must include the nutritional information that should be located on the packaging. Basic nutritional information and a list of ingredients must appear on the product once launched in the market.

**Profit and Loss (P&L) statement**

Financial statement that summarizes the revenues, costs and expenses incurred during a specific period of time. The P&L statement is also known as an “income statement” and provides information that shows the ability of a company to generate profit by increasing revenue and reducing costs.

**Reserve Item Number Globally (RING)**

Global register system based on all the finished goods of Kraft Foods that are implemented in the SAP Portal.

**Stage Gate Document**

Document used to describe a point in a Project at which development is examined and relevant decisions are made. All Stage Gate Documents need to be approved in order to move onwards.

**Stage-Gate model**

Idea-to-launch methodology for driving new products into the market. It is composed by seven principles, several phases to be carried out sequentially and a diversity of roles and responsibilities that set into motion the structure.

**Stock Keeping Unit (SKU)**

Number to uniquely identify a product. SKUs are also known as product identifiers that distinguish one product from another.

**System, Applications & Products in Data Processing (SAP)**

German Software Company whose products allow businesses to track customer and business interactions.

**Trade Unit (TU)**

Generic term used to describe any level of the product hierarchy

**Unit Descriptor**

Category of the packaging or container of the component in the structure of a finished good that can be: each, inner-pack, case, pallet, display shipper and module.

## ACRONYMS

Acronym	Description
<b>ATO</b>	Available to Order
<b>BOM</b>	Bill of Material
<b>CU</b>	Consumer Unit
<b>GTIN</b>	Global Trade Identification Number
<b>IC</b>	Innovation Charter
<b>IO</b>	Improvement Opportunity
<b>KOM</b>	Kick-Off Meeting
<b>KIC</b>	Kraft Item Code
<b>LR</b>	Launch Request
<b>MOR</b>	Marketing, Operations and Research Meeting
<b>PCM</b>	Product Change Manager
<b>PAM</b>	Product Approval Meeting
<b>PCL</b>	Product Component Linkage
<b>PDR</b>	Product Development Request
<b>PLR</b>	Product Label Request
<b>P&amp;L</b>	Profit and Loss Statement
<b>RING</b>	Reserve Item Number Globally
<b>SKU</b>	Stock Keeping Unit
<b>SAP</b>	System, Applications & Products in Data Processing
<b>TU</b>	Trade Unit

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## PROLOGUE

This Final Degree Project is based on a full-time Internship at the Kraft Foods Company. Kraft Foods represents the world largest chocolatier and biscuit baker, the second-largest maker of candy and coffee and third largest producer of gum. Offices are all located in four regions; Asia Pacific, Europe, North and Latin America. Headquarters are located in Illinois, United States and the company was founded in 1923. At present, the Kraft Foods Company is experiencing a transition into a bigger organization known as Mondelēz International since 2014. The transition and background of the company is precisely described in Appendix A.

My role carried out is the Project Management or Product Change Management of a new consumer product launch process. The Internship was begun in the month of July 2014 and will be finished in June 2015, gathering eleven months of experience as a Project Manager. Furthermore, the practical experience is set out in Barcelona where all Iberia side (Spain and Portugal) is being managed. Additionally, functions developed as Project Manager are focused in the Gum and Candy department; nonetheless, the responsibilities given are the same ones among all departments.

Hence, New Product Development will be the main process that will be analyzed and set to motion along this Project. The principal aim is to describe how the product development process can be improved to overcome the current obstacles and to increment the capableness of success.

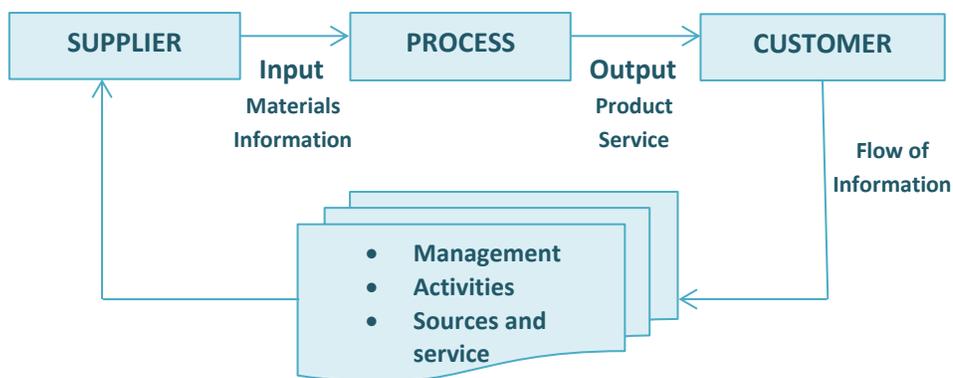
For that reason, the Kraft Foods product development process will be described as well as the barriers that impede the efficient progress of the process. As a result, improvement opportunities to confront the previous obstacles will be proposed.

## CHAPTER 1. INTRODUCTION

According to [1], New Product Development (NPD) is *“the lifeblood of a company that hopes to enhance their competitive posture or even to survive”*. An NPD is the complete process of bringing a new product to the market that involves systematic methods of designing, creating and launching.

As reported by [2], New Product Development is *“a vital part of any business, whether the product is for consumers or not. The constant change in markets and technology requires that companies take different steps to face new obstacles”*. Therefore, developing new products and improving existing ones is an important step in meeting these challenges. In line with [2], *“there is no one “best” method for managing new product projects, since what works for one segment of a concrete industry may not work for another one. Furthermore, there is no perfect project management process that a company can find and use over and over again being successful; it is the people that contribute that are critical. It is very important to have inspiring and ambitious team members”*

In this document, the process for developing a new product based on the consumer industry will be the main focus and will be represented by the framework in which the company of Kraft Foods is established. Nonetheless, it is important to understand the basic structure of systems that represent an NPD (see Figure 1).



**Figure 1.** Basic process structure of an NPD

As shown in Figure 1, an NPD process structure is grounded on the input of a supplier (raw materials) to the process that concludes in the output (product or service) to the main customer. Additionally, the customer provides the necessary feedback on the product to be managed in order to fulfill the requirements.

The “Idea To Market (I2M)” process is based on the so-called Stage-Gate model, a project management technique for driving new products to the market. Thus, the Stage-Gate model represents the standard framework for moving a new project from idea to launch. Consequently, the “Idea To Market (I2M)” process is a Kraft Foods Company customization of the common Stage-Gate model.

All in all, this document analyzes the “Idea To Market (I2M)” process of the Kraft Foods Company, hereafter stated as I2M. The main goal of the analysis is to explore possible inefficiencies in the process and propose improvements.

## 1.1 Objectives and methodology

The main objective of this Final Degree Project is to analyze how the I2M process is executed in order to propose Improvement Opportunities (IO) for a New Product Development (NPD) to increment the efficiency of the procedure and overcome the current obstacles. It is focused in the Fast-Moving Consumer Goods sector (FMCG) with the purpose of improving the launching of new projects to the market.

To accomplish the principal objective of this Final Degree Project, the following methodology will be carried out:

- To define the improvement goals to enhance the efficiency, to adapt to the constant changing market and to adjust production capacity to an estimated demand.

- To describe how the I2M process is coordinated and how it can be ameliorated from a Project Manager or PCM perspective. Furthermore, the Project Leader or Manager role throughout the I2M process will be explained. To that matter, phases in which the Project Manager contribution is vital, will be emphasized.
- To expose a new organization structure between departments: The non-stop evolution of the market requires moving a step forward in business. Competent and efficacious roles will be determined, as well as their respective functions and responsibilities.

To that end, the NPD described throughout this Final Degree Project is called “Halls XS” and it is based on a real product launching in which I have participated as Project Manager from the Gum and Candy department.

The Halls XS project started to be developed in May 2014 and it was launched on the month of December 2014. Consequently, the first phase of the Idea Development was arranged by a previous Project Manager until the month of July where I had begun the Internship. The next chapter describes precisely the Halls XS project.

## **1.2 Halls XS project**

In this chapter, the main characteristics of the product Halls XS launched throughout this Final Degree Project are described. The Halls XS project belongs to the NPD project group, concretely, to a Line Extension which represents an expansion in the line of an existing brand, including new formats and innovations.

Halls is a well-known brand of a popular candy that is commonly used as a cough suppressant and offers several different flavors and varieties. In this case, Halls XS represents an innovation of the current Halls products that involves new packaging format plus brand-new shaped drops (see Figure 2).

All in all, the Halls XS project is considered to be good example of an NPD due to the following reasons:

- **Capable of illustrating all the principal steps;** it is fundamental to study and analyze the launching of a Project which follows entirely every step, since exceptional cases can be found that may have skipped phases for different reasons.
- **Proficient of exemplifying uncertainty;** controversial issues along the process will be highlighted in order to describe how does a Project Manager deal with difficulties and which alternatives are provided to move onwards.
- **Concluded launching;** inaccuracies and mistakes will be analyzed to improve the launch process for future projects.



**Figure 2.** Halls XS Consumer Unit in three flavors: Mint, Orange and Strong Mint

Therefore, the Halls XS project will be precisely described throughout this Final Degree Project and improvement opportunities will be proposed to ameliorate the performance of the previous NPD in the I2M process.

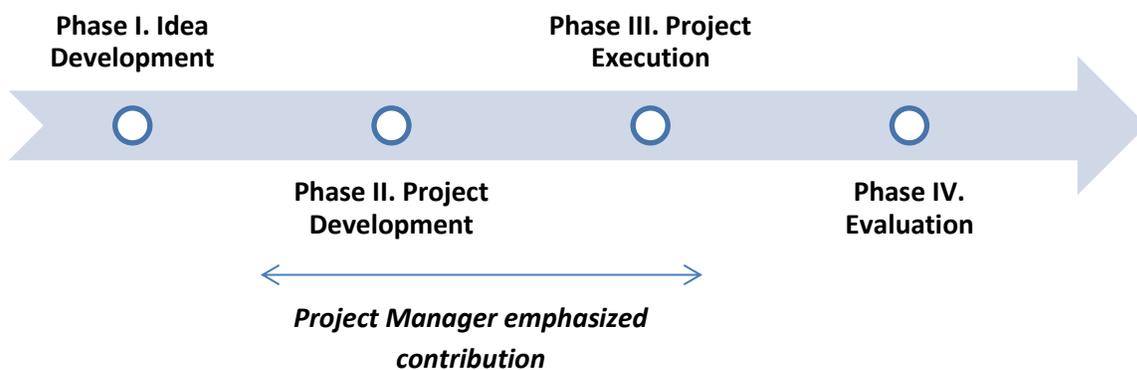
As a whole, chapters from 1 to 3 expose the background of the organization and the Stage-Gate model precisely whereas chapters from 4 to 10 represent the analysis of the I2M process and the improvement opportunities proposed. Altogether, the remainder of this document is structured as follows:

- **Chapter 1.** Describes the principal objective to be accomplished with a particular methodology. Furthermore, the Halls XS project is introduced.
- **Chapter 2.** Brings forward the Kraft Foods Company background and the structure of the organization.
- **Chapter 3.** Exposes the Stage Gate-model that is used in a NPD process describing the seven principles that compose the structure, the main phases, roles and responsibilities and the different Stage-Gate configurations.
- **Chapter 4.** Brings to light the I2M process with the principal phases and functions. In addition, the Project Manager contribution is described. Subsequently, the improvement opportunities in the I2M process are brought forward.
- **Chapter 5.** Looks into the structure and circuit of the I2M structure.
- **Chapter 6.** Describes the initial phase of the I2M process (Idea Development) with proposed improvement opportunities.
- **Chapter 7.** Describes the second phase of the I2M process (Project Development) with proposed improvement opportunities.
- **Chapter 8.** Describes the third phase of the I2M process (Project Execution) with proposed improvement opportunities.
- **Chapter 9.** Describes the final phase of the I2M process (Evaluation).
- **Chapter 10.** Exposes a global review of the improvement opportunities considered throughout this document.

- **Chapter 11.** Concludes the Final Degree Project with the best improvement opportunities and exposes the benefits and inconveniences of implementing the Stage-Gate model to launch new products.

### 1.3 Project scope

The project presented in this document forms part of the implementation of an I2M process at Kraft Foods. The global I2M process has a complex and large structure. It is based on a Stage-Gate model divided in four phases:



**Figure 3.** Phases of the I2M model with emphasis in Phase 2 (Project Development) and Phase 3 (Project Execution)

The project presented here is focused on the second and third phases in which the Project Manager has a critical contribution: the Project Development phase and Project Execution phase. However, all the phases will be described throughout the project.

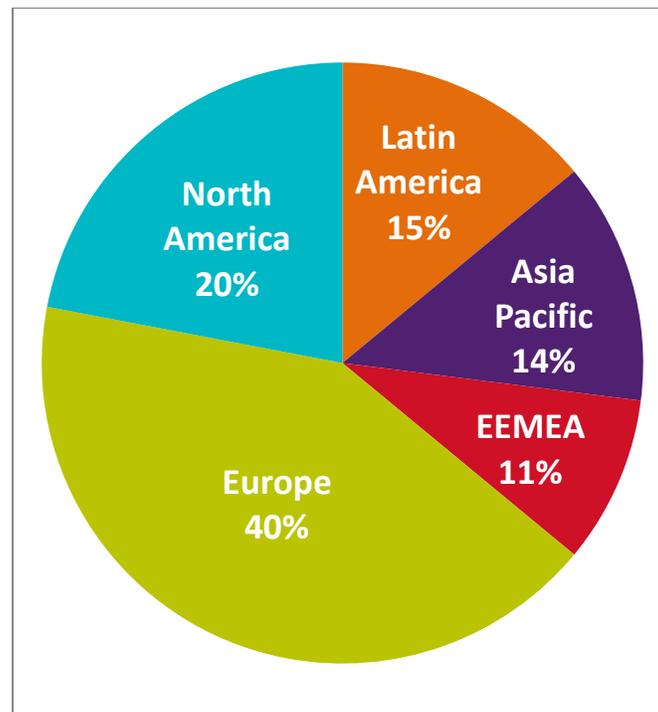
Consequently, the scope of the project is mainly based on the Project Development phase, where timeline and problem identification is established, and the Project Execution phase, where solutions are identified and progress is critical to improve the competition and efficiency of the company.

In order to develop the phases mentioned, previous result from a chosen launched product will be exposed. In spite of describing precisely the Project Manager contribution in the middle phases of the process, support given in all steps throughout the project will be introduced.

## CHAPTER 2. THE KRAFT FOODS COMPANY

The Kraft Foods Company has its origin in 1903, Chicago. The organization was initially set up to execute on a rollup strategy in the ice cream industry. At present, it represents a multinational confectionery, food and beverage conglomerate. The Kraft Foods Company serves more than 170 countries with their well-known brands.

Heretofore, the offices are located in North America, Latin America, Asia Pacific, Europe and Eastern Europe-Middle East-Africa (EEMEA). The amount of revenue provided by each region can be observed in Figure 4.

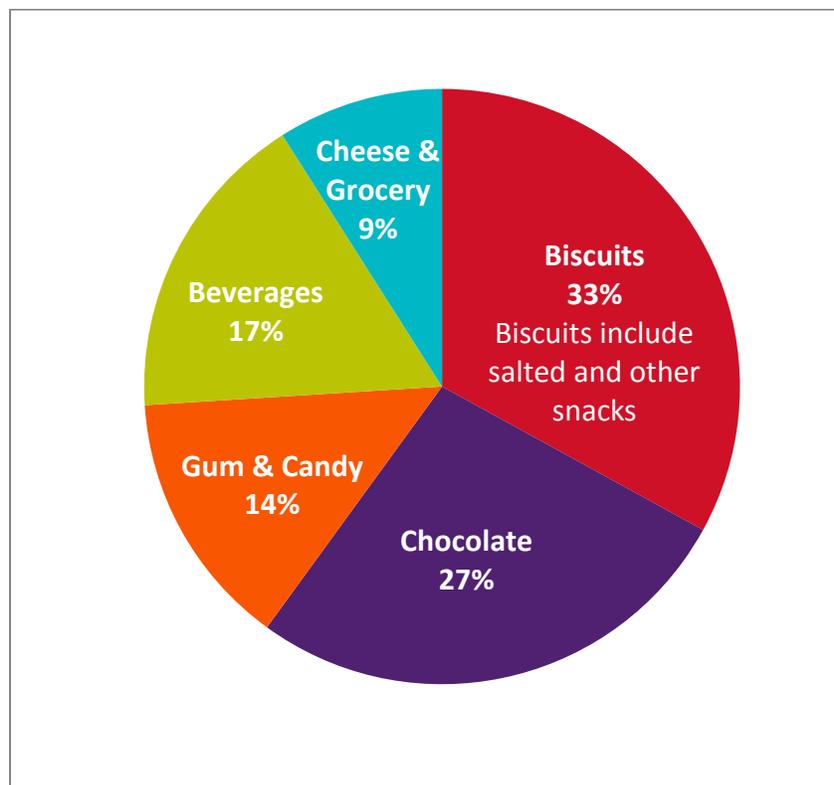


**Figure 4.** Revenue in percentage corresponded to each region for all products in 2013 [3]

As observed in Figure 4, the highest revenue comes from Europe with a 40%, followed by North America, Latin America, Asia Pacific and, to conclude, by EEMEA with a 11%. These results correspond to the total amount of sales in 2013 of all the categories of products launched by the Kraft Foods Company.

Bringing to light the sales split into the consumer goods existing categories managed by the company, it is clear that there is a considerable variation in the results.

Figure 5 represents the percentage of revenue associated to each category of products in 2013.



**Figure 5.** Percentage of revenue classified per category in 2013 [4]

As shown in Figure 5, the results in the revenue referred to each category of the product have noticeable differences. The biscuits category represents the topmost revenue with a 33%, subsequently, Chocolates accumulates a 27% of revenue followed by Beverages, Gum and Candy and, to end, the Cheese and Grocery category signifies a 9%. These percentages correspond to the revenue reported in 2013.

The Kraft Foods Company manages well-known snack brands around the globe, including cookies and crackers (Oreo, Chips Ahoy, TUC, Belvita), chocolate (Milka, Toblerone, Cadbury) and Gum and Candy (Trident, Halls).

To have a global perspective, Figure 6 represents the complete portfolio of the brands owned by the Kraft Foods Company and sold in every country at the present time.

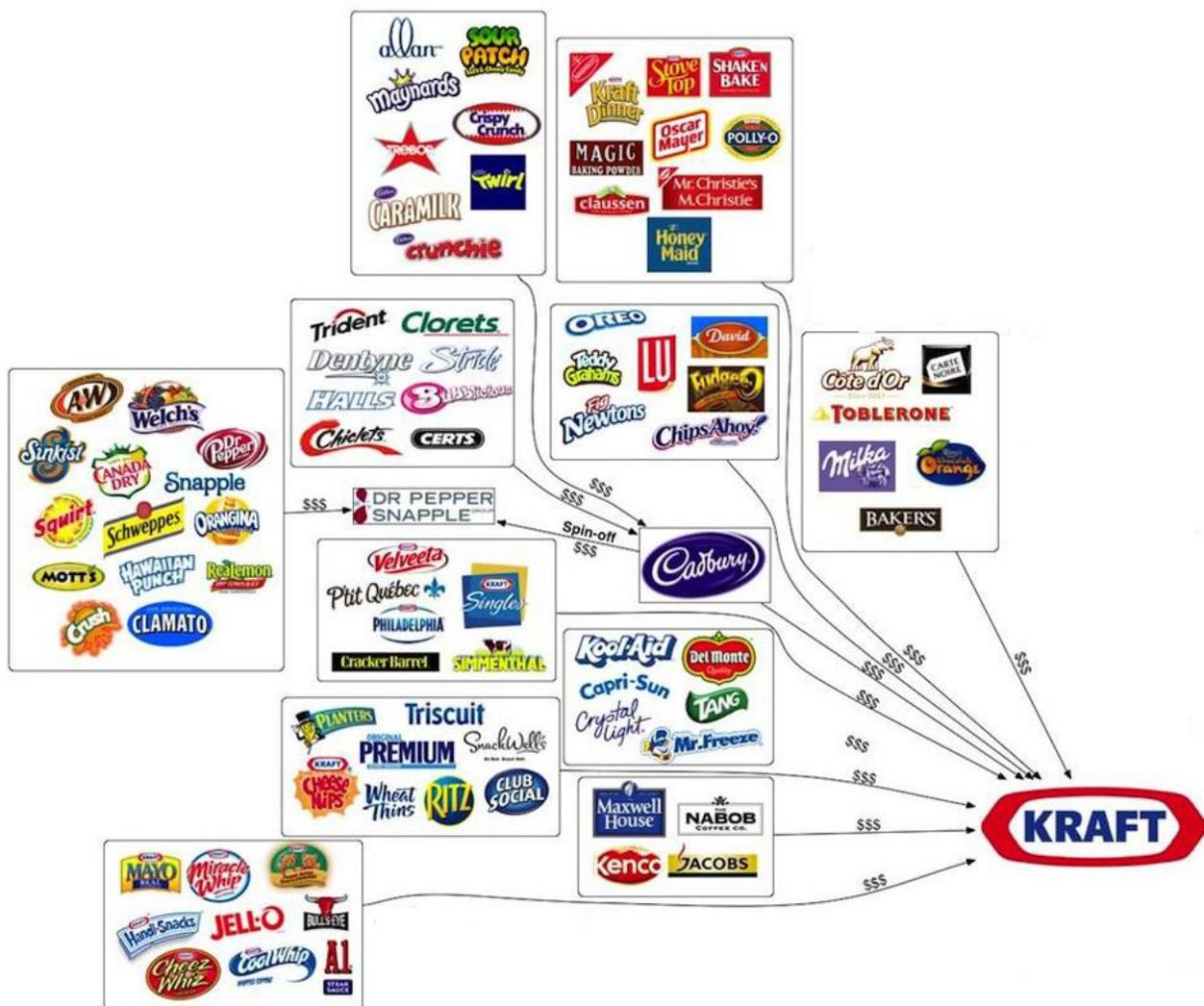


Figure 6. Complete portfolio of the Kraft Foods Company owned brands

As shown in Figure 6; the organization manages a high number of brands all over the world, in total, 83 brands including all the categories.

## CHAPTER 3. STAGE-GATE MODEL

Companies involved in the launching of new consumer products use different methods and structures to achieve their goals. Generally, industries based on consumer products, share similar frameworks throughout new projects which are inspired in a concrete procedure of working called “Stage-Gate”.

This ideal technique is focused in the following characteristics:

- Standard, sequence and progressive process.
- Proposed roadmap consists of three or four main components
- Improved alignment across business leaders.
- Increased cross-functional engagement and collaboration.
- Decreased new products failures
- Improved communication and coordination with external stakeholders.

However, companies such as Kraft Foods, have implemented, modified and improved the methodology; the I2M process is a convenient example of a Stage-Gate model that has been improved into a faster and more effective tool.

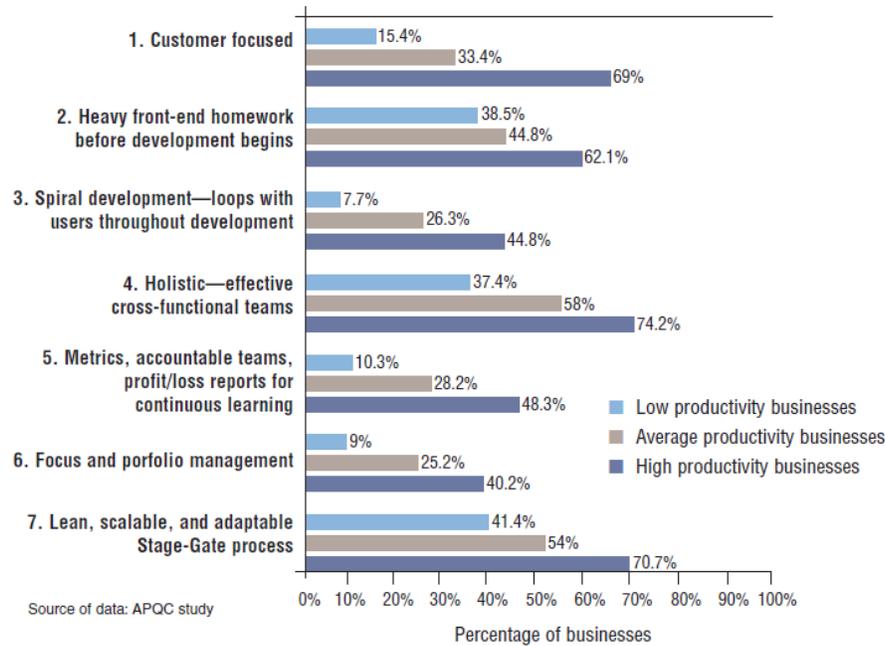
### 3.1 Principles of the Stage-Gate model

The Stage-Gate model builds in seven principles of lean, rapid and profitable new-product development to maximize productivity in product innovation. For this purpose, the Stage-Gate is based on the following basis:

1. **Customer focused:** The customer becomes a crucial part of the entire process: scoping, product definition, development, validation and beyond.

- 
2. **Front-end loading:** Project Managers or Leaders involved in the Stage-Gate model are constantly analyzing and reviewing every step to guarantee a final success.
  3. **Spiral development:** A NPD can be modified during the launch process and information can be further updated. For that reason, a first model production is arranged and evaluated so that a successful production can be ensured.
  4. **A holistic approach:** A Stage-Gate model is built upon an effective cross-functional team that reduces timings and is highly motivated to complete their tasks properly.
  5. **Metrics, accountability and continuous improvement:** It is essential to measure the NPD results after being implemented in the market. For that reason, the Stage-Gate model focuses in learning and improving the method so that every project is executed better than the one before.
  6. **Focus and effective portfolio management:** As stated in [5], *“Having too many low-value projects opened can disperse the main focus and waste resources”*.
  7. **A lean, scalable and adaptable process:** The NPD process is constantly updated and ameliorated; risks of failure are reduced to the minimum.

In consonance with [6], *“high productivity businesses practice the seven NPD principles”*. Results are reflected in Figure 4 where productivity is compared with the level of accomplishments.



**Figure 7.** Level of accomplishment of the seven principles of the NPD in contrast to the amount of productivity in business [7]

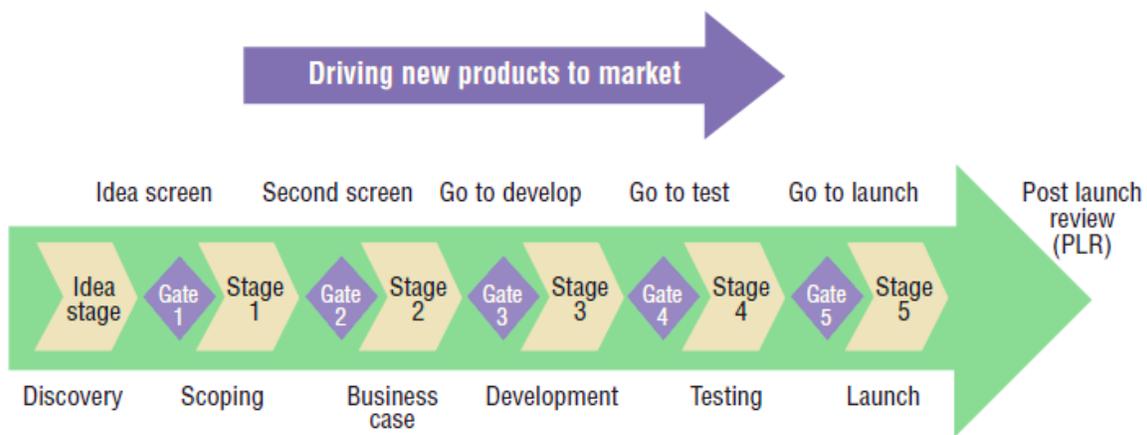
As seen in Figure 7, those businesses that practice the seven principles in a large amount of involvement tend to have high productivity while the opposite occurs with a low grade of engagement.

### 3.2 Phases of the Stage-Gate model

The Stage-Gate model is based on the philosophy that product innovation starts with ideas and finishes once a product is successfully launched and introduced in the market. It is based on breaking down the complex idea into smaller stages and gates where critical decisions of Go/Kill are made. Thus, each individual gate represents a Go/Kill decision step in the Stage-Gate model.

As a whole, a Go/Kill decision represents a phase in which a crucial decision is made which determines whether or not to proceed with the project and it is used to ensure quality during the launching process. The Go decision represents an approval of the previous stage development to move forwards, whereas a Kill decision stops the process and no further work is conducted.

As a result, Stage-Gate models are built by the same based skeleton which is divided in five phases and five gates where Go/Kill decisions are made:



**Figure 8.** Basic structure of a Stage-Gate model [8]

As seen in Figure 8, the usual Stage-Gate structure is determined by five stages and three gates:

- **Stage 0: Idea Discovery**

Pre-work designed to explore business opportunities and generate brand-new ideas.

- **Stage 1: Scoping**

Brief, economical preliminary investigation and scoping of the project, commonly, research.

- **Stage 2: Build the Business case**

Accurate investigation which involves primary research (technical and market) that involves a Business case where project definition and plan for development is described.

- **Stage 3 – Development**

Definition of the operations or production process carried out and determined design of the new product,

- **Stage 4 – Testing and Validation**

Trials assigned in marketplace, laboratory or plant in order to verify the arranged product, marketing plan and production.

- **Stage 5 – Launch**

Beginning of full-scale operations/production, marketing and selling.

As reported by [9], *“the majority of top performing companies in product innovation like Procter & Gamble, Siemens or Microsoft have implemented such processes and seen their new products going to the market quickly and effectively. Huge companies like Procter & Gamble launched five of the top 10 best-selling consumer new-products implementing a Stage-Gate model”*.

### 3.3 Roles and responsibilities in the Stage-Gate model

Product development involves partners and alliances that should be identified. Seeking for potential partners is crucial since, during the Stage-Gate model, they are expected to understand and be able to complete their tasks on time. The project manager is committed to choose the best team members and to solve the partnering issues that may appear.

To that end, there are three principal roles involved in the Stage-Gate model; the Project Leader or Manager, the Cross-Functional Team and the Gatekeepers. In Table 1 their respective functions are described.

**Table 1.** Main roles carried out throughout a Stage-Gate launching process

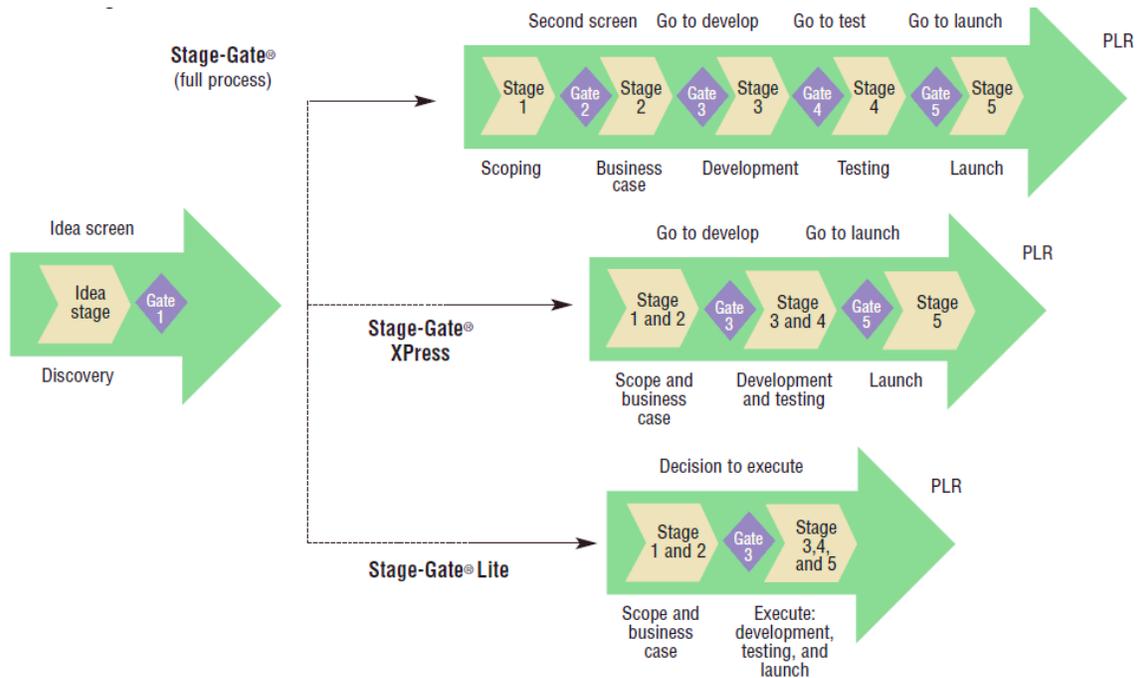
Project Leader	<ul style="list-style-type: none"><li>• Project manager who is the principal responsible of the project that must coordinate the planification and execution of the project.</li></ul>
Cross-Functional Team	<ul style="list-style-type: none"><li>• Members from different departments chosen and involved in the launching of a project. They are assigned tasks and functions that hould meet the deadlines, support must be given to the Project Leader at all time.</li></ul>
Gatekeepers	<ul style="list-style-type: none"><li>• Group of members involved in the project that participate in the Go/Kill decisions of every gate along the process</li></ul>

Therefore, success in product innovation requires determinant behaviors such as discipline, transparent decision making, effective and committed cross-functional team, open-minded members that learn from mistakes and look forward to improve the process and a fair combination between risk taking and risk awareness.

### 3.4 Stage-Gate Configurations

Likewise, the Stage-Gate model is flexible and scalable. Activities can be simultaneously carried out or be omitted, in any case, customizing the Stage-Gate method for a particular project banks on the Project Leader.

Figure 9 represents three general possible combinations of a scalable NPD process:



**Figure 9.** Three scalable Stage-Gate methods; Stage-Gate Full Process, Stage-Gate Xpress, Stage-Gate Lite [10]

As exposed in Figure 9, there are three principal sub-procedures that combine functions of the Stage-Gate model:

1. *Stage-Gate Full Process:* It is commonly used for a New Product Developments and represents the standard method in which five phases are followed in a defined sequence and no parallel activity is carried out.
2. *Stage-Gate Xpress:* describes a three phased-process. Stage 1 and Stage 2 are carried out at the same time as well as Stage 3 and Stage 4. Stage 5 is the only phase in which there is no double task performed. This sub-procedure is a combination well suited for an existing product which is improved or redesigned.

3. *Stage-GateLite*: represents the simplest Stage-Gate sub-procedure composed by two phases. Stages 1 and 2 are arranged in parallel in the first phase followed by Stage 3, 4 and 5 that build the second phase. The Stage-Gate Lite is mainly defined for promotions of an existing product.

As a result, throughout this Final Degree Project, a *Stage-Gate Full Process* will be described since the main purpose is to define a New Product Development.

## CHAPTER 4. I2M PROCESS

Idea to Market (I2M) is the globally accepted Kraft Foods approach to bring “Ideas to Market”. It is designed to unify the activities required to commercialize a new idea into the market while ensuring speed to success and measuring the process effectiveness for continuous improvement.

The I2M process carries responsibilities from all the partners involved in the Gum and Candy department. Additionally, I2M is divided in four different phases from the beginning to the final stage of the Project. These four parts depend on three Stage Documents built by the Project Manager that, one by one, must be approved in order to move forward to the next step of the process. In other words, at the end of every phase, a Stage Document Approval has to be arranged.

The four fundamental phases that compose the I2M process from the start are the following:

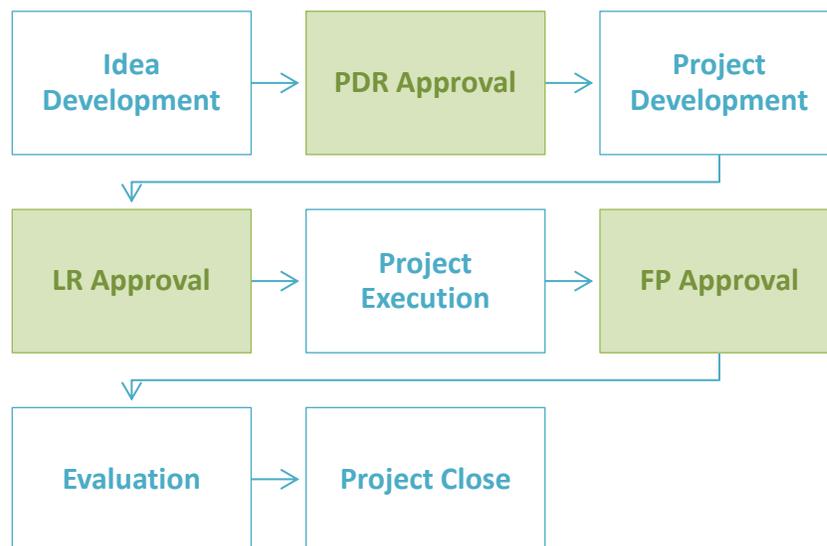
1. Idea Development
2. Project Development
3. Project Execution
4. Evaluation

As previously mentioned, the steps that are specified above depend on the approval of three Stage Documents which are essential:

- 1. Project Development Request (PDR) Approval:** it is arranged during the transition from the Idea to the Project Development (from phase 1 to phase 2). The PDR is a statement of intent to work on a project that contains project visibility, objectives, a strategic alignment and consumer opportunities.

2. **Launch Request (LR) Approval:** it is carried out the time between the Project Development and the Project Execution (from phase 2 to phase 3). The LR is grounded in facts based on feedback and analysis that can be different from the PDR assumptions. To that end, this Stage Document describes the financials, risk assessment and a definitive timeline.
  
3. **First Production (FP) Approval:** it is set up after the Project Execution in order to move onwards to the final Evaluation (from phase 3 to phase 4). The FP reviews the performance of the first production and compares it with the LR assumptions. It describes the final time and costs to decide if a full production should be arranged or if changes in the manufacturing procedure should be made.

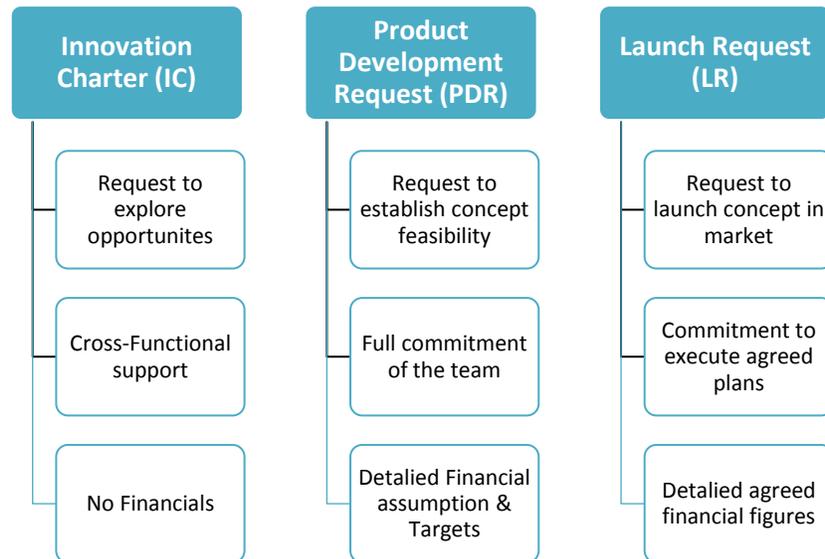
All steps that take part of the I2M process will be precisely described in the chapters 5, 6, 7, 8 and 9. Furthermore, so as to have a clear vision of the structure that builds I2M and to follow visibly all the succession of tasks that will be arranged, Figure 10 provides a global view of the basic steps involved in the process.



**Figure 10.** Basic steps of the I2M process with the main gates emphasized; PDR Approval, LR Approval, FP Approval

Likewise, the I2M process counts on a communication tool that encapsulates the objective and scope of the Idea Development task, which receives the name of Innovation Charter (IC). The IC is not a Stage-Gate document or a mandatory approval, even though; it represents the growth of the initiative in order to support the PDR Approval.

As a result, functions between the Innovation Charter (IC), Product Development Request (PDR) and the Launch Request (LR) may lead to confusion. Therefore, the diagram in Figure 11 describes the main differences between gates:



**Figure 11.** Main functions of the Stage-Gate documents (PDR and LR) and the Innovation Charter

#### 4.1 Project Manager mission and functions

It is essential to be qualified to manage the I2M process, which is the main reason why the Project Manager has several training sessions along the year. A successful management and organization requires administrative, leading and optimizing skills.

The manager must have determining attitude capable of pushing the cross functional team to do their tasks on time. It is very important to be creative and have the initiative of finding the best alternatives and solutions to the problems that may appear during the process. Being persistent and hard-working is also vital since, most of the times; it will be required to help other teams and to understand their situation. Moreover, Project Manager should always try to be aligned with all the cross-functional team.

Therefore, a Project Manager has three principal defined goals during the I2M process:

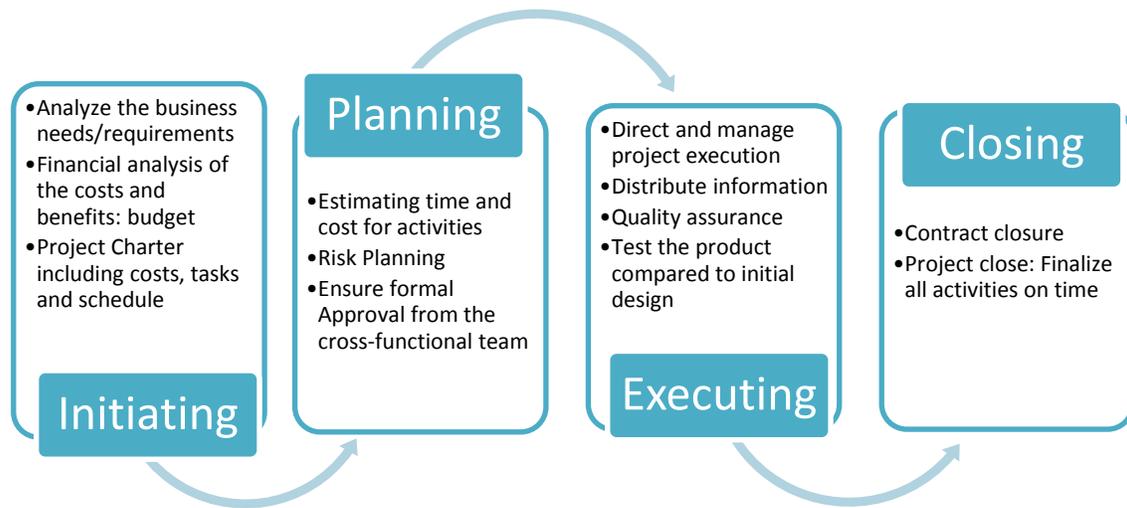
1. Optimize timings during the different steps along the process
2. Reduce costs and minimize the risks of failure
3. Maximize benefits and ensure quality throughout the product development

It is important to meet the required skills that a Project Manager role needs, as they have full responsibility to complete a Project.

Previously mentioned, a Project Manager has to know the role of other team members and support them as much as possible. So as to be, it is elementary for a Project Manager to assume the following duties:

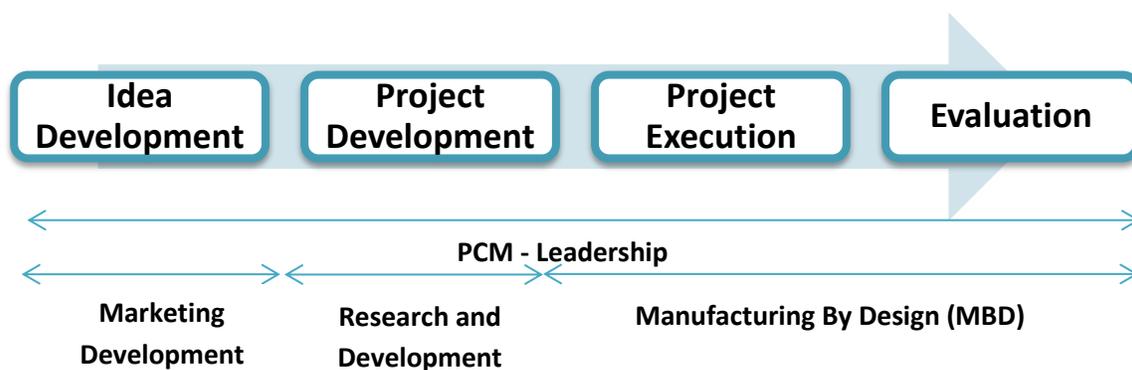
- To develop the project plan
- To manage the communication
- To organize the project team and project risk
- To establish the required budget and schedule
- To solve the project conflicts and delivery

To illustrate better how a Project Manager contributes in every step of process, Figure 12 represents the principal functions all through the development stages:



**Figure 12.** Contribution of a Project Manager throughout the I2M process

A Project Manager observes the I2M process from a Global View, so that potential problems can be identified and a corrective action can be taken. In big and successful companies like Kraft Foods, the Project Manager role is critical. They are assigned with the Leadership of the Project. Subsequently, a Project Manager is constantly communicating with different departments involved in the launching of new consumer products and trying to solve issues that may appear. Depending on the stage of the I2M process, the Project Manager is focused on directing a particular department (see Figure 13):

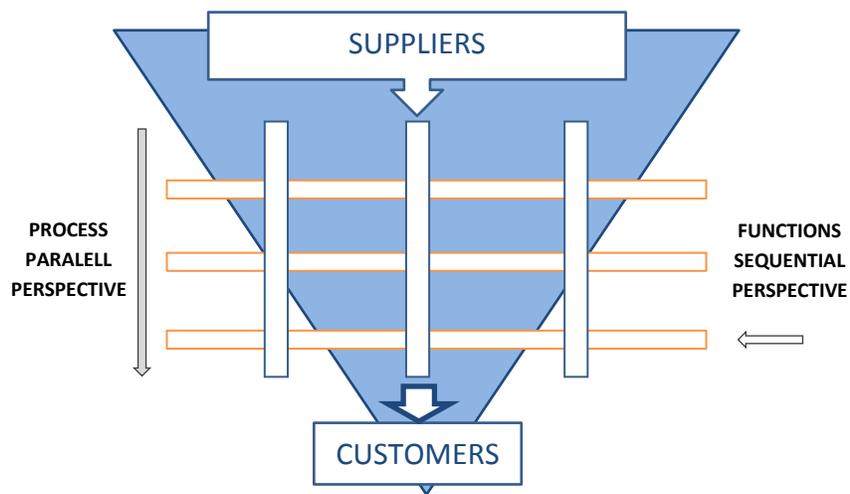


**Figure 13.** Structure of the relationships between a Project Manager and the departments throughout the phases of the I2M process

As seen in Figure 13, with the process management, all the teams involved receive communication and are concerned about the importance of their contribution. It is important for the Project Manager to motivate the team members implicated in the project development and to pursue the maximum potential that can be given to the product or service.

To that matter, the organization should be considered as a whole with the main objective of coordinating all the activities disregarding the department.

However, at present, the process generally crosses transversally the department structure as no activity begins and finishes in the same department. Therefore, each department is treated separately (see Figure 14).



**Figure 14.** Functional vision (sequential) and process vision (parallel) of an organization

Figure 14 represents the process in a parallel perspective, as every process can be carried out independently, and the functions that are developed throughout each process in a sequential perspective. Every process begins with the delivery of raw materials from the suppliers and finishes once the product is ready to be implemented in the market by the customers.

## 4.2 I2M types of project-launching

The I2M process is a multifunctional method that can be used, concretely, for nine Project Groups that are split into fourteen Project Types, from a New Product Development Project to a Promotion. Figure 15 describes the classification of Projects that are suitable to be developed by the I2M process:



**Figure 15.** Classification of the existing categories of Project Groups split into Project Types

Throughout this Final Degree Project, the objective is to analyze an NPD that is new to the consumer. For that reason, it is necessary to expose the entire procedure of I2M, as described in the previous with the standard 5 phases.

### 4.3 I2M problems and improvement goals

Handled the right way, business process improvement can provide tremendous benefits to the company. To be able to make the necessary changes in the I2M structure, it is important to identify the factors that inhibit the efficiency and effectiveness of the process. It is essential to reduce risks involved in the launching of a new product: accurately, no matter how great the new product may seem, if the market rejects it, it is a failure.

Consequently, taking the I2M process seriously can notably reduce the risk that involves launching a new Project and can move towards a successful result. Furthermore, the main problems and possibilities must be categorized and prioritized in order to evaluate alternative solutions.

#### 4.3.1 Incidents source in 2014

Focusing in all the consumer goods of the Kraft Foods Company in the Iberia region, several incidents had been identified during the last year (see Figure 16).

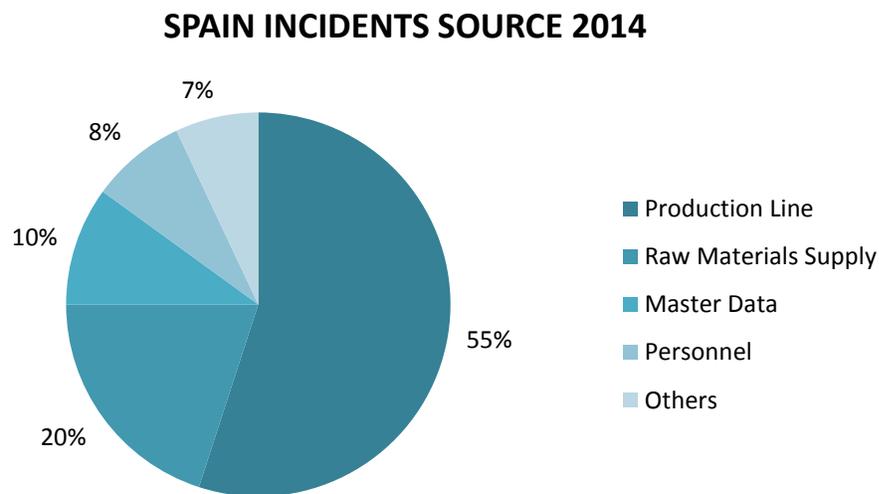


**Figure 16.** Total amount of incidents in the Iberia region throughout 2014

As seen in Figure 16, in Spain, 174 incidents had been reported during 2014 whereas in Portugal, 270. It is visible that the process requires a redesign in order to reduce or eliminate the amount of events in the next year.

To that matter, it is essential to analyze precisely the source or the phase where incidents are likely to occur in the process.

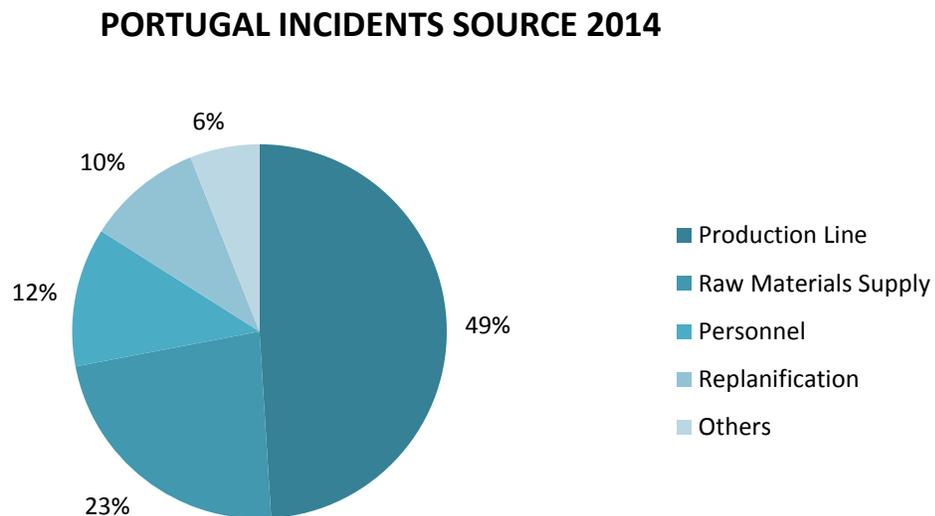
The diagrams exposed in Figure 17 and Figure 18 represents the origin of the incidents individually for Spain and Portugal so that improvement opportunities can be prioritized.



**Figure 17.** Spain Incidents Source reported in 2014

As seen in Figure 17, the main incident source in Spain during the 2014 happened in the Production Line, followed by the Raw Materials Supply, the Master Data, the Personnel and Others.

In the same way, Portugal had reported a great amount of incidents that were identified in different sources (see Figure 18).



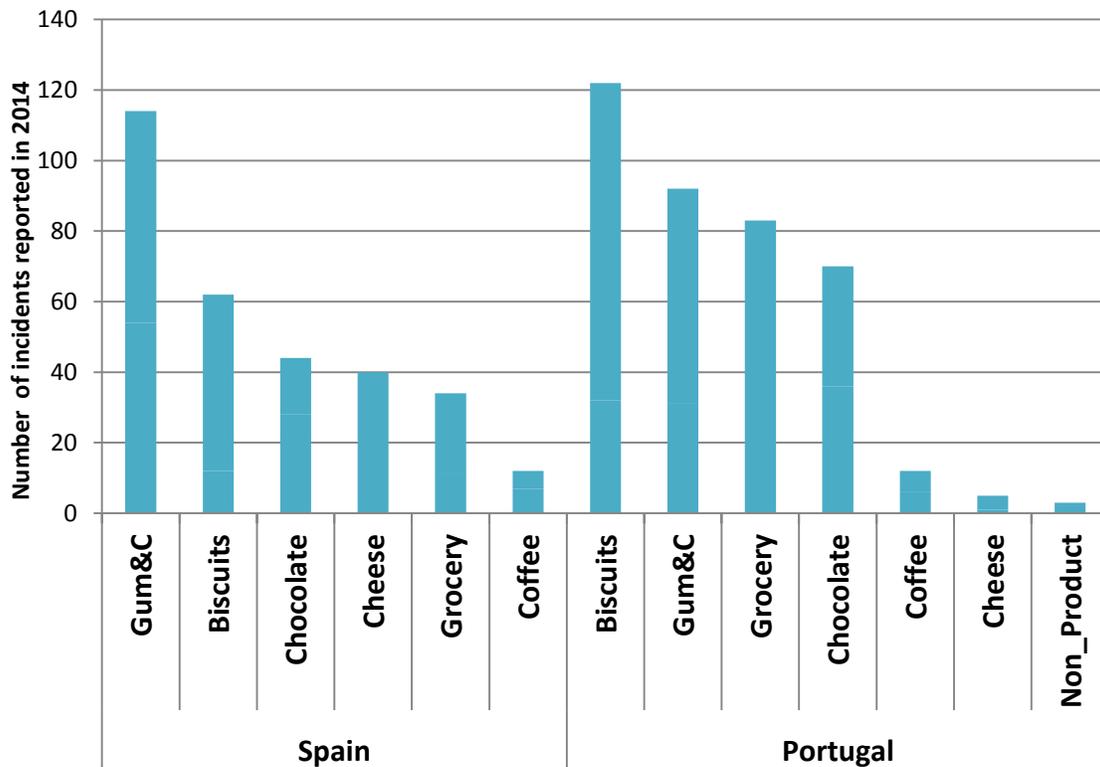
**Figure 18.** Portugal Incidents Source reported in 2014

As observed in Figure 18, the sources of the incidents in Portugal during the last year are reflected. In parallel to Spain, the predominant incident is identified in the Production Line followed by the Raw Materials Supply, the Personnel, the Replanification and Others. The main difference between the previous countries is based on one source; Master Data and Replanification.

#### 4.3.2 I2M focus and scope

A large amount of alternatives to improve the process could be arranged in order to ameliorate the effectiveness of the I2M process. Nonetheless, it is vital to distinguish the needs between categories and to attend the priorities of the company.

The graphic represented in Figure 19 describes the variety of categories in which incidents were reported during the 2014 for the Iberia region:



**Figure 19.** Variety of the Kraft Foods Categories (axis X) confronted with the respective number of incidents reported in 2014 (axis Y)

It is visible in the previous graphic that the Gum and Candy category or department accumulates the top number of incidents in Spain and the second highest in Portugal. Therefore, it is essential to redesign the I2M process focusing in the Gum and Candy department and to adopt several measures in order to reduce the amount of incidents reported.

As a result, it is clear that the Gum and Candy department collects an important number of incidents and, concretely, occur in the Production Line.

In order to distinguish between the possibilities of improving each of the phases that compose the I2M structure, Table 2 reflects a process matrix that brings together the critical factors that are identified and the improvement opportunities that could be implemented throughout a project development.

For each phase, the critical factor repercussion on the project will be given a numeric value, depending on the impact that may have in the timing and resources needed. To that matter, if the mentioned phase of the I2M process has a strong effect in the duration of the project, three points will be provided, whereas two points are to be corresponded with a medium level and, finally, one point will be for the lowest level of influence.

Table 2 can be interpreted as follows: Column 1 represents the probability of risk in each of the I2M phases. Column 2 states the probabilities of extending the process completion by suffering a delay in each phase. Column 3 exposes the potential of implementing improvement opportunities to ameliorate the performance of each I2M phases. To conclude, Column 4 brings to light the total amount of points accumulated by the previous columns results.

**Table 2.** Matrix of the repercussion of the critical factors in the different I2M phases

Phases	Critical Factors	Risk Involvement	Probabilities of delaying the process	Possibilities for improvement opportunities	TOTAL
<b>1. Idea Development</b>		1	1	2	4
<b>2. Project Development</b>		2	3	3	8
<b>3. Project Execution</b>		3	3	2	8
<b>4. Evaluation</b>		1	2	2	5

As seen in the last column of the matrix above (Table 2), the highest results are found in the middle phases; Project Development and Project Execution.

Additionally, as seen in the previous chapter of the Project Scope (1.3), these two phases have the strongest contribution of the Project Manager. To conclude, the steps to identify the opportunity areas of the process that will be followed throughout the phases are resumed in the following flowchart (see Figure 20).

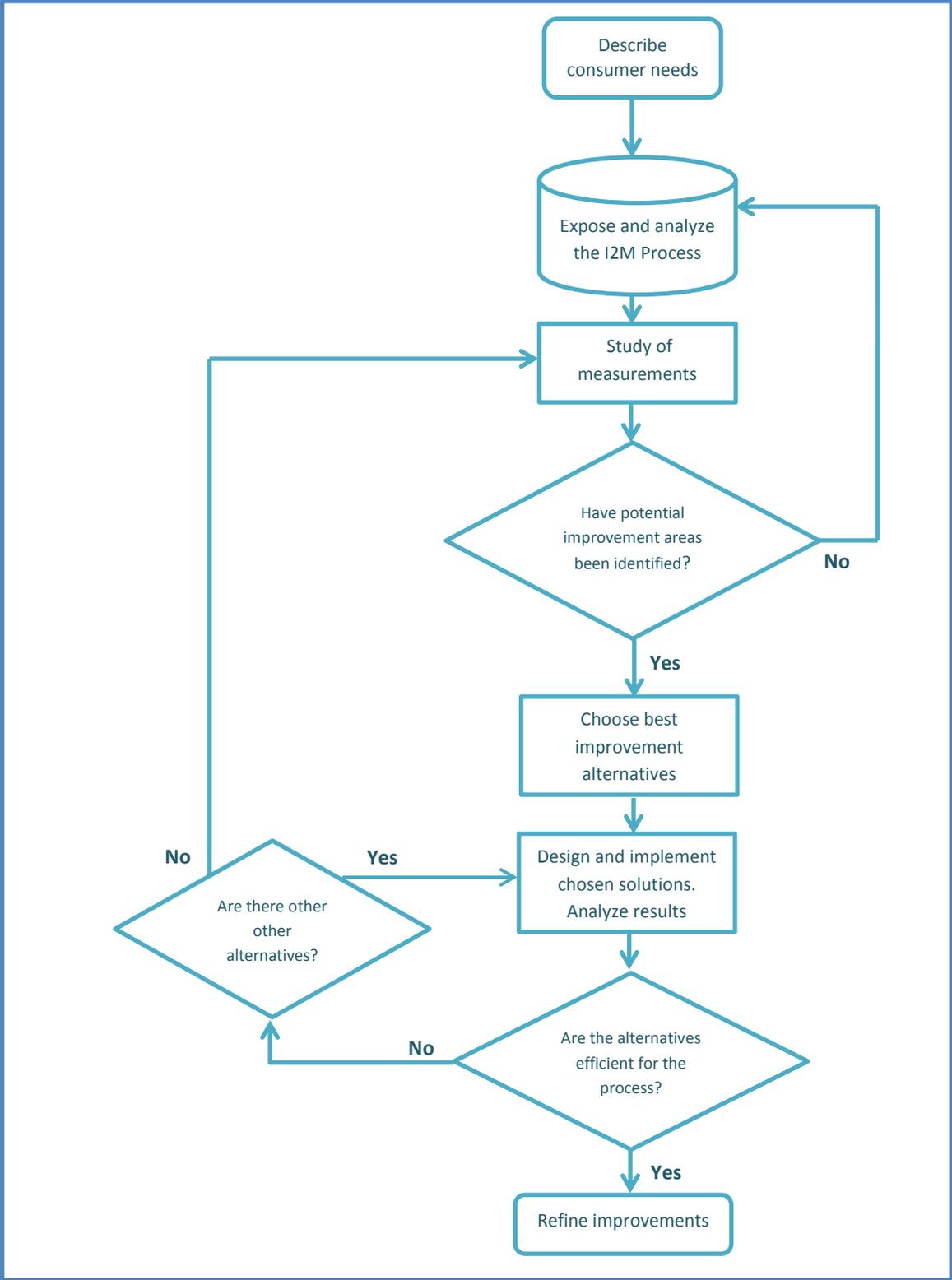


Figure 20. Description of the steps to identify opportunity areas

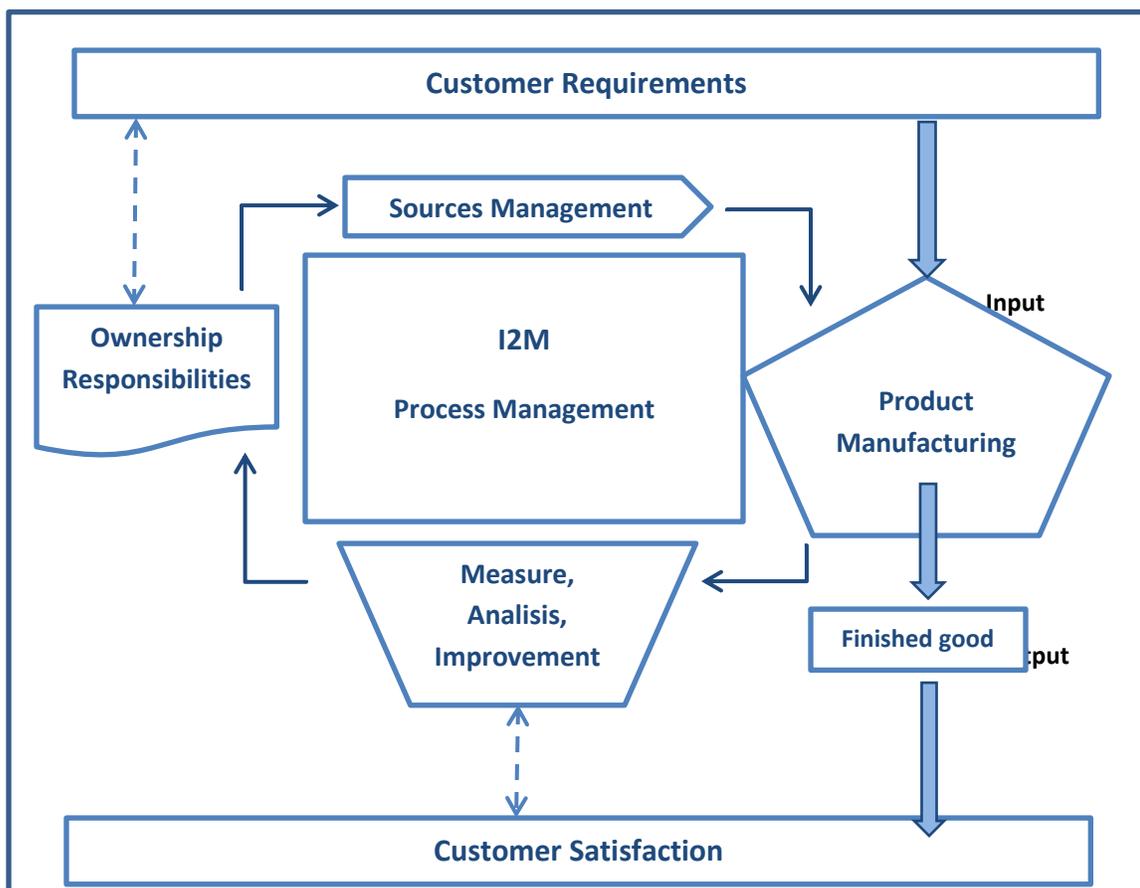
In Table 3, the symbols of the flowchart represented in Figure 20 are described:

**Table 3.** Flowchart design elements and description

Symbol	Description
	Indicates the beginning or end of a program flow in the diagram
	Indicates a list of information with a standard structure
	Indicates any processing function
	Indicates a decision point between two or more paths in the diagram

## CHAPTER 5. I2M SET IN MOTION

The I2M process is defined by a large and circuitous structure that requires an exhaustive and precise analysis and commitment. It is based on characterizing the systems of the process that are interrelated throughout cause-effect relationships. Managing the I2M process needs to guarantee the coordination of all the tasks within, improving the efficiency and satisfaction of the customer and suppliers. The next model represents the structure of systems involved in the I2M process:

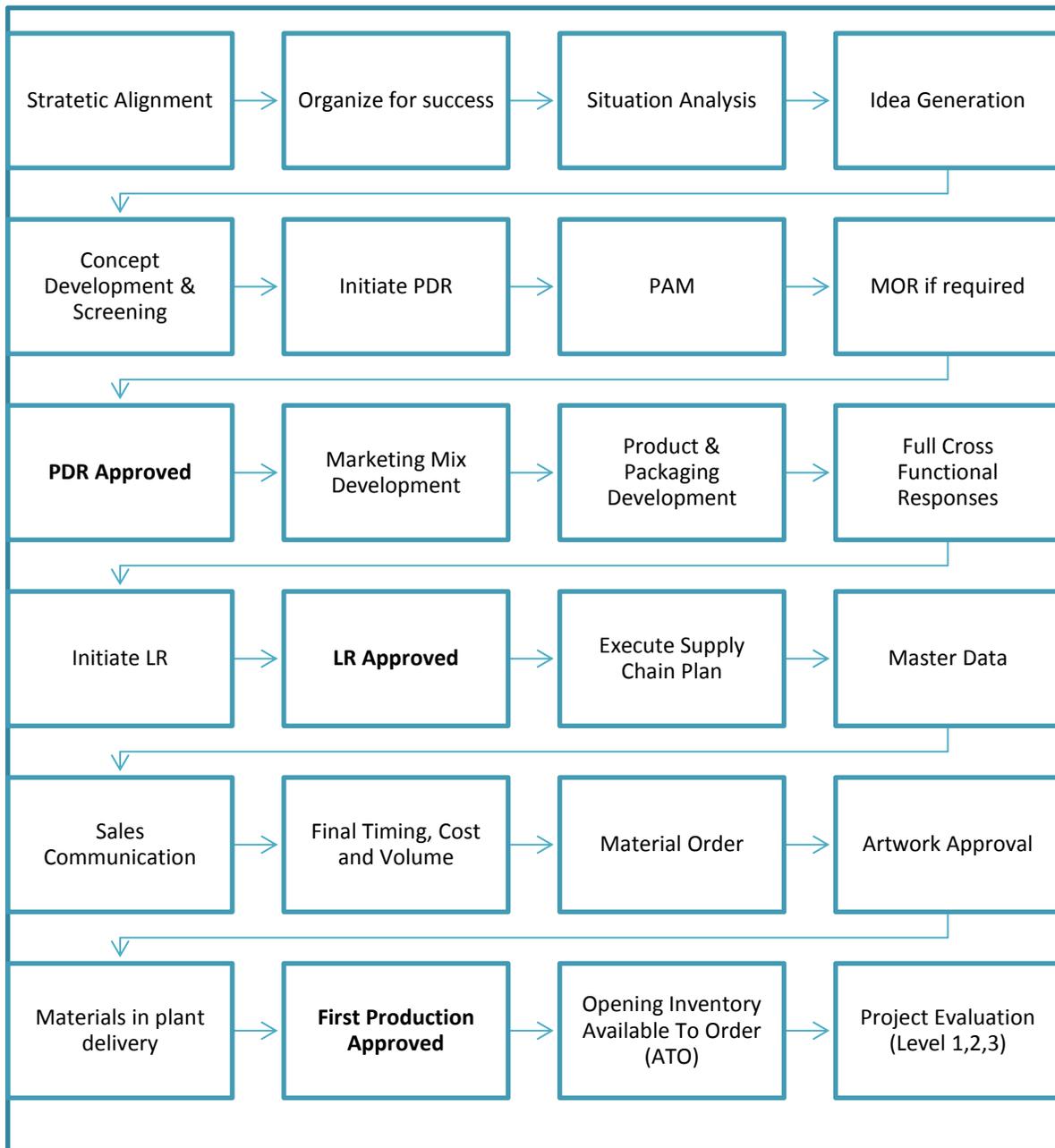


**Figure 21.** Model of the I2M process structure divided in systems

The management of the I2M model represented previously involves the following characteristics:

- Coherent sequence structure of systems or sub-processes
- Evaluation of the efficiency and effectiveness of the process (performance)
- Definition of the process leader or manager to supervise and to guarantee the fulfillment of the customer requirements
- Elimination of the unnecessary activities in the process
- Minimize waste of all types such as:
  - Exceeding process capacity
  - Space
  - Transports
  - Overstock

Furthermore, in order to understand the sequence followed throughout the method for Halls XS Project, Figure 22 represents the complete structure of the I2M process; from the idea to the implementation in the market. Additionally, it exposes the phases on which the next four chapters will be divided and developed.



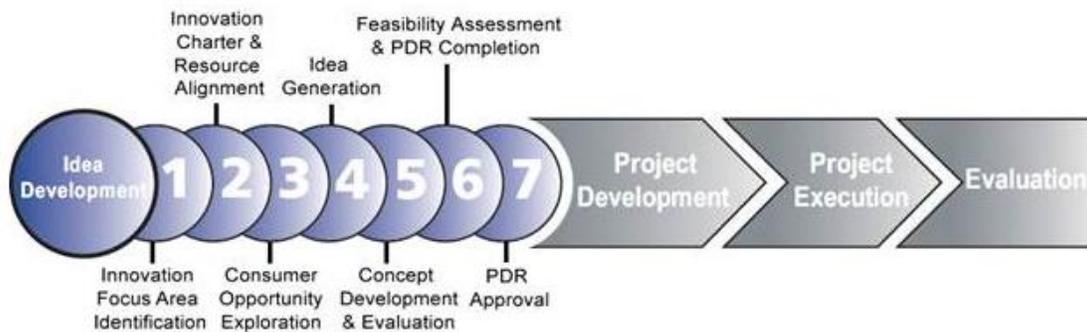
**Figure 22.** Complete detailed diagram of the Idea To Market (I2M) Process

## CHAPTER 6. PHASE I: IDEA DEVELOPMENT



The Idea Development phase represents the first step of the I2M process; it is intended to ensure the development of consumer focused ideas which provide profitable business growth. These ideas are based on real consumer needs or desires and offer important advantage.

In other words, it is a suggested path, not a rigid process, which explores opportunities in the market and it is comprised on the following seven milestones (see Figure 23): Innovation Focus Area Identification, Innovation Charter & Resource Alignment, Consumer Opportunity Exploration, Idea Generation, Concept Development & Evaluation, Feasibility Assessment & Project Development Request (PDR) Completion and PDR Approval.



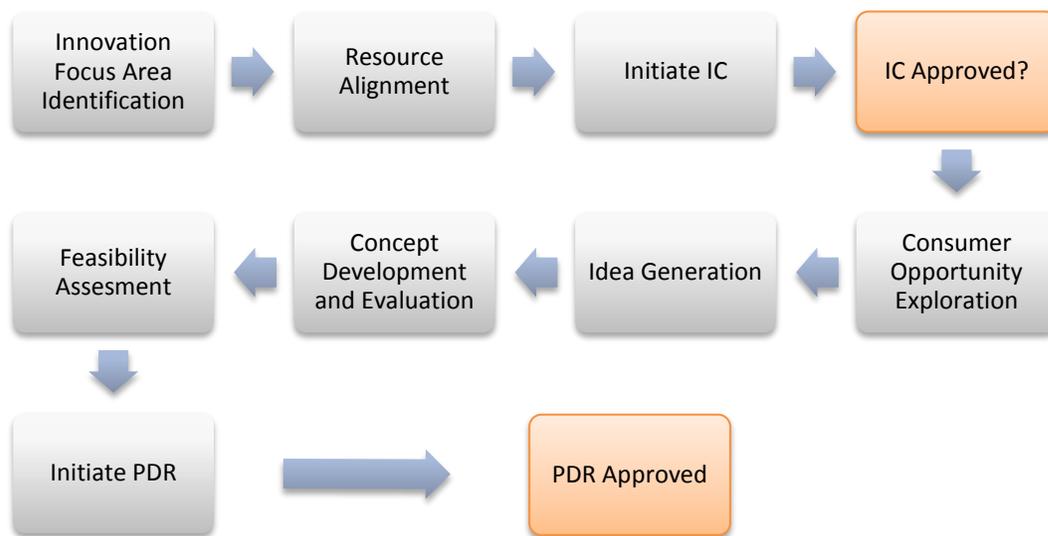
**Figure 23.** Seven milestones that build the initial phase of the I2M process; Idea Development

As it seen in Figure 23, there are seven defined turning points within the Idea Development stage which are:

- 1) Innovation Focus Area Identification:** Link the innovation idea to the organization vision or product roadmap

- 2) **Innovation Charter (IC) and Resource Alignment:** To define the primary involvement resources needed (timing, budget...) to guarantee a successful concept
- 3) **Consumer Opportunity Exploration:** To identify the opportunity areas
- 4) **Idea Generation:** To describe the ideas that deliver against the identified opportunity areas
- 5) **Concept Development and Evaluation:** To define the concepts that meet the criteria for progression
- 6) **Complete Feasibility Assessment and PDR**
- 7) **Project Development Request (PDR) Approval:** Ensure full business approval to progress with the development of the project

In order to have a complete and sequential perspective of the first phase framework, Figure 24 comprises the route map to success in the Idea Development stage, where the last step is a Go/Kill decision; the Project Development Request (PDR) Approval. Once the PDR is approved, the Idea Development phase can proceed to the Project Development phase.



**Figure 24.** Route map of the phases that comprise the Idea Development stage

In order to identify an area among consumers that could guarantee a successful launching of the Halls XS, the Project Manager must arrange several meetings with the Marketing department. During this phase, Marketing provides essential contributions in the exploration of ideas, even though; it is responsibility of the Project Manager to define answers to the questions below.

Regarding to the consumer focus area, it is fundamental to find an age group that could feel excited about the innovations of Halls XS and could have a significant influence over household decisions. In this case, after arranging several meetings with Marketing, it was decided that this area should be based on Teenagers. The way in which teens make use of the media could help the business. The advertising efforts would be effectively targeting the right customers with the most effective product messaging.

On the other hand, to determine the main flavors that should be developed, it is necessary to carefully choose those who have had a special impact on consumers. For that reason, the Project Manager has to collect the necessary information and study the sales history of Halls in which the summarized sales revenue data are exposed.

Descripción	Cobertura Mese	VTAS IC	VTAS Retail
HLS 4X33.5G CALM HONEY LEMON PROMO 24CA	-0,1	3	2.126
HLS 4X32G VITAC CITRUS S/F PROMO24CA	0,0	18	2.227
HLS COOLWAVE S/F WATERMELON DBX	8,8	44	45
HLS 4X32G VITA C STRAWB S/F 24CA	0,2	49	568
HLS 4X32G COOL MENTHOLYPT S/F PROMO 24CA	0,3	25	4.051
HLS 4X32G COOL XSTRONG PROMO 24CA	1,3	28	2.771
HLS 33.5G VITA-C LIME 24X20CA	0,7	1.145	695
HLS 4X32G VITAC CITRUS S/F 24CA	1,2	3	3.484
HLS 33.5G ORIGINAL 24X20CA	7,8	485	279
HLS 32G COOL ORIGINAL S/F 24X20CA	1,0	5.712	1.273
HLS 32G COL XSTRO 24X20 CA	0,8	4.449	1.074
HLS 100G EUCALIPTUS S/F BAG 12CA	10,5	12	144
HLS 17G XS PEPPERMINT 12X16CA	36,2	15	2
HLS 33.5G VITA-C LIME 24X20CA	0,0	48	9

**Figure 25.** Screenshot of the month sales report of the Halls brand. It represents sales in the Impulse Channel (IC) and in Retail.

In the screenshot from Figure 25, the columns represent:

- “Descripción”: *Description of the product and flavor*
- “Cobertura meses”: *Stock coverage in Tonne*
- “VTAS IC”: *Month sales in Euros for the Impulse Channel (IC) on each reference*
- “VTAS Retail”: *Month sales in Euros for the Retail sector on each reference*

As it is remarked with the red arrows in Figure 25, it is fundamental to select the flavors that minimize possible risks, specially, in the cases in which the project that is being launched, involves innovations that may cause uncertainty among consumers. In the studied case of Halls XS, focus should be on the usual Halls sticks that are currently on the market and have been successful.

Table 4 represents the flavors that have been outstandingly superior and the sales in kilograms that correspond to the main channels that build the market: Impulse Channel and Retail.

The first column exposes the description of the product with the flavor specified, subsequently, the second column describes the amount of kilograms (kg) that each product accumulates in the Impulse Channel (IC), the third column shows the sales in Retail for each product and, to conclude, the last column represents the total amount of the sales in both channels.

**Table 4.** Description of the top sales flavors of Halls brand in the current market

Description	Sales IC (kg)	Sales Retail (kg)	Total Sales (kg)
<b>Halls Cool Menthol (Original)</b>	25	4051	4076
<b>Halls Extra Strong</b>	28	2771	2799
<b>Halls Vita C Citrus or Lemon</b>	3	3484	3487

Menthol (Original), Extra Strong and Vita C Citrus (or Lemon) represent the principal top flavors of all Halls formats. So as to be, these three flavors will be established as the unique initial flavors of the new Halls XS project. It will provide future consistent guidance on how is the product developing in the market.

## 6.1 Building a Project Development Request (PDR)

Building a Project Development Request (PDR) is the subsequent step to proceed in the Idea Development phase. To arrange a correct PDR, it is essential to collect the basic project related information such as:

- Project Group
- Region/BU
- Product Segment
- Summary of request

- Project Objective

As a minimum, the Project Manager or Leader identifies the full project team that may consist of local Business Unit (BU) and regional cross functional representatives. However, one of the principal members that should be precisely chosen is the Finance person who is responsible for evaluating the financial viability of a project. The Financial member uses best estimates to complete the input of the PDR Key Financials.

In this step, the Project Manager takes over responsibility of leading the completion of the PDR. The Project Manager must gather and summarize cross functional perspectives, establish initial project feasibility and associated risks and, finally, submitting the PDR to the relevant Project Approval Meeting (PAM) or Marketing, Operations and Research (MOR) meeting for approval.

As a whole, the Project Manager should determine the key milestones to deliver the product on time in the Available To Order (ATO) deadline and, most importantly, whether they believe the requested ATO date is achievable.

Likewise, a preliminary risk assessment of the proposed idea is created based on the information gathered during the cross functional checks. The Project Manager should include timings, costs and overall expectations. Furthermore, it is responsibility of the Project Manager to assess the Manufacturing By Design (MBD) sector where capability and capacity to produce a product should be studied. Once PDR is completed, it should be circulated one week prior to the approval meeting so that attendees have an opportunity to familiarize themselves with the proposals and identify any key issues or concerns.

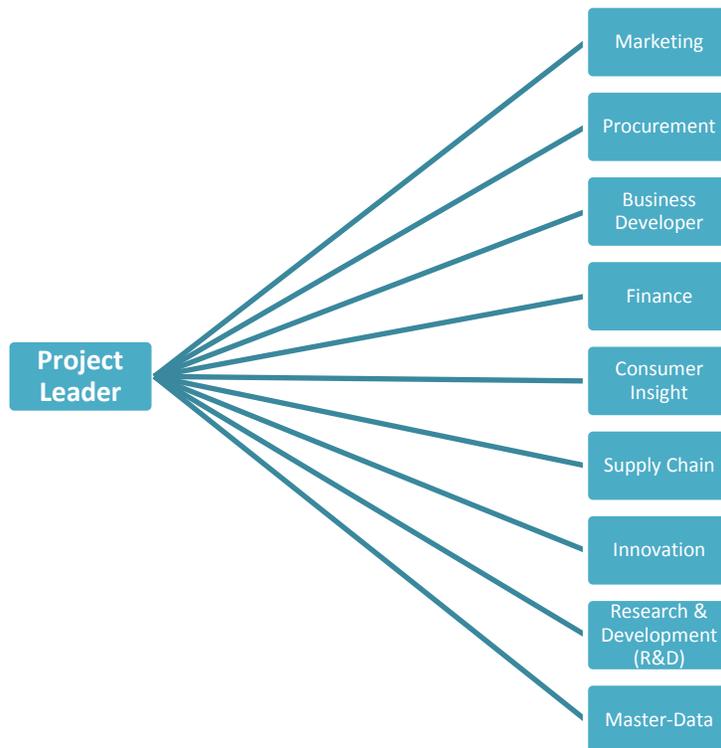
**IMPROVEMENT OPPORTUNITY N1. Kick-Off Meeting****Table 5.** Kick-Off Meeting IO

Phase: IDEA DEVELOPMENT	
<b>Background and importance</b>	Once a Project Development Request has been approved it is essential to ensure that everyone in the project team is fully briefed on their involvement and the expectation of their contributions.
<b>Current situation</b>	Throughout the Halls XS Project, several issues regarding to the lack of information among the team delayed the timing. It is important for the Project Manager to be able to communicate easily with the department and to choose the members that should be involved in the launching efficiently.
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Delay on project duration</li> </ul>
<b>Improvement goal</b>	To avoid misunderstandings and defining clearly the tasks that each team member is expected to carry out, it is essential to share all the information and to discuss openly the schedule.
<b>Proposed improvement</b>	To that matter, a Kick-Off meeting (KOM) should be arranged in order to define the project planning activities and to analyze possible risks that may decrease customer satisfaction.

As a result of arranging a KOM before developing the project, the team members and a detailed timeline should be defined:

- **Team members chosen to contribute in the project in the KOM**

In the case of the Halls XS Project, a possible example of the structure of the team members implicated to be shared by the Project Manager during the KOM is exposed in Figure 23.



**Figure 26.** Example of the Local Core Team members from different departments and selected by the Project Leader for the launching of Halls XS in the KOM.

As shown in Figure 26, to manage effectively a Kick-Off Meeting, the Project Leader should chose accurately at least one member from each department to be involved in the product launching. To have a complete project team, it is necessary to involve the following departments: Marketing, Procurement, Business Developer, Finance, Consumer Insight, Product Supply, Innovation, Research & Development (R&D) and Master-Data.

The main responsibilities of the departments shown in Figure 26 are the following:

- **Marketing:** to research and report on external opportunities, to understand current and potential customers, to develop marketing strategy, to create product designs and to make customer focused decisions.
- **Procurement:** to manage the purchasing activity for the organization. All requests for materials are center to this department. In addition, the Procurement department is responsible for negotiating pricing to purchase goods in order to reduce costs and increase profitability.
- **Business Developer:** to design manufacturing operations and to ensure operations are carried out on time. Mainly, the Business Developer should manage the manufacturing and facilities team including mentoring and developing stable products and processes.
- **Finance:** to understand the financial situation and not allowing unintended deficits to occur. The Finance department is in charge of including funding, developing a Profit and Loss (P&L) report of an NPD and managing expenditures and reserves available.
- **Consumer Insight:** to understand consumer behavior and present insights for clients. The Consumer Insight department should represent the voice of the customers in business decisions.
- **Supply Chain:** to monitor stock levels, to oversee the ordering and packaging process, to ensure stores have enough stock and to oversee arrival of shipments.
- **Innovation:** To design, research, develop, analyze and suggest new marketing concepts as well as strategies.
- **Research & Development (R&D):** to determine and execute improved technologies used by suppliers, competitors and customers. The R&D department is also responsible for the research, design and evaluation of materials, assemblies, processes and equipment.
- **Master-Data:** to manage the transactional system to run business operations, to develop supplier lists, hierarchies or shared data and to report business performance management.

- **Timeline definition KOM**

In addition, throughout the development of the Halls XS Project, a rough estimated timeline was exposed to the team on which deadlines were not precisely calculated. Having an accurate timeline with a clear-cut ATO date is preventive from disappointing customers and improves the efficiency of the process.

A rigorous proposal is to build a detailed timeline including the next aspects:

- **Time:** when does the task need to be completed
- **Duration:** How long will it take to complete task
- **Resource:** Who needs to do the task
- **Sequence:** Which order do the tasks have to be completed
- **Relationship/Dependencies:** Which tasks are reliant on each other and which can be done in parallel
- **Critical Path:** Which tasks have to be completed on time in order to complete the whole project on time

**An example of the previous proposal could be the following:**

Tasks must be coordinated and be assigned in a logical sequence. The Project Manager is responsible of scheduling, organizing and coordinating tasks within the project in the most efficient procedure.

To that end, an adequate technique is the PERT chart tool that describes the project as a network diagram consisting of numbered nodes. A PERT chart is based on a graphic representation of a project schedule, showing the sequence of tasks and which tasks can be performed simultaneously.

The main goal is to identify the critical path of tasks that must be completed on time in order for the project to meet its completion deadline.

Thus, to identify the sequence of tasks and to differ between serial tasks (dependent) and not dependent on the completion of another, Table 6 collects the principal activities and their respective duration from the beginning (PDR Approval) to the end (ATO). In the studied case of Halls XS:

**Table 6.** Activities carried out from the PDR Approval to the ATO for Halls XS and their duration in weeks.

Activity	Duration (weeks)
A. PDR Approved PAM	1
B. Build TD	5
C. Confirmation TD	1
D. Ring-SKU	2
E. Forecast in system	1
F. Deliver BOM form	1
G. Material Codes	1
H. Spec Number	1
I. Handover design	1
J. PLR Request	1
K. PLR Translation	3
L. PCM Brief	1
M. Approval Loop	4
N. Repro to supplier	1
O. Printing CU	6
P. 1 <sup>st</sup> Production CU	2
Q. Reception of CU Copacking	1
R. Printing DBX	4
S. 1 <sup>st</sup> Production DBX	2
T. Reception of DBX Copacking	1
U. Packaging case/pallet	1
V. Material Delivery at plant	6
W. ATO	1

The Project Manager builds the PERT chart considering the PDR Approval as the first step as it represents the progress from the Idea Development to the Project Development phase. Once a project is approved in the PDR, it is considered to have more consistency and, therefore, it can be analyzed. Furthermore, the Idea Development phase does not involve productive activities that impact on the deliverable deadlines.

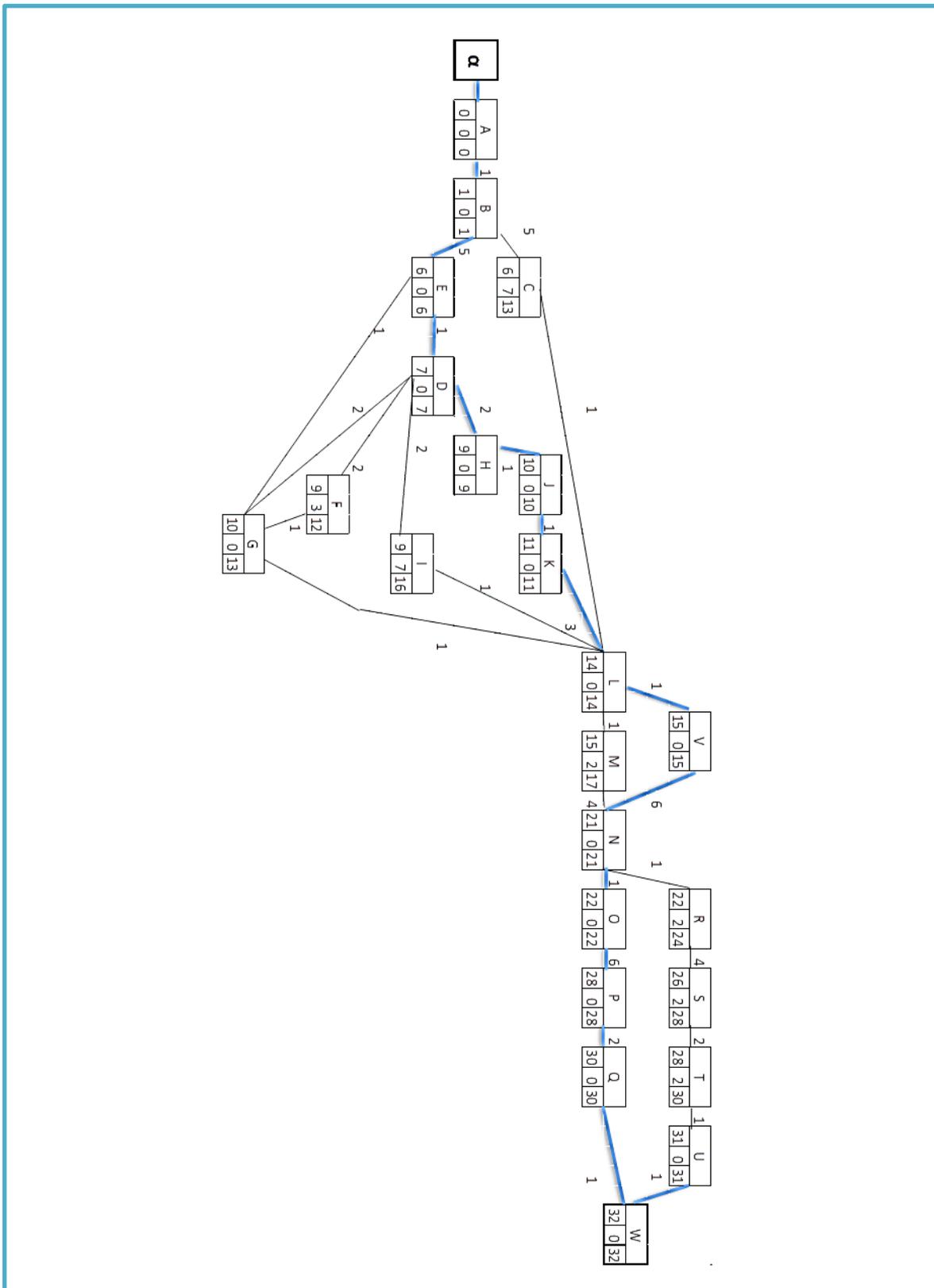
As a result, once Table 6 is established for Halls XS next steps with their corresponding duration in weeks, the next step is to expose the dependence between activities. The matrix exposed in Figure 27 represents the origin and destination of each task:

		DESTINATION																							
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	
ORIGIN	A	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	B	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	C	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	D	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	E	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	F	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	G	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	H	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	I	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	K	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	L	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0
	M	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	N	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
	O	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Q	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
	S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	U	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
V	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Figure 27. Matrix of dependences between each task, establishing their origin and destination

As seen in Figure 27, the matrix contains 2 different characters: "1" and "0". Origin activities exposed with "1" are joined to a destination activity that is dependent on the previous completion. Therefore, the last activity (W) has a row of "0" since it cannot be the origin of any task.

To conclude, the previous information is collected and organized in order to build the PERT diagram:



**Figure 28.** The PERT diagram of the Halls XS Project with the critical path highlighted in blue

As observed in Figure 28, the required activities that are carried out between the Project Development Request (PDR) Approval and the Available To Order (ATO) deadline must be organized in a logical sequence. In this case, activities are represented by the corresponding letters in Table 6. The total duration of the Halls XS project launching, from the PDR submission to the ATO date, is 32 weeks. Likewise, the critical path is highlighted in blue and includes the following thirteen critical activities:

**A, B, E, D, H, J, K, V, N, O, P, Q, U**

The previous activities must be carried out on time in order to accomplish the final deadline of the Project. On the other hand, as seen in Figure 28, the rest of the activities have a margin of weeks so that resources can be distributed efficiently.

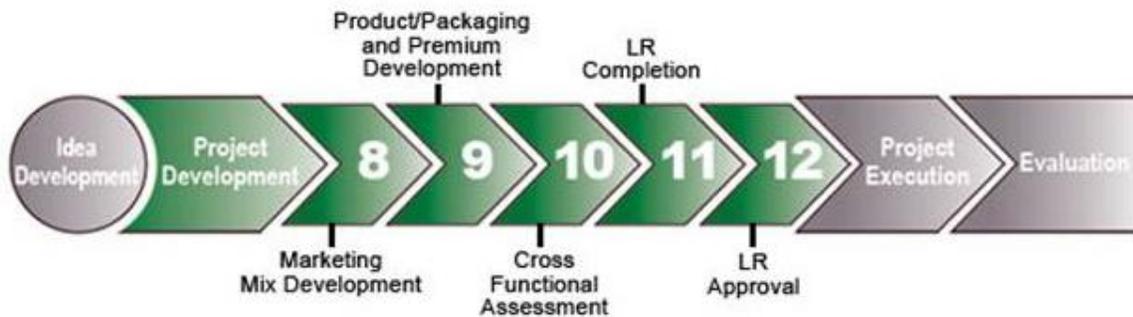
In addition, during the Kick-Off Meeting, a form with basic questions can be utilized in order to ensure collecting or demanding the necessary information of the NPD to the team. Following a questions prototype in the meeting could guarantee that steps are being accomplished and the project can be developed efficiently. A possible example of a KOM questions form is described in Appendix B.

## CHAPTER 7. PHASE II: PROJECT DEVELOPMENT



Following the approval of the PDR, the Project Manager is responsible for leading the Project Development phase. The main functions that the Project Manager has to carry out in this stage is to coordinate all activities to ensure that the correct resources are aligned and focused on developing the most effective business solution.

There are five milestones that comprise the Project Development phase (see Figure 29): starting from the Marketing Mix Development, followed by Product Packaging and Premium Development, Cross Functional Assessment, Launch Request (LR) Completion and Launch Request (LR) Approval.



**Figure 29.** The Project Development phase divided in 5 milestones: Marketing Mix Development, Product/Packaging and Premium Development, Cross Functional Assessment, LR Completion and LR Approval

The main objectives of the Project Development phase are:

- To identify best business solutions to issues that may appear
- To develop a comprehensive project plan
- To describe a full project risk analysis and contingency plan

In order to accomplish the goals mentioned above, it is required to complete the following steps that build the Project Development phase:

- **Reserve Stock Keeping Unit (SKU) with the Reserve Item Numbers Globally (RING) Process**
- **Marketing Mix Development**
- **Product/Packaging and Premium Development**
- **Cross Functional Assessment:**
  - Manufacturing location and execution plans
  - Engineering and capital plans
  - Final product cost(s)
  - Network and inventory plans
  - Execution timelines

Therefore, Figure 30 represents the route map with the correct sequence of tasks that guarantee the success of the Project Development in order to move towards the execution phase:



**Figure 30.** Route map of the Project Development Phase with the sequence of tasks required to accomplish

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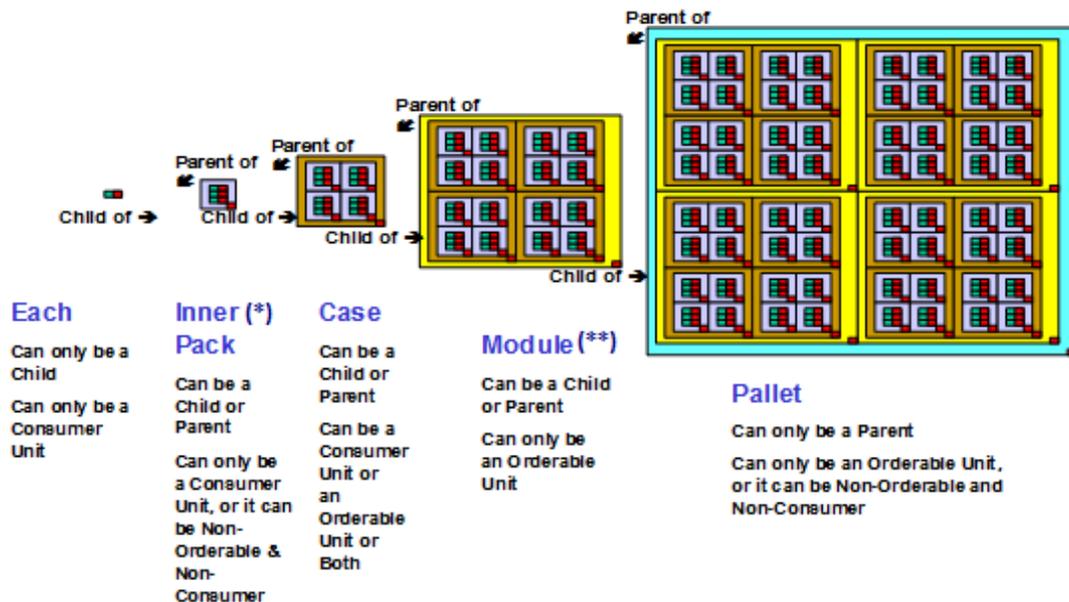
## 7.1 Reserve SKUs with the RING process

In order to ensure effective capacity planning through the network and early identification and resolution of capacity hotspots, it is essential to set up a volume place holder. This is, allowing the demand to capture future volumes for the new product launching early within the forecasting framework (see Appendix E) and facilitating integrated business processes.

The reservation process is arranged by utilizing previously reserved numbers within the RING (Reserve Item Numbers Globally) system that can be later transformed into the final live Stock Keeping Unit (SKU) once all the detailed master data information is known. The Project Manager has a critical role during this part of the process since the new product must have a corresponded SKU or product number to be identified and differed from others. Additionally, if the SKU happens to be reserved with a delay, all the I2M process will suffer the consequences extending the ATO deadline.

Therefore, a SKU represents a finished consumer good. In the studied case of Halls XS, reserving a SKU in order to identify the product, involves not only the Consumer Unit but the display box, the case and the pallet. It is essential to establish a correct Product Component Linkage (PCL), which is a link between the components that build a finished good, during the RING process to establish a Parent/Child relationship.

The diagram in Figure 31 reflects a PCL with the corresponding Unit Descriptor of a generic finished good:

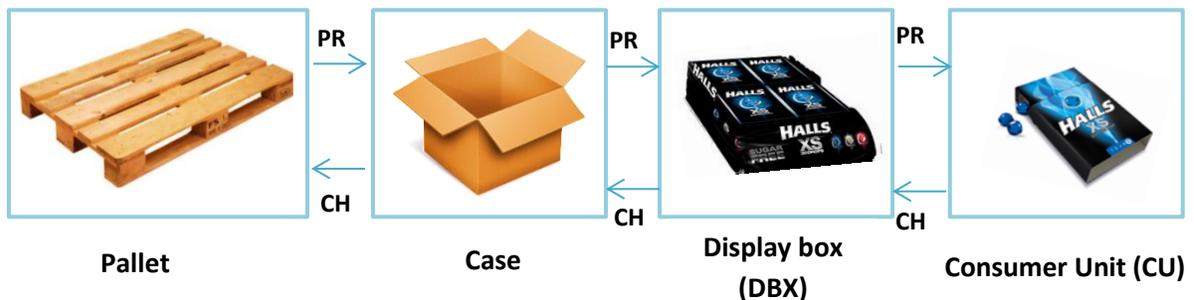


**Figure 31.** PCL generic description structure with the corresponding Unit Descriptor

(\*) An Inner Pack is commonly necessary when the customer belongs to the Retail channel. In the IC channel, it can be omitted as the CU is sold individually.

(\*\*) A module is not always necessary, it can be replaced by a plastic wrapper to hold the cases.

As seen in Figure 31, the PCL must be precisely followed and the Child/Parent link depends on the Unit Descriptor that is being processed. Therefore, in the studied case, it is fundamental to identify the PCL and the Unit Descriptor of the components that build the finished good. Figure 32 reflects the relationship between each item of the Halls XS Project, where “PR” represents a Parent link and “CH” a Child link:



**Figure 32.** Structure of a finished consumer good of Halls XS with the corresponding PCL and Unit Descriptor particularized to the Peppermint flavor

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### 7.1.1 Dimensions and volumes of the Unit Descriptors

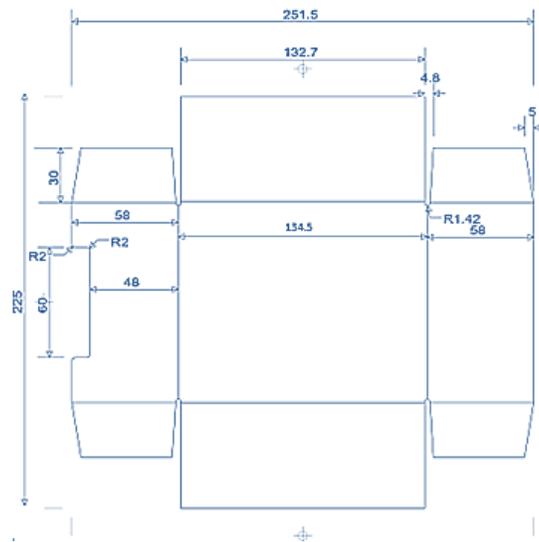
Previous to proceeding to the reservation of codes via RING, it is basic to consolidate the dimensions for each Unit Descriptor that composes a finished good and an estimation of their volume that will be submitted to the Launch Request (LR) Approval at the end of this phase. To have a clear perspective of the structure followed in this subchapter, it will be split up in three parts: assemblage of dimensions, volume assessment and proposal for case and pallet dimension.

- **Assemblage of dimensions**

Anteriorly to decide the number of items required of each component that builds the finished good in order to satisfy the demand, it is fundamental for the Project Leader to provide accurate information about the dimensions of the Unit Descriptors to all the cross-functional team.

Broadly, the dimensions for the Each and Inner-Pack Unit Descriptors are provided by the Research & Development (R&D) team that decides the shape of the product and the number of Halls XS drops contained in each Consumer Unit. However, regarding to the rest of the Unit Descriptors, the Project Leader has the objective of optimizing the quantity the materials used, minimizing the number of cases and pallets that are needed to transport the product. In other words, the Project Leader should be involved in those materials that are used only for service matters, not to be exposed in the market.

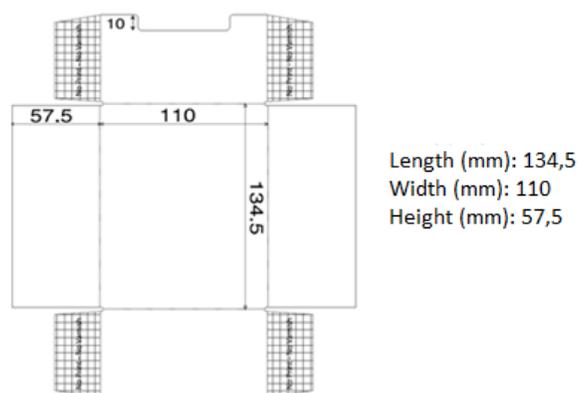
To that case, Figure 33 represents the dimensions imposed by the R&D partners for the display box that contains the Consumer Unit:



**Figure 33.** Unfolded display box Technical Drawing of Halls XS

Therefore, the Project Manager collects the previous data in order to provide the most efficient proposal for the case and pallet dimension depending on the demanded volume of the finished good by the customer. In contrast to the unfolded dimensions from Figure 33, it is important to have a perspective of the built-view display box that will be placed inside of the case.

By collecting the principal dimensions of the Length, Width and Height from Figure 33, the Project Leader frames a draft Technical Drawing (see Figure 34).



**Figure 34.** Draft Technical Drawing with the principal dimensions of Length, Width and Height specified

Once the principal dimensions of the display box are accurately separated from the unfolded Technical Drawing provided (Length 134,5 mm, Width 110 mm, Height 57,5 mm), the Project Manager has all the required information collected in order to proceed to the volume estimation.

- **Volume assessment**

Subsequently, a Project Manager should have the capacity of decomposing the finished consumer good into the necessary volumes of cases, display boxes and Consumer Units according to the estimated demand. In this case, to launch the Halls XS Project, the next particular example of a customer represents the construction of the Product Component Linkage (PCL):

To exemplify a customer purchasing order, in the Retail channel, of one launched flavor of the Halls XS, the demanded volume during the first four weeks is exposed in Table 7.

**Table 7.** Example of a demand purchasing order for the first month after the product launching

Product description		Week 1 2014	Week 2 2014	Week 3 2014	Week 4 2014	Total
<b>HALLS CU XS PEPPERMINT</b>	KG	47,6	38,1	47,6	47,6	181,0

Table 7 represents the amount of kilograms demanded in the first four weeks after the implementation of the Halls XS project in the market. The last column exposes the total amount of kilograms in the first month of the Peppermint flavor.

Likewise, the Demand Planning department is responsible of submitting the previous volumes to the Forecast system visible to the Project Manager. Once the volumes are uploaded into the system, the Project Manager must define the necessary units per item that compose a finished good to satisfy the demand.

Focusing in the example shown in Table 7, Table 8 collects the necessary amount of components to build the finished good in order to satisfy the demand order.

**Table 8.** PCL specific level description of Halls XS

PCL Halls XS				
Level	Description	Trade Type	Unit Descriptor	Units per Item
1	Child sub-item: Halls XS CU	Consumer Unit	Each	1
2	Halls XS display box	Consumer Unit	Inner Pack	16 (*)
3	Halls XS case	Orderable Unit	case	12
4	Halls XS pallet	Orderable Unit	pallet	60

(\*) 16 Consumer Units represent the standard size of a display box imposed by the Kraft Foods Company

Table 8 can be interpreted as follows: Column 1 represents the level of Unit Descriptor starting from the simplest composition (Consumer Unit) and finishing with the last level of component that builds a finished good (pallet). Column 2 shows the description of each item that composes the Halls XS product. Column 3 exposes the type of trade registered in the RING process (Consumer Unit or Orderable Unit). Column 4 classifies each item per Unit Descriptor. To conclude, Column 5 describes the number of units per item of the previous lower level necessary to achieve the demanded quantity in Table 7.

Thus, to satisfy accurately the customer purchase order, it is important to calculate the minimum number of sets of component that can cover the volume exposed in the forecast. As the volumes described in Table 7 refer to a short-term period (4 weeks), the manufacturing order should produce to cover the total amount of 181 kg instead of producing each week. Only when it is a one-year prevision of volumes, production should be split into months.

As a result, considering the amounts in the last column of Table 8, to cover 181 kg it is necessary to produce: 1 unique pallet to transport 60 cases. Each case should carry 12 display boxes and each display box should be filled in with 16 Consumer Units.

Taking into account the previous relationships and quantities between the Unit Descriptors, eq. 7.1 calculates the kilograms that would be necessary to produce in order to adjust the demand order to the production:

$$\frac{17g}{1 \text{ CU Halls XS}} \cdot \frac{16 \text{ CU Halls XS}}{1 \text{ Display Box}} \cdot \frac{12 \text{ Display Box}}{1 \text{ Case}} \cdot \frac{60 \text{ Cases}}{1 \text{ Pallet}} = 195,84 \text{ kg (Eq. 7.1)}$$

Equation 7.1 represents the equivalent weight of an individual Consumer Unit (CU), 17g, distributed in 60 cases. Consequently, to satisfy 181kg, it is necessary to produce 195,8kg. The extra 14,84kg would be kept in the warehouse as stock-still to guarantee a minimum coverage.

- **Proposal for case and pallet dimension**

Once dimensions are established and volume is defined, the Project Manager should provide an efficient proposal to reduce the material waste of the case and pallet. During the Halls XS Project, the following proposal of the case and pallet dimension was carried out:

**A. Proposal: Minimum volume per case**

Taking into consideration that 12 display boxes (see Table 8) should be able to fit in one case, the minimum volume per case is calculated in Equation 7.2:

$$\begin{aligned} \text{Min Vol per Case} &= \frac{134,5 \times 110 \times 57,5 \text{ mm}^3}{1 \text{ Halls XS Display Box}} \times 12 \text{ Halls XS Display Box} \\ &= 0,01021 \text{ mm}^3 \text{ (Eq. 7.2)} \end{aligned}$$

*(An over wrapping film for the display box is used to hold the structure inside the case although the extra volume occupied is negligible)*

As seen in Equation 7.2, the minimum volume per case in order to transport 12 display boxes should be 0,01021m<sup>3</sup>.

**B. Proposal: Minimum volume per pallet**

In the same way, the pallet needs to be adjusted to the cases that will be placed to be transported. Having analyzed the convenient position for the cases and distribution, determining the minimum dimension is a parallel procedure applied precedently but, in this case, for the 60 cases as shown in Table 8:

$$\begin{aligned} \text{Min Vol per Pallet} &= \frac{0,01021 \text{ m}^3}{1 \text{ Halls XS Case}} \times 60 \text{ Halls XS Case} \\ &= 0,61252 \text{ m}^3 \text{ (Eq. 7.3)} \end{aligned}$$

Equation 7.3 reflects the minimum volume per pallet that could have the capacity of transporting 60 cases, 0,61252m<sup>3</sup>.

As a result, for the Halls XS Project, the case and pallet chosen had a minimum volume with the objective of reducing the material waste.

**IMPROVEMENT OPPORTUNITY N2. Case and pallet efficient dimension****Table 9.** Case and pallet efficient dimension IO

Phase: PROJECT DEVELOPMENT	
<b>Background and importance</b>	Analyzing carefully the most efficient dimensions of the case and pallet is critical. Not only material waste should be minimized but considering the product security is vital during transportation and manipulation.
<b>Current situation</b>	All through the Halls XS Project, the case and pallet dimension brought a large amount of problems and complaints. The dimensions of the case were exactly as the size of the display boxes gathered together and lacked of capacity to keep the product safe during the transportation. In parallel, the pallet had the exact dimensions of the cases gathered together and caused problems in the storehouse where products are continuously being moved and manipulated.
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Highly damaged products and deformed cases</li> <li>• Opened packs</li> <li>• Material waste due to defective products that had to be discarded</li> <li>• Large number of complaint and unsatisfied customers</li> <li>• Delay in the project duration</li> <li>• Difficulties to manipulate product</li> <li>• Stock break</li> </ul>

<b>Improvement goal</b>	To solve the consequences and to avoid further projects to be carried out in the same way, it is essential to propose a variety of alternatives in the case and pallet dimension selection; minimizing the material waste, keeping the product safe during transportation, easy to manipulate and to ensure that the customer requirements are prioritized.
<b>Proposed improvement</b>	<p>Therefore, in order to guarantee product security and, at the same time, minimizing the material waste, a possible proposal is the following:</p> <ul style="list-style-type: none"> <li>• Leave mandatory unobstructed space</li> <li>• Efficient position of merchandise</li> <li>• Iteration to approach adequate dimensions of the case</li> <li>• Iteration to approach adequate dimensions of the pallet</li> </ul>

The proposed improvement goals of the case and pallet efficient dimension IO are precisely described as follows:

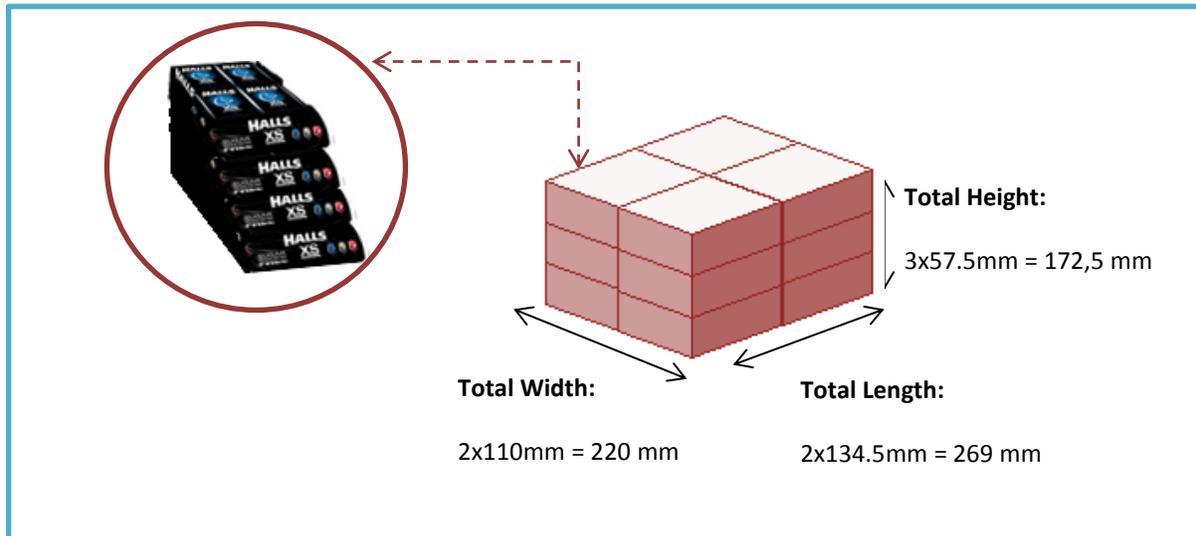
***Proposal: Leave mandatory unobstructed space***

It is highly recommended to leave a determined free space in the inside edge of the case not to overload it and to guarantee a complete closure during the transportation. Imposing to keep from 10% to 15% of unobstructed space within the edge of each case could be enough to fulfill the objectives and to avoid oversize.

***Proposal: Efficient position of the merchandise***

Likewise, it is critical to considerate the most efficient position of the display box to optimize the space of the case and to ensure a safety structure. In this case, as 16 Consumer Units are contained in each display box, the weight could damage the over wrapping film of the display box or be displaced if they were to be positioned in vertical. Consequently, the best option would be to keep the horizontal position for each display box so that the consumer receives the product in perfect conditions.

To have a clear perspective of this proposal, Figure 35 represents the alternative of keeping the product in horizontal when placed inside the case with the dimensions that would occupy shown in Figure 34:



**Figure 35.** Total dimensions that occupy the 12 display boxes in horizontal position proposal

Figure 35 exposes the horizontal position of the display box in order to ensure a secure transport of the product and the total dimensions of gathering 12 display boxes as established in Table 8. The 12 display boxes put together measure 172,5mm of height, 269mm of length and 220mm of width.

**Proposal: Iteration to approach adequate dimensions of the case**

Once the unobstructed space is considered and the efficient position of the DBX inside the case is taken into account, the dimensions of the case can be defined. Trying to accomplish exact dimensions to have an increment from 10% to 15% in the height of the case is a difficult and long procedure. Consequently, the best method is to impose similar dimensions to the ones defined for the 12 displays always overcoming their minimum longitude.

For example, if the minimum dimensions of the display boxes gathered in horizontal are:

- Height: 172,5mm
- Length: 269mm
- Width: 220mm

To overcome these measures and to ensure a 10-15% of unobstructed space in the edge, a possible proposal of the case dimensions could be the following:

- Height: 193mm
- Length: 283mm
- Width: 233mm

Table 10 puzzles the calculations carried out for the 12 display boxes altogether and one individual case dimension.

**Table 10.** Dimensions of the 12 display boxes and case and the increment between height longitudes

Unit Descriptor	Length (mm)	Width (mm)	Height (mm)	Volume (dm <sup>3</sup> )	Increment (%)
12 display boxes	269	220	172,5	10,21	$\frac{193-172,5}{172,5} \cdot 100 = 11,88\%$
1 case	283	233	193	12,73	
Requirements					

As represented in Table 10: Columns from 1 to 3 compare the length, width and height of 12 display boxes gathered together and of a unique case. Column 4 analyzes the different volumes that correspond to the 12 display boxes and to the case. Ultimately, column 5 calculates the increment between the height longitudes, 11,88%.

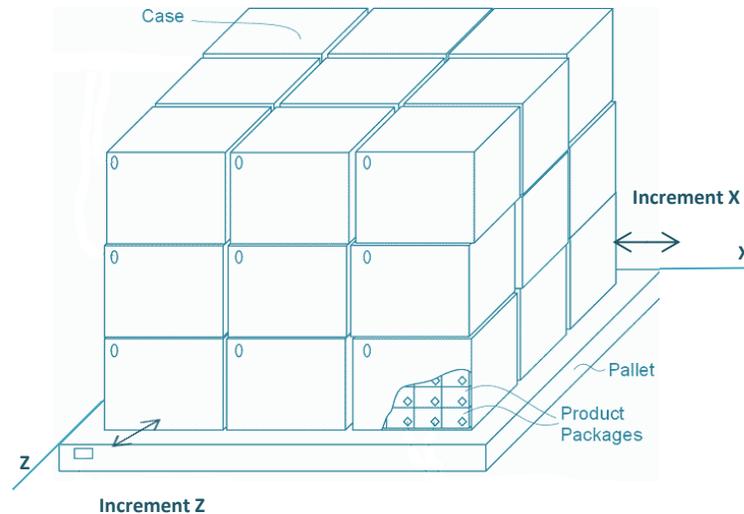
As a result, Table 10 confirms that the following requirements have been accomplished:

- Dimensions of the case should be superior to the 12 display boxes gathered
- Increment of the height is recommended to be from 10% to 15%, leaving the required margin in the edge unimpeded.

**Proposal: Iteration to approach adequate dimensions of the pallet**

The requirements for the pallet dimension should be slightly different from the ones previously mentioned since it needs more protection in the transport:

- Dimensions of the pallet must be superior to the 60 cases gathered
- There should be a bigger increment in the width and the length between the pallet and the 60 cases to ensure that they stand still during the transportation, avoiding being displaced for any abrupt movement (see Figure 36).



**Figure 36.** Pallet dimensions proposal with increment in axis Z and X from the cases

Figure 36 illustrates the proposal of leaving an increment in the width (increment X) and length (increment Z) of the pallet not to be equivalent to the 60 cases dimensions. Even though dimensions of the pallet would be superior to the minimum required, it could ensure a safe transport of the product and avoid delivering damaged cases.

### 7.1.2. RING procedure

Once volumes are established and the sub-units per item are defined, all the required information to reserve a SKU code is collected. However, it is necessary to obtain a Kraft Item Code (KIC-7) and a Global Trade Identification Number (GTIN) for all components that build the finished good. Therefore, it is important to have a clear perspective of how to proceed and how many codes will be provided and reserved with the RING procedure:

- One SKU code
- Four KIC-7
- Four GTINs

The previous codes refer to one flavor of the Halls XS. As mentioned in chapter 1.2, three flavors will be launched for this project and, consequently, it will be necessary to repeat the procedure. In total, fifteen codes are required to launch entirely the new product.

To proceed with the reservation of codes, it is fundamental to select a logical sequence of the components as a child cannot be joined to an inexistent parent. Consequently, the reservation via RING must start from the highest level (pallet) or, on the contrary, with the lowest one (Consumer Unit). Once the SKU code or product identification in the system is set up, it can be visible in the SAP channel for the rest of the cross-functional team. Implementing the codes in the SAP software system allows product planning and materials purchasing orders.

In spite of the many functions offered by the SAP system, throughout this Final Degree Project, the main utilization remains in the software system to identify and plan the resource needs.

In other words, SAP is used as an Enterprise Resource Planning (ERP) focused in the product planning, materials and parts purchasing, inventory control, distribution and logistics, production scheduling, order tracking and capacity utilization.

The screenshot in Figure 37 represents the procedure required to reserve the SKU code, KIC-7 and GTINs via RING starting the sequence with the lowest level: **Consumer Unit**

Save Submit To Approver

Cloned From

MDM ID: 274337  
Kraft Item Code: 0642554

Once the RING procedure is finished for this component, it must be submitted to the Master-Data Department (Approver) that will provide the kic7 and GTIN required

MDM Id: \_\_\_\_\_  
Status MDM: \_\_\_\_\_  
Organization of Ownership: \* ESP    
Product Type: EACH  
Unit Descriptor: \* EACH    
Product Description GRID: \_\_\_\_\_  
GTIN - Trade Item Type: CONSUMER UNIT  
Consumer Unit Flag: \* Yes    
Orderable Unit Flag: No    
GTIN - PL/Distributed: \_\_\_\_\_  
Manufacturer No - Prefix Code: \* 7622300   1  
Product Code: \_\_\_\_\_  
KNAC-14 Suffix Code: \_\_\_\_\_  
GTIN: \_\_\_\_\_  
GTIN - Override Flag: \* \_\_\_\_\_   2  
GTIN - Suppressible Code: \_\_\_\_\_  
GTIN - Suppressible Indicator: \* \_\_\_\_\_    
Brand/Sub Brand: \* HALLS <HALLS>    
Variant: PEPPERMINT    
Sub-Variant: SUGAR FREE    
Sub Units Per Item: 0  
Kraft Item Code: \_\_\_\_\_  
KNAC-14: \_\_\_\_\_  
KIC-7: \_\_\_\_\_  
GTIN - Variable Weight: \* No    
PDR/Project Number: \* 53602

Prefix Code of the Manufacturing Plant

GTIN-Override Flag (Yes/No): NO

GTIN-Suppressible Indicator (Yes/No): NO

Specify Brand (Halls) and flavor (Peppermint or Mint)

EACH is the lowest level of the finished good

Manufacturing plant country chosen by Hurdle Rates

Packaging Language according to the selling countries of the PDR

Parent Packaging Relationship:

Parent Packaging Quantity	Parent Kraft Item Code
---------------------------	------------------------

Child Packaging Relationship:

Child Packaging Quantity	Child Kraft Item Code
--------------------------	-----------------------

As the next superior level has not a kic7 or GTIN yet to be identified, it will be linked with this child when the reservation for the Inner-Pack is done, following a logical sequence

The EACH Unit Descriptor is the lowest level, it has no child linkage

Status Global: \_\_\_\_\_  
Packaging Type: BOX/CARTON    
Functional Name: CANDY    
Consumer Unit Size: 17    
Consumer Unit Size UOM: GR    
Reason For SKU Creation: \* \_\_\_\_\_   4  
Reason For SKU Elimination: \_\_\_\_\_    
Comments: \_\_\_\_\_

Reason for creating the SKU refers to the Project Type

Figure 37. Screenshot of the RING procedure for the reservation EACH Unit Description

The numbers indicated in Figure 37 can be interpreted as follows:

- 1) **GTIN - Override Flag:** represents the option of using an existing GTIN or creating a new one. For those projects that involve improvements, modifications or a promo flash, a new SKU code is required but not a new GTIN. In this case, it is necessary a new GTIN as it is an NPD.
- 2) **GTIN – Suppressible Indicator:** points out the option of omitting the prefix code of the manufacturing plant from the barcode. It is strongly recommended to include the Indicator in all products to avoid making possible mistakes in identifying the correct plant that will be producing.
- 3) **Hurdle Rates:** refers to the minimum volume of product imposed by the plant that must be produced in order for them to accept carrying out the project productivity. The Hurdle Rates change depending on the manufacturing plant, consequently, is it important to choose the most optimized option (minimizing waste of product). In the next chapter, the accurate procedure of selecting the best manufacturing plant is explained.
- 4) **Project Types of the I2M process:** attributes to the description of the project types in chapter 4.2. In this case, as mentioned previously, it is an NPD Line Extension.

Only when the pallet has been associated to the case, the SKU code can be reserved. Additionally, the KIC-7 and GTIN codes are provided at the same time. To understand the Unit Descriptors precisely and the linkage that are established between them, Appendix C describes each Unit Descriptor and how it should be developed in the RING procedure.

Table 11 contains the heretofore codes for each item, which are supplied by the Master-Data team (described in the Kick-Off Meeting Improvement Opportunity in chapter 6.1), of the finished good to proceed to the next step in the Project Development phase:

**Table 11.** SKU Code, KIC-7 and GTINs for each component that builds the Halls XS Peppermint finished good

		KIC-7	GTIN	SKU
<b>Halls XS Peppermint</b>	case	SKU 1	GTIN 1	<b>SKU 2</b>
	display box	KIC-7 <sub>1</sub>	GTIN 2	
	Consumer Unit	KIC-7 <sub>2</sub>	GTIN 3	
	<i>pallet</i>	SKU 2	GTIN 4	

The SKU code, broadly, uses the KIC-7 corresponded to the pallet component. Therefore, the KIC-7 code of the pallet is equivalent to the finished good SKU code.

*IMPROVEMENT OPPORTUNITY N3. SKU reservation and material plant delivery***Table 12.** SKU reservation and material plant delivery IO

Phase: PROJECT DEVELOPMENT	
<b>Background and importance</b>	Throughout the Project Development Phase, the SKU reservation via RING is critical. It represents the beginning of the Master-Data procedure in order to create the reference code of the product that will be implemented in the market.
<b>Current situation</b>	<p>During the reservation of SKU in the Halls XS Project, linkage between parent/child formats were erroneous and, consequently, the manufacturing plant started to prepare the first production with misfigured information.</p> <p>For that reason, wrong materials were purchased in inaccurate quantities and gone to waste. In addition, the SKU reservation had to be restarted gathering a four week delay of the project launching.</p>
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Material and funds waste</li> <li>• Delay on project duration</li> </ul>
<b>Improvement goal</b>	To ensure that the SKU reservation is arranged properly, it is fundamental to supervise the RING procedure before being submitted and to introduce a security measure in the system.
<b>Proposed improvement</b>	<p>Imposing a logic linkage between parent/child formats that can block any possible incoherence that may be introduced in the system could prevent from dragging continuous errors.</p> <p>Furthermore, to impede suffering extra delays, building a Bill of Materials (BOM) when the SKU is reserved, provides additional weeks for the Manufacturing Plant to buy the necessary materials and prepare the machinery for the production.</p>

Therefore, in reference to the improvement opportunity in Table 12, the BOM for the product should be built and sent to the manufacturing unit to provide the necessary time to buy the materials and achieve the estimated deadline for the materials plant delivery activity.

Focusing in the example of Halls XS and the units described, Table 13 represents the proposed Bill of Materials (BOM).

**Table 13.** Bill of Materials (BOM) for the Halls XS Peppermint finished good

<b>BOM HALLS XS PEPPERMINT</b>	
<b>Unit Descriptor</b>	<b>Total Amount (units)</b>
PALLET	1
CASES	60
DISPLAY BOX	720
CONSUMER UNIT	11520

Table 13 exposes the Halls XS BOM proposal where the first column determines the Unit Descriptor and the second column reflects the total amount of units required. The BOM is delivered to the suppliers in order to prepare the raw materials for production. It is convenient to anticipate the purchase of materials sending the BOM as soon as the SKU code is reserved.

## 7.2 Launch Request completion

After carrying out all the previous stages in the Project Development phase (see section 7.1), information needs to be collected and exposed in the Launch Request (LR) form. It is important to provide all necessary data that enables to make the decision to move from the Project Development to the Project Execution phase.

The major benefits of the Launch Request (LR) include:

- Carefully considered financial justification for project execution

- Proactive management of sensitivities and risk
- Ensured excellence and speed in execution

Whereas a Project Development Request (PDR) is based on targets and assumptions, the LR is grounded in facts based on feedback and analysis. It is possible and acceptable that the information presented in the LR is significantly different from the original assumptions in the PDR.

### **7.2.1 Building a Launch Request**

To build a Launch Request, it is basic for the Project Leader to collect and include:

- Recommendations
- Strategies and plans
- Financials
- Key project milestones
- Risk and contingencies

However, the Project Manager takes over responsibility of completing key milestones, establishing project feasibility and associated risks and submitting the LR to the relevant PAM (or MOR) meetings for approval. Broadly, the legal and regulatory perspective is also carried out by the Project Manager in the LR completion.

### **7.2.2 Launch Request Approval**

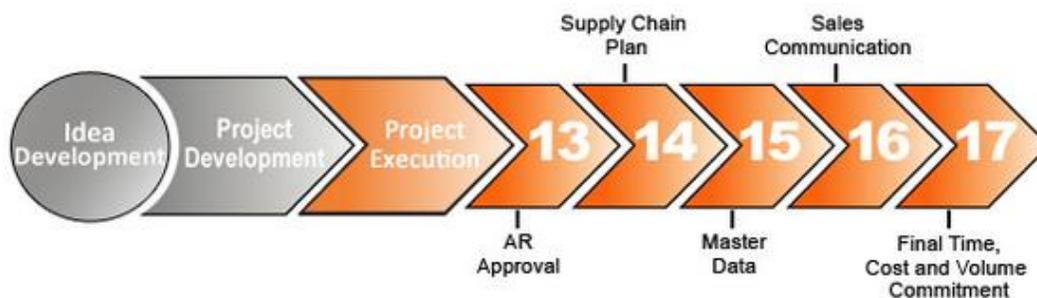
Ultimately, a mandatory step is to obtain approval from the PAM members of the LR and communicate status to the project team. Launch Requests may not be progressed without formal approval being given by the PAM (and MOR where appropriate).

## CHAPTER 8. PHASE III: PROJECT EXECUTION



After the approval of a Launch Request (LR), the Project Manager is responsible for driving the delivery of the previously developed and business approved project plans, ultimately ensuring the commercialization of the idea into the market.

There are five milestones that comprise the Project Execution phase (see Figure 38): Administrative Regulations (AR) Approval, Supply Chain Plan, Master Data, Sales Communication and Final Time, Cost and Volume Commitment



**Figure 38.** The Project Execution phase structure composed by 5 milestones; Administrative Regulations (AR) Approval, Supply Chain Plan, Master Data, Sales Communication and Final Time, Cost and Volume Commitment

The main objectives of the Project Execution phase are:

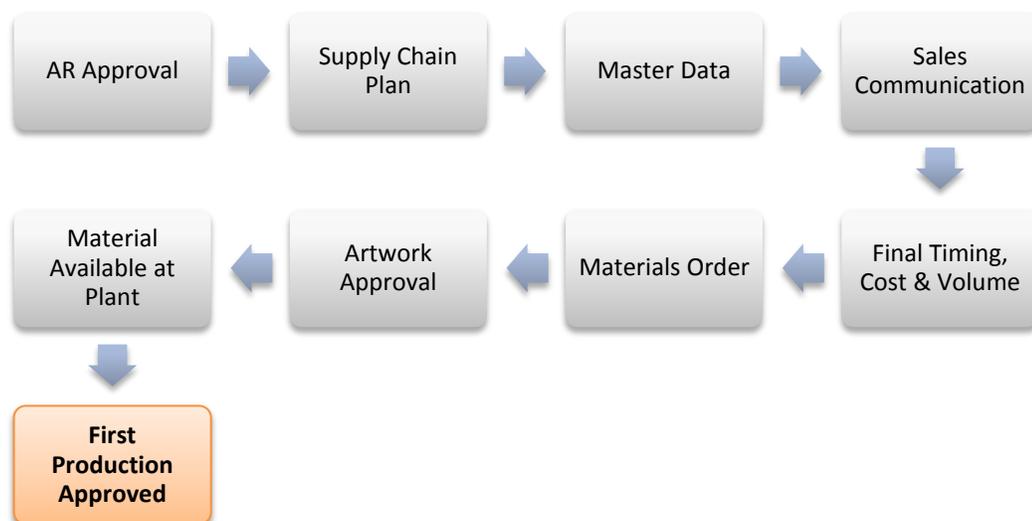
- To implement the manufacturing plan and integrate all necessary data
- To provide guidelines for sales communications and artwork approval
- To outline tasks for efficient appropriation of material

Therefore, in order to have a clear vision, the concrete steps that must be completed to meet the phase requirements are the following:

- **Administrative Regulations (AR) Approval:** Only required if project needs capital investment.

- **Supply Chain Plan:** To execute all plant plans (equipment ordering, installations...)
- **Master Data:** To gather and enter all required product information in the appropriate system so that it is visible for all the cross-functional team.
- **Sales Communication:** Send out sales samples and communicate all necessary product information and rollout.
- **Final Timing, Cost and Volume Commitment:** Establish forecasts based on final agreement for timing, cost and volume.
- **Materials Order:** Commit to supplier on the ordering of required materials.
- **Artwork Approval:** Create and approve final artwork for all packaging types, including separations and print proof approval.
- **Materials Available in Plant:** Ensure all required materials have been ordered and delivered to the appropriate location and they meet required specifications.

Figure 39 represents the route map with the correct sequence of tasks that guarantee the success of the Project Execution in order to move towards the execution phase:



**Figure 39.** Route map of the phases that comprise the Project Execution stage

## 8.1 Supply Chain Plan

Broadly, in the Iberia Region, the Manufacturing Plant is located in Valladolid to serve Spain and Portugal. The Valladolid (VDD) Plant orders the necessary materials from the suppliers and executes the first production of the consumer good.

All the packaging of the consumer good, once it is fully produced, is arranged in VDD. Using the VDD Plant to produce and develop the necessary packaging for the cases, display boxes, Consumer Units in addition to possible stands or showcases are the main reason of the frequent delays of the project. As described in chapter 4.3.1, the highest number of incidents is reported in the production line due to delays in material delivery, damaged production machinery, unexpected modifications in the product format or defective product packaging.

Therefore, the first step of the Project Execution phase is to elaborate a production plan with the estimated dates of production for each reference. Usually, the VDD Business Developer provides a document with the previous information adjusting the deadlines to the submitted time plan.

## 8.2 Materials Order

Applying the improvement opportunity and sending the BOM when the SKU is created, provides enough time for the suppliers to prepare the materials.

Throughout the Halls XS Project, materials were ordered out of the system by VDD to shorten the procedure time of releasing a formal purchasing order (PO). Working out of the system, or informally, involves a great risk as materials can be, not only defective or with less quality, but delivered in a longer period of time than expected.

**IMPROVEMENT OPPORTUNITY N4. Formal Purchasing Order****Table 14.** Formal Purchasing Order IO

Phase: PROJECT EXECUTION	
<b>Background and importance</b>	Once the project is executed and set to motion, it is essential to be cautious to guarantee a successful production and to minimize waste of materials. Suppliers constitute one of the most critical factors during this phase as the production depends on the materials delivery at plant, on the quality and on the possible delays that can be caused during the transfer.
<b>Current situation</b>	Throughout the Halls XS Project, materials were ordered out of the system missing a formal Purchasing Order to reduce possible delays. It is critical to ensure an approval of the materials that are purchased reviewed by the Project Manager and the VDD team.
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Low quality materials</li> <li>• Delay in the transfer</li> <li>• Delay in the production</li> <li>• Waste of resources</li> </ul>
<b>Improvement goal</b>	Every step of the I2M process should be supervised and formally reflected in a document. A formal contract could avoid purchasing defective raw materials or experiencing delays in materials delivery to the plant in order to start producing.
<b>Proposed improvement</b>	It is highly recommended to establish a formal Purchasing Order and the correct steps to follow to request the materials to the suppliers. Saving time with worst consequences does not ameliorate the process.

As a result, a possible example of a formal Purchasing Order and materials request to be submitted to the VDD team is described in Figure 40.



**Figure 40.** Example of the possible steps to follow to establish a formal Purchasing Order

As observed in Figure 40, establishing a formal Purchasing Order requires several steps to be arranged before it is received by the suppliers. The Purchase Order should be sent to the Procurement department to be supervised once it is fulfilled. The Procurement department collects all the material requests and negotiates the total costs. Once it is administered, it is important to choose accurately the adequate supplier and to expose the Purchasing Order with the team members involved in the NPD for approval. Only when approved, the purchase can be registered in the system and sent to the selected suppliers.

### **8.3 Artwork Approval**

The Artwork Approval consists on approving the design of the product provided by the Marketing department. The term Artwork refers to one possible version of the definitive design, which receives the name of "Repro". Currently, the final design or Repro is approved by the team members involved in the project through the system and sent to the printer. The legibility and the colors of the pack are the principal factors that are reviewed and approved. Approving the Artwork uniquely through the system involves risk in the legibility or color as the physic pack printed can be different from the virtual one.

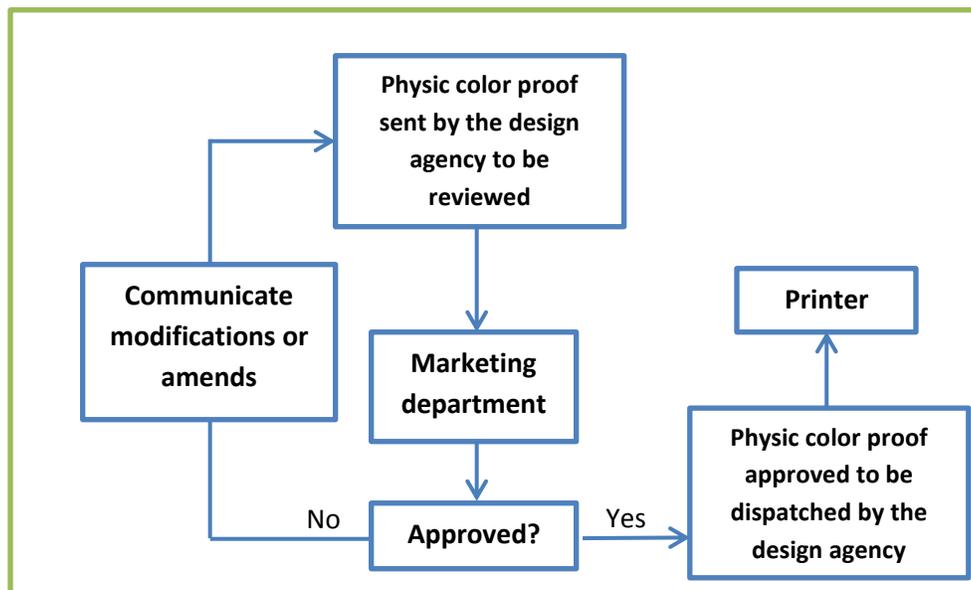
**IMPROVEMENT OPPORTUNITY N5. Physical color proof approval****Table 15.** Physical color proof approval IO

Phase: PROJECT EXECUTION	
<b>Background and importance</b>	<p>Reviewing and approving the packaging design correctly is important to proceed with the printer and, subsequently, receiving the materials from the suppliers to start producing. The main factors to be considered in this step are: the color and the legibility of the pack for the consumer.</p>
<b>Current situation</b>	<p>The Artwork Approval of the Halls XS caused a 2 weeks delay in the project estimated ATO. The principal reason is based on approving the design through the system instead of requiring a physical color proof to be reviewed precisely since differences can be noticeable. Not only the color but the legibility is critical in the customer requirements. The consequences of producing with an inaccurate design are crucial as production has to be restarted and Artworks need to be rearranged.</p>
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Delay in project duration</li> <li>• Waste of materials</li> <li>• Extra work</li> <li>• Machine wear in production line</li> </ul>
<b>Improvement goal</b>	<p>To improve the efficiency of the Artwork Approval chapter and to ensure a correct review, a new structure of the physic color proof approval process could be introduced.</p>

**Proposed improvement**

A considerable proposal could be for the design agency to send an additional physic color proof, apart from the one sent directly to the printer, to the Marketing department where colors can be evaluated and legibility can be verified. The impact on the timings due to the physic color proof dispatch is minimum as the agencies are located in Barcelona.

To apply the previous improvement opportunity, Figure 41 represents a proposal of the structure to be followed in this alternative:



**Figure 41.** Structure of the physic color proof approval proposal

As shown in Figure 41, to apply the Physical color proof approval IO, it is necessary for the design agency to send an additional copy to the Marketing department to be reviewed. If the Marketing department decides to approve the color proof, the design agency could send the original color proof directly to the printer. Otherwise, the Marketing team members should inform the agency about the requested amends.

## 8.4 First Production Approval

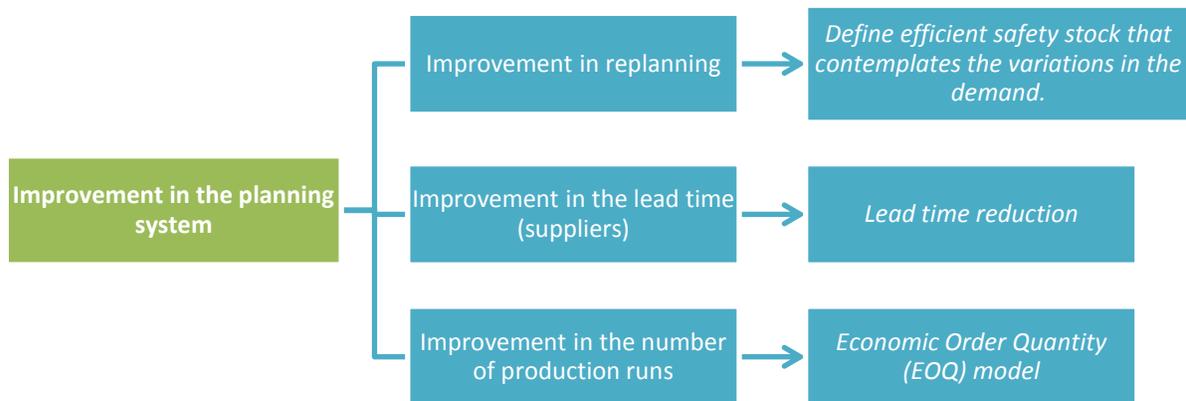
The First Production Approval (FPA) can start when all materials required have been delivered to the correct manufacturing location, in this case, VDD. The main goal of a FPA is to confirm the quality of the finished good and to compare it with the approved specifications. In addition, when production has been carried out, the packaging is also arranged in the same plant to avoid transport costs or delays.

During the Halls XS FPA, several issues were reported by the manufacturing plant staff, such as the unsatisfactory coordination with the planning team members, the unexpected modifications in the product format, the material waste generated and the delays that concluded in stock break for the customer.

In the next chapters, the production phase will be precisely examined to understand the factors that could be improved in order to obtain a successful FPA.

### 8.4.1 Planning system

The improvements in the planning system do not require an important investment although they can result highly efficient in the results. The aspects to be improved in this area are reflected in Figure 42:



**Figure 42.** Improvement opportunities in the planning system

Figure 42 collects three improvement opportunities that could ameliorate the effectiveness of the planning system:

- **Improvement in replanning:** to overcome successfully urgent last minute modifications in the production.
- **Improvement in the lead time (suppliers):** to anticipate the events and avoid delays by minimizing the time between the placement of an order in the planning system and the start of production.
- **Improvement in the number of production runs:** to produce with an optimal number of orders.

The previous improvement opportunities will be precisely analyzed in the following three pages.

**IMPROVEMENT OPPORTUNITY N6.** *Define efficient safety stock that contemplates the variations in the demand.*

**Table 16.** Define efficient safety stock that contemplates the variations in the demand IO

Phase: PROJECT EXECUTION	
<b>Background and importance</b>	Launching a new product to the market, such as Halls XS, implicates uncertainty as the impact in the consumer is not predictable. To that matter, it is usual to experiment changes in the production plan increasing or reducing the tonnage order. Customers are likely to feel unsure and to modify the volume of product ordered during the production track.
<b>Current situation</b>	A production replanning is an essential resource for those urgent and eventual last minute changes. Nevertheless, the Halls XS product experienced several production replannings changing the demand orders as customers felt uncertainty. These actions increased the production costs and material waste.
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Excess of stock in over production</li> <li>• Delay in the production</li> <li>• Waste of resources</li> </ul>
<b>Improvement goal</b>	The main cause of changing the whole production plan when the demand order is deviated is having an inadequate stock coverage. The safety stock should be able to compensate the deviations in the forecast that may appear, particularly, in the launching of new products.

To that matter, a proposal is to estimate the deviation in the demand order and to contain it in an interval. Using other new product launching examples could be helpful to assemble a maximum value of variation and a minimum. To calculate an efficient safety stock that contemplates the variations in the demand, it is recommended to use Equation 8.1:

$$SS = u \cdot \sqrt{T_m^2 \cdot \sigma_D^2 + D \cdot \sigma_{T_m}^2} \quad (\text{Eq.8.1})$$

where:

**SS (Tons):** Safety Stock. Level of extra stock maintained to mitigate risks of stock outs

**Proposed  
improvement**

**u (%):** Service level. Desired probability that the level of SS will not lead to a stock out

**T<sub>m</sub><sup>2</sup> (Time period):** Average Lead Time. Delay between the time when the reorder point is reached and renewed availability

**σ<sub>D</sub><sup>2</sup>:** Standard Deviation of Demand. Measure used to quantify the amount of variation of the demand

**D (Tons/Time period):** Average Demand

**σ<sub>T<sub>m</sub></sub><sup>2</sup>:** Standard Deviation of Lead Time. Measure used to quantify the amount of dispersion of the Lead Time.

As observed in Table 16, the amount of safety stock an organization chooses to keep on hand can dramatically affect their business. Too much safety stock can result in high holding costs of inventory. In addition, products which are stored for too long a time can spoil, expire or break during the warehousing process. Too little safety stock can result in lost sales and, thus, a higher rate of customer turnover. As a result, finding the right balance is essential.

To that matter, it is important to understand how the inventory replenishment is carried out. The process flow is described in Appendix D.

**IMPROVEMENT OPPORTUNITY N7. Lead time reduction****Table 17.** Lead time reduction IO

Phase: PROJECT EXECUTION	
<b>Background and importance</b>	<p>The lead time is a concept based on the latency between the initiation and execution of a process. More precisely, it is the period of time between the placement of an order in the planning track and the initiation of the production.</p> <p>In reference to the previous improvement opportunity of establishing a Kick-Off Meeting, the lead time can relate to the critical path determined in the PERT chart.</p> <p>Reducing the lead time is essential as it compensates possible delays in other steps of the project development. It is mainly based on the objective of improving the planning efficiency by anticipating the further steps.</p>
<b>Current situation</b>	<p>In the Halls XS project, as seen in the previous phases, there were several events that prolonged the launching of the product. It is important to foresee alternatives that could shorten the duration of particular activities.</p> <p>This improvement opportunity represents a global alternative to anticipate the events and compensate the delays that appeared in the Halls XS project</p>
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Delay in the ATO of the project</li> </ul>
<b>Improvement goal</b>	<p>It is recommended to minimize the duration between the project planning establishment and the first production.</p>

**Proposed improvement**

There are timings that are fixed and difficult to reduce, such as the raw materials supply that is defined in the contract. However, it could be interesting to conserve the materials supply fixed duration with the possibility of adjusting the orders subsequently. With this method, a close estimation of the materials order could be provided with a certain margin to be fixed a week before the delivery in the plant.

Anticipating the raw materials supply with a close estimation would provide to the suppliers the opportunity of starting sooner. Consequently, materials could be delivered on time at the plant compensating possible delays in the transfer.

**IMPROVEMENT OPPORTUNITY N8.** *Economic Order Quantity (EOQ) model***Table 18.** Economic Order Quantity (EOQ) model IO

Phase: PROJECT EXECUTION	
<b>Background and importance</b>	<p>Using the SAP system to plan the production orders can be useful for a conventional product development. Nonetheless, the main issue is the short-term planning performance that can result from the last minute changes. These changes trigger inefficient number of production runs. Therefore, it is important to maintain an optimized production track with the capacity of using other resources to overcome short-term planning performance.</p>
<b>Current situation</b>	<p>Throughout the Halls XS project, as mentioned before, last minute modifications were several due to the innovation and uncertainty of the product performance in the market. As a result, the tonnage produced was misadjusted to the demand order.</p> <p>Having an ineffective number of production runs resulted in producing excessively or deficiently in comparison to the tonnage demanded.</p>
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Waste of resources</li> <li>• Delay in product delivery due to deficient stock</li> </ul>
<b>Improvement goal</b>	<p>It is essential to use a fast system that could replace SAP in the short-term performances providing an optimized number of production runs. Moreover, in the case of having a breakage in the production line as it occurred with Halls XS, the operator could adapt the production plan to the optimized solution swiftly.</p>

An interesting proposal to calculate the efficient number of production runs and reduce costs could be the *Economic Order Quantity (EOQ)* model. With the EOQ model, it is necessary to define a fixed quantity to be ordered in each run. To that matter, the next equation is to obtain the number of production runs per period of time;

$$N^* = \sqrt{\frac{\sum_{i=1}^n K_{Pi} \cdot D_i \cdot \left(1 - \frac{d_i}{T p_i}\right)}{2 \cdot \left(\sum_{i=1}^n K_r i + X \cdot K_c\right)}} \quad (\text{Eq. 8.2})$$

where:

**Proposed improvement N\* (Orders/Time period):** Optimal number of orders per period of time

**K<sub>p</sub> (Euros):** Cost of maintaining inventory

**d (Tons/Time period):** Demand

**D (Tons/Time period):** Demand rate

**T<sub>p</sub> (Tons/Time period):** Production rate

**K<sub>r</sub> (Euros):** Cost of preparation of an order

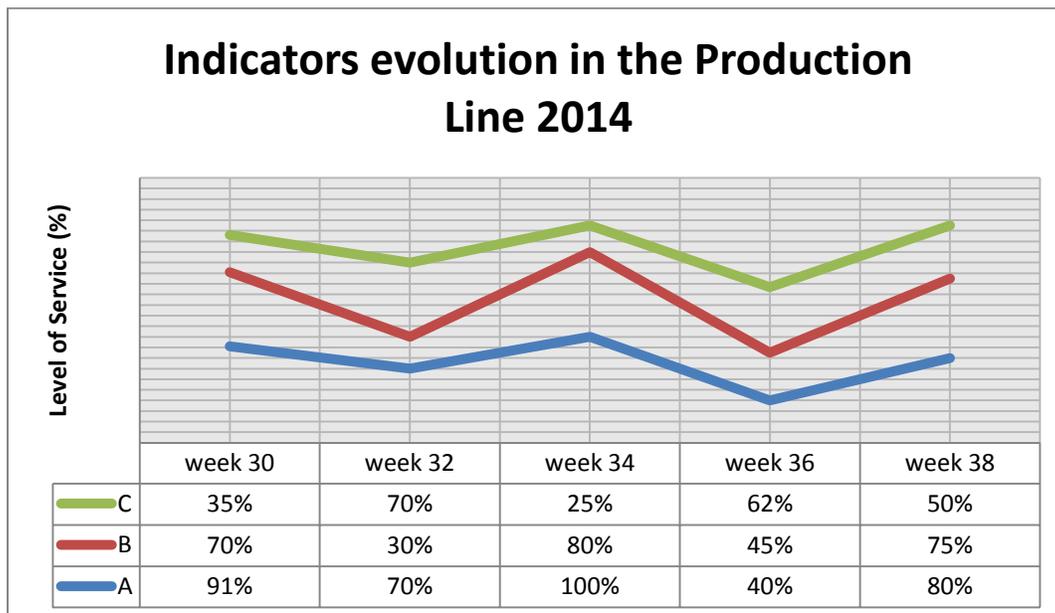
**X:** Changes of format per cycle

**K<sub>c</sub> (Euros):** Purchase cost

### 8.4.2 Production Line global evaluation

As described in section 4.3.1, the Production Line collects the highest number of customer complaints in the launching of consumer goods. To properly analyze the Production Line, it is necessary to have a global view of the production performance and service. To that matter, it is important to use historic results from other projects to identify the origin of the problems using indicators.

Throughout the weeks, information is collected and exposed in the meetings and in the manufacturing plant to identify eventually difficulties. Results from other projects have been gathered together in Figure 43 to evaluate the level of service that the indicators have collected.



**Figure 43.** Graphic of the evolution of the indicators in the production line during five weeks in 2014

The indicators stated in Figure 43 (A, B, C) represent the level of service in the production line that corresponds to a ponderation of the measures taken in different projects.

The “A” indicator in blue color refers to the plant performance. In order to improve this aspect, it would be necessary to make important investments in the machinery. Nonetheless, there are other alternatives that could ameliorate the efficiency of the plant that will be described in the next chapter.

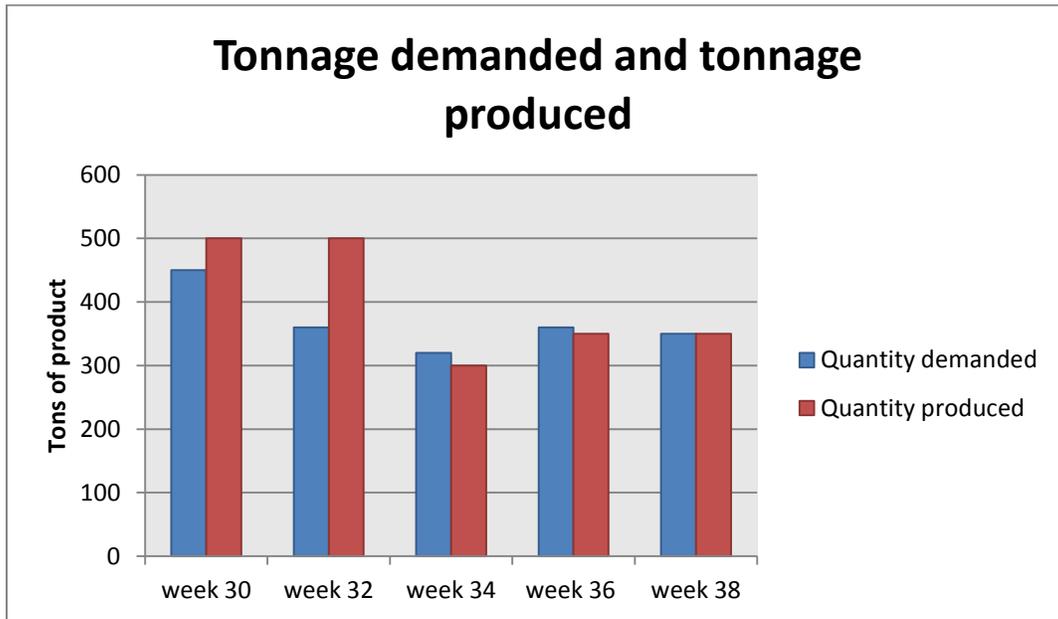
The other indicators are remarkable due to their noticeable oscillation and low values. The low percentage corresponds to problems in the flexibility of the plant and to the lack of information from the planning that the team elaborates to develop the project;

The “B” red color indicator describes the short-term planning performance that could be substantially improved by promoting the coordination between the manufacturing plant staff and the team members involved in the planning of the project development.

To conclude, the “C” indicator in green color represents the insufficient flexibility of the plant in implementing changes in the product format or in arranging optimized runs in the production. It is important for the plant to create a contract were restrictions, costs in format changes and efficient runs of production are exposed for the team members involved to adapt to production regulations.

Carrying out the efficient runs of production to avoid producing insufficient or exceedingly could minimize largely the material waste.

Figure 44 represents a graphic with the variation between the planning orders and the tons that were produced to satisfy the demand.



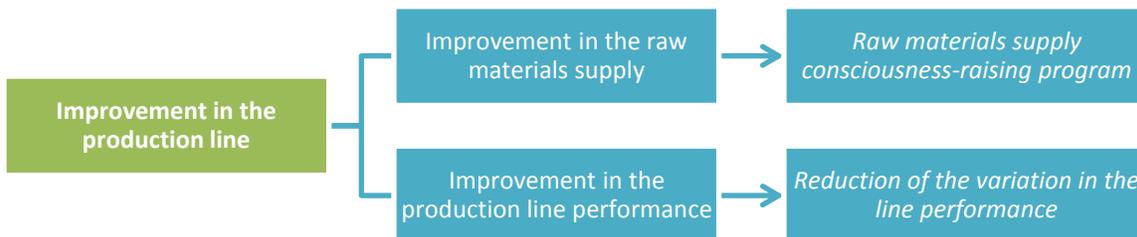
**Figure 44.** Graphic that represents the tonnage demanded and the tonnage produced

As seen in Figure 44, it is noticeable that the production orders should be precisely adjusted. On the other hand, it is important to considerate that the problem in the production line is not the capacity of the plant as exposed in the graphic.

### 8.4.3 Production cycles

The frequency of production at the plant is critical as it has an impact in the rotation and safety stock. It is important to understand production periods of the product and how they can be efficiently determined.

As there are diverse aspects to improve in the production line, the improvement opportunities will be decomposed in several alternatives (see Figure 45). The aspects that will be described are the following:



**Figure 45.** Improvement opportunities in the production line

Figure 45 exposes two improvement opportunities that could ameliorate the performance of the production line:

- **Improvement in the raw materials supply:** to ensure that the team members are completely aware of the importance of their precise work and supervision throughout the raw materials purchase and delivery.
- **Improvement in the production line performance:** to adjust the production to the demanded tonnage and to guarantee an effective maintenance service.

The previous improvement opportunities are described in the next two pages.

**IMPROVEMENT OPPORTUNITY N9.** *Raw materials supply consciousness-raising program.***Table 19.** Raw materials supply consciousness-raising program IO

Phase: PROJECT EXECUTION	
<b>Background and importance</b>	Failures in the materials supply have an impact in the stock and increase the production costs since it involves unexpected modifications.
<b>Current situation</b>	All through the Halls XS project, the raw materials supply experienced a considerable delay. Moreover, the inventory of materials requires a constant supervision and control which was not provided.
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Low quality materials and waste of resources</li> <li>• Delay in the transfer and production</li> </ul>
<b>Improvement goal</b>	<p>As explained previously in the formal Purchasing Order improvement opportunity, it is important to choose accurately the suppliers and to create a contract to ensure that materials are delivered in time, penalizing delays in the supply.</p> <p>In addition to this alternative, to minimize the risks in the raw materials supply, it is highly recommended to inform the team members about the importance of their good work in the process and constant supervision.</p>

**Proposed improvement**

A possible alternative could be to promote a consciousness-raising program. The team members could be aware of the risks that involve inaccuracies in the work and the consequences. Not implementing precisely the data in the SAP system or not updating it could lead in huge misunderstandings and delays. Therefore, this supplementary improvement opportunity is based on raising the awareness of the personnel involved in the materials supply to be more precise and concerned about the importance of their work.

*IMPROVEMENT OPPORTUNITY N10. Reduction of the variation in the line performance***Table 20.** Reduction of the variation in the line performance IO

Phase: PROJECT EXECUTION	
<b>Background and importance</b>	The performance in the production line can result in an insufficient or exceeding production. This is due to the indicative value of production that is assumed considering a normal operation in the line.
<b>Current situation</b>	<p>The Halls XS project experienced deviations in the demand orders due to the variation in the line performance and a stop in the production. A change in the format was required in short-term prevision and the production line had to be adapted briefly. This resulted in an over production of goods as production had already been started with the current format.</p> <p>As seen in the graphic (Figure 41), which represents the tonnage demanded versus the tonnage produced, most of the production weeks suffered an exceeding production compared to the tonnage demanded. Nonetheless, two concrete weeks reflect a deficient production caused by the wear of machines that provoked a discontinuation in the line.</p>
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Excess of stock in over production</li> <li>• Delay in the production</li> <li>• Waste of resources</li> <li>• Delay in product delivery in deficient production</li> </ul>

<b>Improvement goal</b>	<p>It is important to minimize the deviation between the tonnage demanded and produced. Adjusting the orders precisely could overcome short term prevision and adapt briefly to possible changes. Having an efficient maintenance service and stopping the production line on time could ensure a better adjustment in the tonnage produced.</p>
<b>Proposed improvement</b>	<p>In the over production case, an eventual solution is to break the production line once the required tonnage is produced. This could imply an increment in the unoccupied staff in the plant that should be given other activities to arrange in order to optimize resources.</p> <p>On the other hand, to avoid a breakage in the production line and, consequently, a deficient production, it is necessary to improve the efficiency of the maintenance service. In the worst case, it could be indispensable to replace the current machinery in spite of the important investment.</p>

## **8.5 Outsource Manufacturing: Co-packing**

Once the First Production Approval (FPA) is approved, a complete production of the demanded volume is carried out and delivered to the warehouse.

Utilizing one unique resource to produce and to develop the packaging can collapse the production line. Not only it can result saturating but also, the plant is not an exclusive producer for the company as it can receive orders from other clients. Exploring other resources could improve the quality of the product minimizing the added costs. At present, existing consumer industries that manufacture and package products hire a contract packer or co-packer to provide packing capacity, machinery or knowledge. A co-packer works under contract exclusively for the hiring company.

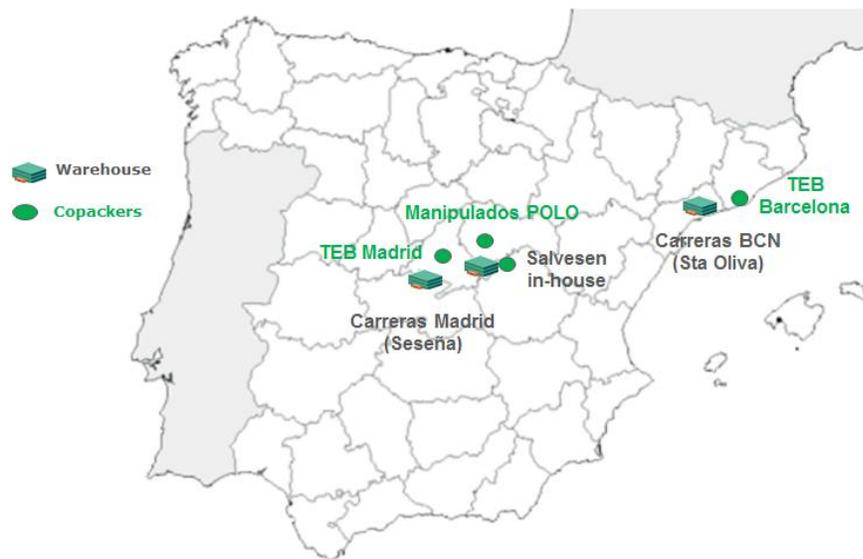
**IMPROVEMENT OPPORTUNITY N11.** Co-packing Resource**Table 21.** Co-packing Resource IO

Phase: PROJECT EXECUTION	
<b>Background and importance</b>	Developing a successful FPA involves an approved quality and an expected duration. Giving all the production responsibilities to one unique resource (VDD) can be risky. Moreover, the objective of all the I2M structure is to achieve a successful result that can satisfy customer requirements.
<b>Current situation</b>	Throughout the Halls XS Project, the packaging was critical due to the complexity of the product design. Packaging was successful in the quality but suffered a considerable delay due to the limited resources of the plant.
<b>Consequences</b>	<ul style="list-style-type: none"> <li>• Delay in project duration</li> <li>• Work overload</li> </ul>
<b>Improvement goal</b>	It is important to reduce the lead-time in implementing the product in the market. Moreover, the packaging is essential in the product and should be delivered on time. Reducing the amount of work in the manufacturing plant, by separating the packaging from the production, could result beneficial in the effectiveness of the production line.
<b>Proposed improvement</b>	Hiring a co-packer to be in charge of the packaging of the finished good may result strongly beneficial to the company. Using a co-packer allows to predict accurately overhead costs due to manufacturing. It would be preferable to choose a co-packer who already has processing lines in place and experience with similar products so that it becomes easier to transfer to the new product.

In order to put in practice the improvement opportunity of hiring a co-packer to develop the product packaging, a possible alternative is to follow the next structure:

**1. Find an experienced co-packer in the Iberia region that serves similar products.**

The existing co-packer network for food or beverage products in the Iberia region has several locations:



**Figure 46.** Co-packer network for food or beverage products in the Iberia region

As shown in the previous Figure, the co-packers are located in different zones with their corresponding warehouse where finished goods are kept to be delivered to the customers. Considering that the main manufacturing plant is situated in Valladolid, it is clear that transport will be required to transfer the products to the co-packer. As all the Iberia region is served from Barcelona, customers can be located in different areas and it is convenient to consider the option of hiring at least two co-packers in the network.

2. Establish a clear co-packing logistic process to orientate the VDD team.

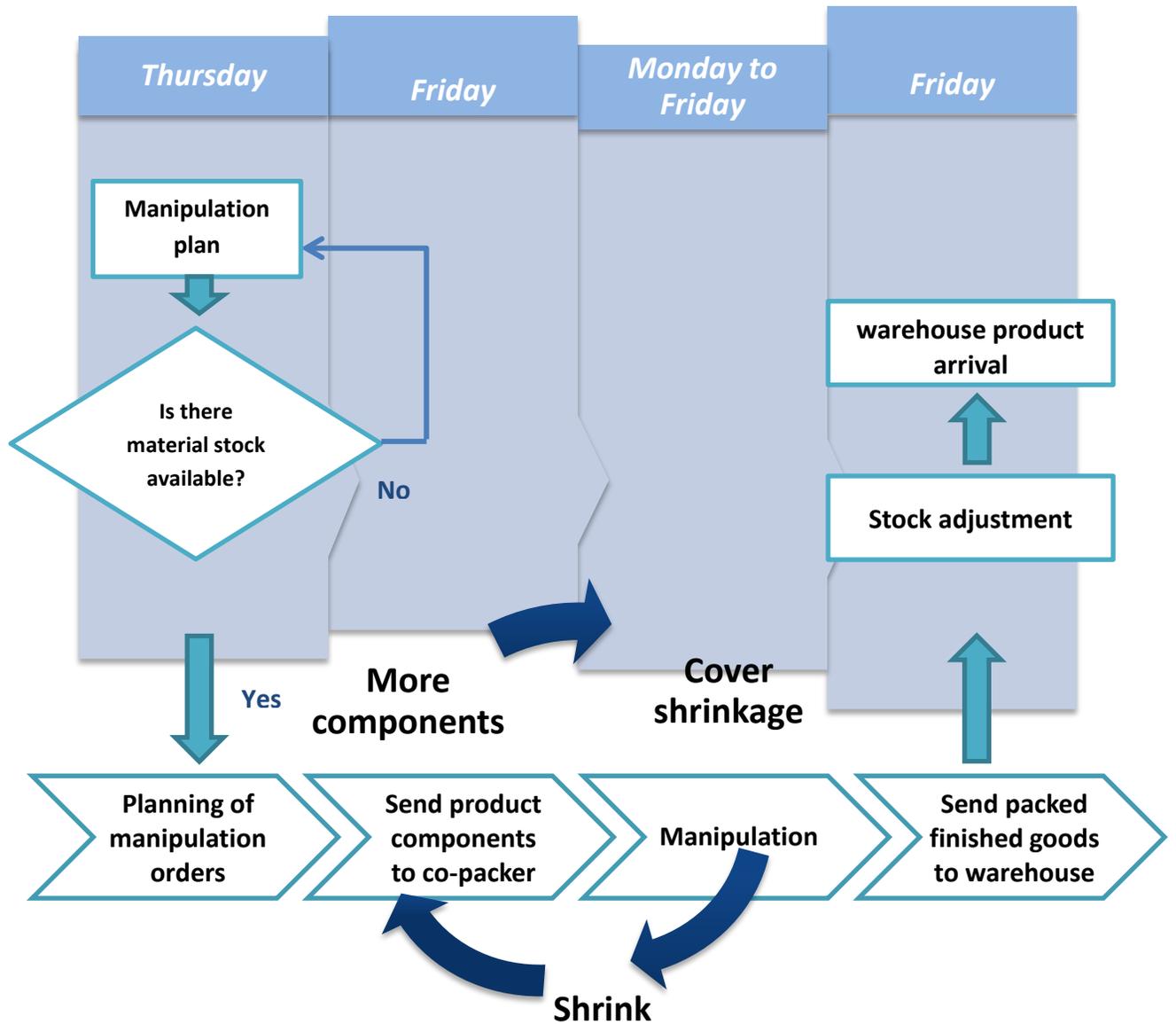


Figure 47. Co-packing logistic process proposal with the duration in days of each step, from manipulation plan to the product arrival at the warehouse

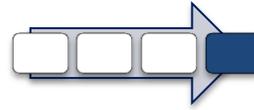
As observed in Figure 47, the co-packing logistic process has different time periods depending on the activity being arranged. Manipulation orders should be planned on Thursday particularly for the components to be sent to the co-packer on Friday.

Consequently, the product can be manipulated throughout the next week. Furthermore, at this point, an extra amount of components are sent to the co-packer to adjust the inventory shrinkage. The term inventory shrinkage or shrink refers to the loss of products between the point of manufacture and point of sale. It is important to ensure a short shrink in order to maintain the profits. In reference to the co-packing logistic process, the shrinkage is frequently caused due to shipping errors from the plant, warehouse discrepancies or misplaced goods.

To conclude, following the manipulation phase, the packed finished good is sent to the warehouse and stock is adjusted. Once the product arrives to the warehouse, it is delivered to the corresponding customers.

The co-packing logistic process usually requires eight days to prepare the product packaging, manipulate and distribute the product to the warehouse.

## CHAPTER 9. PHASE IV: EVALUATION



A Project Close is required for all project types. As the evaluation is focused on how well the project was executed, it should be completed as early as possible to ensure learning is still fresh in the minds of the project team, typically, within one to six months. To that matter, the main goal of this ultimate phase is to review the project development entirely, including the transport and product delivery to the customer with the objective of learning and improving.

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## CHAPTER 10. IMPROVEMENT OPPORTUNITIES GLOBAL REVIEW

Throughout this project, several improvement opportunities have been identified and described. The main benefits that the improvement opportunities look forward to bring to fruition are:

- To improve the strategic alignment
- To have a positive return versus risk
- To meet customer needs better than existing product development
- To adjust to market growth and size
- To achieve higher productivity
- To guarantee upraised probability of success
- To ensure product quality and reduce costs

One possible inconvenience of implementing the improvement opportunities to launch new products in the market is the robust structural organization that could meddle with the potential of creativity. Creativity could be underrated due to the overly structure process and the deadlines imposed to be achieved so that the process can be fluent in motion.

By and large, Table 24 collects the different alternatives that have been mentioned to ameliorate the efficiency of each phase in the I2M process. The first column represents the description of the opportunity, the second one describes the corresponding phase in the I2M process, the third column exposes the potential of the opportunity rated from 1 (lowest potential) to 3 (highest potential), and, to conclude, the last column defines if the proposed alternative implies an economic investment in order to be developed.

Results exposed in Table 24 have been previously shared and deliberated within the Project Management team of the Gum and Candy department.

**Table 22.** Improvement opportunities summary proposed to ameliorate the I2M process

IO DESCRIPTION	PHASE	POTENTIAL	ECONOMIC IMPACT
(1) Kick-Off Meeting IO	Idea Development	3	✗
(2) case and pallet efficient dimension IO	Project Development	3	✗
(3) SKU reservation and material plant delivery IO	Project Development	1	✗
(4) Formal Purchasing Order IO	Project Execution	2	✓
(5) Physical color proof approval IO	Project Execution	2	✓
(6) Define efficient safety stock that contemplates the variations in the demand IO	Project Execution	1	✗
(7) Lead time reduction IO	Project Execution	2	✗
(8) Economic Order Quantity (EOQ) model IO	Project Execution	3	✗
(9) Raw materials supply consciousness-raising program IO	Project Execution	2	✗
(10) Reduction of the variation in the line performance IO	Project Execution	3	✓
(11) Co-packing Resource IO	Project Execution	3	✓

As seen in Table 24, the phase that involves the highest number of improvement opportunities proposals is the Project Execution phase. Subsequently, the Project Development phase accumulates two improvement proposals and, to conclude, the Idea Development phase collects one unique improvement opportunity.

To review precisely the main characteristics of each improvement opportunity proposed, the next two chapters divide those alternatives that require a considerable amount of investment from those that are free of cost.

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## 10.1 Investment improvement opportunities review

From the eleven improvement opportunities proposals, four of them would require a certain amount of investment to be carried out. The proposed alternatives that imply a considerable investment are the following:

- **Proposal: To establish a formal material Purchasing Order**

It is critical to impose the creation of a formal Purchasing Order, without exception, for all projects in order to avoid receiving defective raw materials or suffering unexpected delays in the supplier delivery. A formal Purchase Order indicates types, quantities and agreed prices for products in order to control the purchasing of products from suppliers. Implementing this improvement opportunity provides a standard procedure in the purchasing process and avoids any process arranged out of the system. Additionally, raising a Purchase Order has a cost being between 30€ and 50€. As a whole, the investment of a formal Purchasing Order is based on requisition forms, machine time to produce the documents, the cost of raising a *cheque* or other form of payment and postage or fax costs.

- **Proposal: To produce an additional physical color proof for Marketing approval**

Producing an extra physical color proof to be sent to the Marketing department involves an additional printing cost. The cost of ordering an additional color proof per reference in a particular project is negligible, less than 100€ per copy.

However, if a major volume of projects is considered with several references per project, it can result in an important investment. To have an estimated idea, the Halls XS project involved the following six references, split into three flavors, which required a color proof to be reviewed:

- **Halls Menthol:** Consumer Unit and display box
- **Halls Extra Strong:** Consumer Unit and display box
- **Halls Vita C Citrus or Lemon :** Consumer Unit and display box

Consequently, the cost of printing an additional color proof for each reference of this project is multiplied by six. To the previous amount, the number of NPDs with their own number of references needs to be summed up to the total cost.

Therefore, if six references were considered per project and, at least, ten NPDs are being launched, Table 25 reflects an estimated cost of the total investment required to implement this improvement opportunity:

**Table 23.** Total investment required to implement the physical color proof approval IO

<b>Estimated cost per color proof: 80€</b>
<b>Number of references that require a color proof in a project: 6</b>
<b>Number of NPDs: 3</b>
<b>TOTAL COSTS OF PRINTING AN ADDITIONAL COLOR PROOF PER PROJECT: 480€</b>
<b>TOTAL COSTS OF PRINTING AN ADDITIONAL COLOR PROOF FOR ALL PROJECTS: 1440 €</b>

As observed in Table 25, the estimated total costs of printing an additional color proof in every project for each of the references is considerable, 1440€. Nonetheless, the benefits that this improvement opportunity could provide are significant.

It is critical to ensure the adequate legibility and color of the product as they represent the most important factors that the customer requires in the market.

Reviewing the previous factors before proceeding to a complete production can avoid delays, minimize the waste of materials, reduce the probabilities of a machine wear in the production line and, as whole, make the process more efficient.

Moreover, to support the implementation of the physical color proof approval IO, costs can be reduced by minimizing the number of references for each project; a possible alternative could be to use a generic display box for all the flavors of the product.

In the Halls XS case, if a generic display box unifies all the flavors, the number of references could be reduced from six to four. However, this alternative would depend on the decision of the customer.

- **Proposal: To reduce the variation in the line performance minimizing waste of materials and resources**

In order to adjust the demand order to the production, it is necessary to guarantee the efficiency of the maintenance service. As mentioned previously, if deficient productions are carried out continuously, it can be important to replace the current machinery.

In spite of the major investment which this improvement opportunity implies, having inadequate appliances could lead to the worst consequences in a project. The least desirable delays come from deficient machinery and, additionally, it results in a significant waste of resources. Furthermore, it is essential to guarantee a periodic maintenance service to oversee the machinery conditions.

- **Proposal: To provide greater expertise in the product packaging with a co-packer**

The decision of manufacturing the products with a contract manufacturer or co-packer has a considerable economic impact. However, once the investment in hiring an external manufacturer is arranged, there are several essential benefits involved, such as a better cost, lower capital requirements, greater expertise and greater focus of the packaging activities.

In addition to the investment required, this improvement opportunity calls for prudence and deliberation when choosing the right co-packer to rely on. It is important to evaluate the cleanliness and organization of potential co-packers as trust factor is critical. Moreover, to reduce the transportation costs, it is essential to find proximity with the hired co-packer.

To conclude, the co-packing resource IO may involve the highest risk between the proposed improvement opportunities as it requires an important investment and the capacity of selecting an efficient reliable co-packer. Nonetheless, valuable time is saved to be invested elsewhere in the development of the product, work overload in the plant is reduced and packaging is arranged by precise expertise in the sector.

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## 10.2 Non-investment improvement opportunities review

Non-investment improvement opportunities are based on ameliorating the efficiency of the I2M process by introducing new structures, developing the communication within the team members, correcting faults in the system and, as a whole, strengthening the procedure with little or no economic impact. All through the process, seven non-investment improvement opportunities have been suggested:

- **Proposal: To improve communication and establish the main objectives of the project with a Kick-Off Meeting**

A project kick-off meeting is the best opportunity for a Project Manager to energize the team. It is important to establish a sense of common goal and to start understanding each individual. Communication is the main aspect of this proposal where task and activities are planned and informed to all the team members from the beginning.

In spite of the amount of time spent arranging these meetings and preparing a project presentation to be shared with the team, the Kick-Off Meeting (KOM) could be probably the most important project meeting held to gain commitment from the team and avoid delays caused by the lack of communication.

- **Proposal: To guarantee the safety of the product in transportation by adjusting case and pallet dimension**

There are certain measures that need to be considered for safety matters, such as selecting the adequate dimensions of cases and pallets to transport the product. Losing the confidence of the customer by delivering damaged or deformed products can result in a huge reduction of the incomes in the company. Moreover, customers should find it easy to manipulate and manage the delivered consumer goods in their storehouse.

All in all, the case and pallet efficient dimension IO represents a critical alternative to reduce the number of complaints and meet the customer requirements by modifying their current size and position.

- **Proposal: To strengthen the SKU reservation procedure and anticipate material plant delivery**

Registering a SKU for a new product is the first step to obtain an active product code in the market. It is a precise step that requires special prudence when establishing the linkage between parent/child formats. It may seem easy to accomplish at first, though the consequences of a wrong SKU reservation can be risky. In addition, faults in the RING procedure are identified once the production is being carried out. To minimize the materials and funds waste, it is important to strengthen the system by warning the user about a possible incoherence or wrong parent/child relationships.

To that matter, if the SKU reservation is unquestionable, a BOM can be built and sent to the plant in order to anticipate the materials acquisition.

- **Proposal: To define efficient safety stock that contemplates the variations in the demand**

Launching a brand new product to the market, such as Halls XS, brings together uncertainty and modifications in the demand order during the production track. To overcome the deviation of the demand with an adequate stock coverage, it is important to foresee this variation and to calculate the necessary safety stock.

Consequently, the proposed alternative reduces the excess of stock in over production and avoids the waste of resources since production can succeed better the last minute changes in the tonnage ordered.

- **Proposal: To reduce the lead time of the NPDs**

To ensure that the ATO deadline is accomplished is the main challenge of each NPD. Meeting the customer requirements should be the main goal for the team members involved in a project. For that reason, it is vital to compensate the delays that take place throughout the project activities with alternatives that can anticipate further tasks. A possible improvement opportunity is to foresee the raw materials order providing a close estimation to the supplier of the exact quantity required which can be adjusted later on. As a result, suppliers can start to prepare the materials sooner to be delivered on time.

- **Proposal: To calculate the optimal number of production runs**

Short-term performances require an agile and efficient alternative to calculate the number of production runs. A breakage in the production line or a last minute change in the format of the product requires a production plan capable of performing efficient runs and minimizing the waste of resources. For that reason, the Economic Order Quantity (EOQ) model determines the optimal number of units to order so that total cost is minimized (purchase, delivery and storage of the product).

- **Proposal: To inform about the importance of the raw materials supply**

It is essential to be concerned and inform about the importance of the contribution of each team member involved in the project. To that matter, the raw materials supply is frequently delayed by several issues including the lack of precision within the team when introducing the correct material orders in the SAP system or updating the information. For that reason, organizing a consciousness-raising program, at least, twice a year, could be useful for the members to be aware of the consequences of unattended performance.

## CHAPTER 11. CONCLUSION

New Product Development is a necessity for companies striving to keep up with the marketplace, submerged in a constant change, to ensure a future success. Meeting the particular consumer needs is essential to launch a competitive product development strategy. Therefore, the increasing competition and advances in technology require an NPD process in continuous improvement able to overcome the different obstacles that may appear during the launching.

Throughout this Final Degree Project, the I2M process has been precisely defined and analyzed in order to propose improvement opportunities for those activities with relatively low performance ratings. To that matter, the main goals of the proposed improvement opportunities are;

- To reduce the lead time
- To improve the quality of the process
- To make the manufacturing and distribution operations more efficient in an effort to cut costs, minimize the delays and reduce material waste.

Improving the I2M process is possible by studying every part that composes the structure. Implementing the proposed alternatives requires precise analysis and several resources. Nonetheless, the benefits that bring together are substantial for the customer and for the organization. Additionally, as eleven improvement opportunities have been proposed, it is convenient to apply them gradually, starting from the alternative that could bring the most determinant benefits and ameliorate the efficiency of the I2M process. No organization can improve all aspects of product development at once. The implementation can be best viewed as a journey rather than a destination. Priorities need to be developed and the organization must start by understanding what improvement opportunities should be adopted briefly. It is highly recommended to take into consideration all the non-investment improvement opportunities proposed in chapter 10.2.

All in all, improving the I2M process should be considered as a project itself to grow in business and to meet the expectations of the customer.

New business strategies, new organizational approaches, new business processes and enabling technology should be introduced to continually improve the product development process. By focusing on the gap between where a company is and where it needs to be, priorities can be set for making improvements. Nonetheless, no improvement can be carried out without training, attendance at meetings or conferences and extensive benchmarking.

## CHAPTER 12. ACKNOWLEDGEMENT

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Last but not least, many thanks go to my parents that have given me their full support and effort in guiding me throughout this Industrial Engineering Degree from the very first day. They have given me the courage to overcome many obstacles all through these four years and positivity to be able to achieve my goals.

Just as [11] once said, *“We all have dreams. But in order to make dreams come into reality, it takes an awful lot of determination, dedication, self-discipline and effort”*

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# APPENDIX

## A) FROM KRAFT FOODS COMPANY TO MONDELEZ INTERNATIONAL

The Kraft Foods Group is an American grocery manufacturing and processing conglomerate headquartered in the Chicago suburb of Northfield, Illinois. Kraft was listed on the New York Stock Exchange and became a component of the Dow Jones Industrial Average on September 22, 2008, replacing the American International Group. In November 2014, the company announced plans to split into a North American grocery business and a faster-growing global snacks company. At present, the company is experiencing a transformation from the known “Kraft Foods Company” to a new multinational organization named “Mondelez International”. As observed in Figure A.1, Mondelez International has incorporated new brands in addition to the Kraft Foods heritage building the world second largest multinational confectionery, food and beverage conglomerate, employing around 107,000 people around the world.

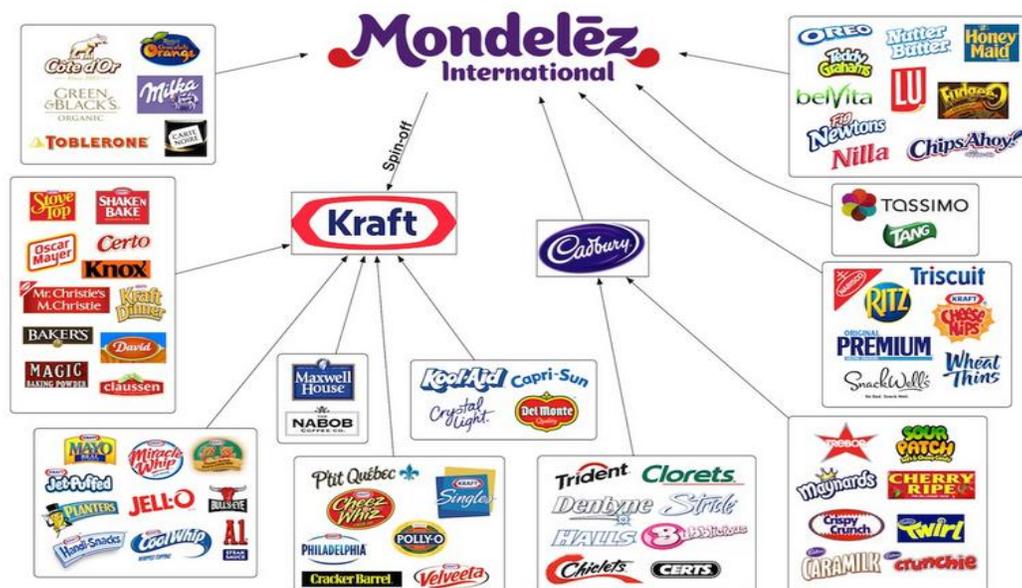


Figure A.1. Mondelez International snack brands in 2014

Moreover, the brands that now comprise Mondelez International have more than 100 years of history. Starting from the oldest brand, Fry's, founded in 1761 in England to the newest one, Cadbury, also founded in England in the year 1915.

Figure A.2 represents the all the brands that build Mondelez International with the year of foundation and the country of origin.

<b>Brand Trademark</b>	<b>Country of Origin</b>	<b>Year</b>
Barnum's Animals	United States	1902
Bassett's	England	1842
Cadbury	England	1824
Cadbury Dairy Milk	England	1905
Cadbury Milk Tray	England	1915
Canale	Argentina	1875
Chiclets	United States	1906
Christie	Canada	1853
Cote d'Or	Belgium	1883
Dadak	Czech Republic/Slovakia	1905
Dentyne	United States	1899
Field	Peru	1864
Figaro	Czech Republic/Slovakia	1896
Fontaneda	Spain	1881
Freia	Norway	1898
Freia Kong Haakon	Norway	1905
Fry's	England	1761
Gallito	Costa Rica	1909
HAG	Germany	1906
Hall's	England	1893
Heudebert	France	1903
Jacobs	Germany	1895
Jubilee	Russia	1913
Kraft	United States	1903
Lacta	Brazil	1912
LU	France	1850
Maxwell House	United States	1892
Maynards	England	1880
Milka	Switzerland	1901
Nabisco	United States	1901
Newtons	United States	1892
Opavia	Czech Republic/Slovakia	1840
Oreo	United States	1912
Paille d'Or	France	1905
Pascall	England	1866
Pavrides	Greece	1841
Peek Freans	England	1857
Petit-Beurre	France	1886
Philadelphia	United States	1880
Poulain	France	1848
Premium	United States	1876
Royal	United States	1866
Saiwa	Italy	1900
Suchard	Switzerland	1825
Terry's	England	1767
Toblerone	Switzerland	1908
Triscuit	United States	1902
Vizzolini	Argentina	1906
Ygeias	Greece	1863

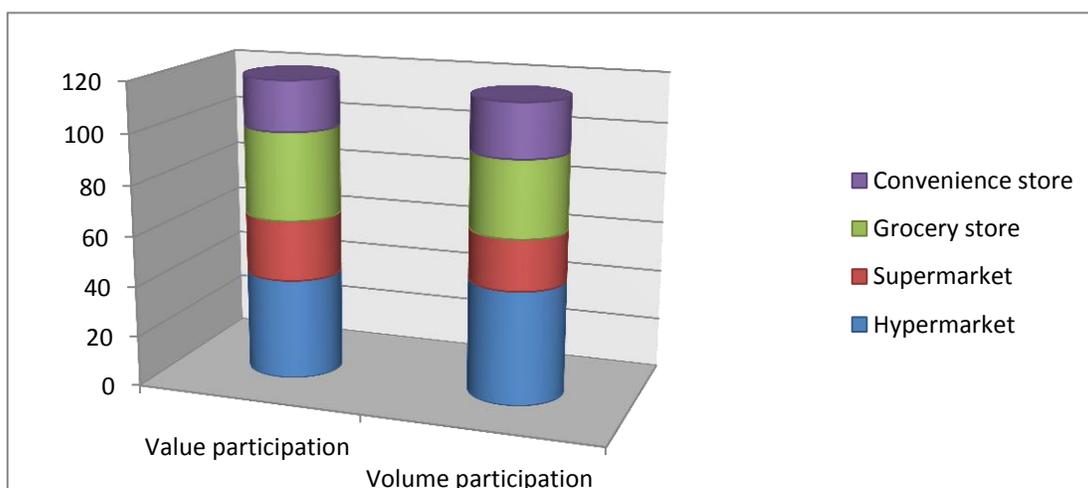
**Figure A.2.** Corporate timeline of the brands now owned by Mondelez International

## A.1) KRAFT FOODS COMPANY RETAIL CHANNEL SALES 2014

To have a perspective of the principal marketplace of the Kraft Foods Company, it is important to analyze the main sales channel of the organization; the Retail channel. The Retail channel has been always superior to the IC channel due to the important volume of sales that accumulates throughout the years. The products launched in the company can be implemented in four different Retail groups:

- **Convenience store:** small grocery store that stocks a range of everyday items. The convenience store has a sales area around 250 m<sup>2</sup>.
- **Grocery store:** bigger grocery store than the convenience store but smaller than the supermarkets. The grocery store has a sales area approximately of 400 m<sup>2</sup>.
- **Supermarket:** large form of the traditional grocery store with wide variety of products organized into aisles. The estimated sales area of a supermarket is 1000 m<sup>2</sup>.
- **Hypermarket:** superstore combining a supermarket and a department store. Expansive retail facility with a sales area around 2500 m<sup>2</sup> or more.

In Figure A.3, the main four representative Retail groups of the Kraft Foods Company are exposed, with the corresponding value and volume of participation collected in 2014 sales.



**Figure A.3.** Kraft Foods Group Retail channel sales in 2014

The principal difference between the value and volume of participation is that, depending on the size of the establishment, the volume of product delivered changes. To that matter, hypermarkets have enough space to storage new product promotions and higher volumes than convenience stores. Nonetheless, depending on the customer, customized products can be launched exclusively for a particular market or grocery store.

As observed in Figure A.3, the major volume of participation corresponds to the hypermarkets . One of the main reasons is that families tend to make a weekly or monthly shopping in this type of stores looking out for competitives prices and promotions. In addition, hypermarkets also accumulate the highest value of participation as they offer the best prices and collect the best product promotions.

On the other hand, Figure A.3 represents the convenience store with the lowest values in volume and participation since prices are the highest and there is little variation in the products offered. However, the convience store is an interesting market for the company in public holidays, Sundays or non-working days when other stores remain closed.

## B) KICK-OFF MEETING PROPOSED YES/NO QUESTIONS

**Table B.1.** Kick-Off Meeting questions form proposal

Question	Yes	No
<b>I2M</b>		
1. Does this project impact any other category or Country (e.g. Foodservice, Import/Export, etc.)?		
<b>MARKETING, SALES</b>		
1. What are the revenue & volume launch targets?		
2. Will this project require any consumer testing, design artwork, advertising strategy/plans or unique market launch plans?		
3. How many flavors/sizes?		
4. Are special packs required (consider formats, bundle, mods, display shipper)?		
5. Are there any special print requirements (e.g. inside prints)?		
6. Opportunity to combine multiple graphics changes (e.g. promo, claims, etc.)?		
7. Are there any SKU discontinuations?		
8. Will this project require sales samples?		
9. Will this require a major product development effort?		
10. Will product meet required standards?		
11. Will we be harmonizing formulas with other countries?		
12. Will we use unique raw materials?		
13. Long lead times?		
14. Will this require 1st Production Approval?		
<b>QUALITY</b>		
1. <b>Consumer insights:</b> what are the consumer relevant aspects of the product, process, and package specifications?		

2. Have consumer complaints for similar products been evaluated for systemic issues, and have the complaints been designed out?		
3. <b>Manufacturing:</b> How is quality in manufacturing being validated?		
4. Is the plant able to meet specifications? Is the process capable? Is the plant engaged in this assessment?		
5. <b>Supplier Quality:</b> will new suppliers need to be approved or new supplier manufacturing locations for existing supplier?		
6. <b>Safety:</b> What consumer safety risks (microbiological, allergen, other chemical, foreign material) have been identified and how has our ability to manage them been validated/verified?		
7. Will this require major package development?		
8. Will this require new materials?		
9. Will this be manufactured in a new location? Internal/External?		
10. Will this project require the purchase of new equipment, new/modified facilities other capital, etc?		
11. Is funding available?		
12. Do we need long-lead equipment funding (early funds)?		
<b>MATERIALS MANAGEMENT</b>		
1. Will we need to set up any new contracts for raw/pack suppliers?		
<b>Meeting Attendees/Participants</b>		
<b>Marketing</b>		
<b>Supply Chain</b>		
<b>RDQ</b>		
<b>Sales</b>		
<b>Finance</b>		
<b>Brand Design</b>		

## C) UNIT DESCRIPTORS

**Table C.1.** Classification of the Unit Descriptors

Unit Descriptors	Description
<b>PALLET</b>	This level defines the logistical configuration, also referred to as the unit load, of how a GTIN is normally stored and shipped in Kraft's Distribution Network. pallet GTINs, where appropriate, are used to share these key supply chain values with our customers for mutual shipping/receiving efficiencies. The pallet consists of a <b>SINGLE</b> next lower level. The shipping materials of pallet-level GTINs are built to withstand the product movement across the supply chain. For instance, a pallet may have a full or partial cardboard outer or a slip sheet that is shrink or stretched wrapped. This is a standard logistical storage configuration and is not built for display purposes. May not have the GTIN bar code physically printed on the pallet.
<b>DISPLAY/ SHIPPER</b>	A display is an orderable unit that is specifically packed to market product to the end consumer. The Consumer Unit may or may not be packed in the display for shipment to Kraft's customer. The display unit may or may not have a GTIN bar code physically printed on it and can have single or multiple parent instances.
<b>CASE</b>	A case is a finished version of the product, in the form sold and shipped to customers. cases contain the Consumer Units (pack/inner pack or each) intended for retail sale. case composition can be corrugate boxes, shrink-wrap trays, bags or other materials that allow Kraft to safely distribute product across the supply chain.
<b>PACK / INNERPACK</b>	A logistical unit between the case and the each. It may or may not be bar-coded and may or may not be consumable. This is dependent on whether or not the inner pack is bar-coded.
<b>EACH</b>	The lowest level of the item hierarchy intended or labeled for individual resale. It has a GTIN bar code physically printed on it.

## D) INVENTORY REPLENISHMENT

The inventory replenishment represents an operation that consists in making the stock full again in order to avoid stock-out. Replenishment is typically initiated by a backorder passed to a supplier or manufacturer.

The goals are always the same:

- Deliver the right products and quantity to the right place on the right day
- Meet service goals
- Minimize costs

Furthermore, there are three key pieces for inventory replenishment:

1. When to reorder
2. How much to reorder
3. Create a Purchase Order for the raw materials

In order to understand the inventory replenishment cycle, it is essential to understand the concepts explained in the following chapters; Safety Stock Model, Reorder Point, Economic Order Quantity and, all together, the inventory cycle.

### D.1) SAFETY STOCK MODEL

The safety stock prevents from generating stock breakage due to delay in the suppliers or an increment in the demand order. It represents the minimum quantity of stock that should always preserve. It is calculated by considering the necessary product quantity to cover the demand deviation or a risk in the suppliers.

$$SS = u \cdot \sqrt{T_m^2 \cdot \sigma_D^2 + D \cdot \sigma_{T_m}^2} \quad (\text{eq D.1})$$

## D.2) REORDER POINT

The reorder point (ROP) is the level of inventory which triggers an action to replenish a particular inventory stock. The reorder point formula allows us to determine the safety stock (SS) needed to achieve a certain cycle service level.

In general, the longer the lead times are, and the greater the variability of demand and lead times, the more SS we will need.

$$R = T_m^2 \cdot D + u \cdot \sqrt{T_m^2 \cdot \sigma_D^2 + D \cdot \sigma_{T_m}^2} \quad (\text{eq D.2})$$

**Table D.1.** Description of the variables in equation D.1 and equation D.2

Variable	Term	Units	Description
SS	Safety stock	Tons	Level of extra stock maintained to mitigate risks of stockouts
u	Service level	%	Desired probability that the level of SS will not lead to a stockout
$T_m^2$	Average Lead Time	Time period	Delay between the time when the reorder point is reached and renewed availability
$\sigma_D^2$	Standard Deviation of Demand	None	Measure used to quantify the amount of variation of the demand
D	Average Demand	Tons/Time period	
$\sigma_{T_m}^2$	Standard Deviation of Lead Time	None	Measure used to quantify the amount of dispersion of the Lead Time
R	Reorder point	None	Inventory unit quantity on hand that triggers the purchase of an amount of replenishment inventory

### D.3) ECONOMIC ORDER QUANTITY (EOQ)

The Economic Order Quantity (EOQ) is the order quantity that minimizes total inventory holding costs and ordering costs. It is one of the oldest classical production scheduling models. The framework used to determine this order quantity is also known as Wilson EOQ Model or Wilson Formula. The EOQ is used as part of a continuous review inventory system in which the level of inventory is monitored at all times and a fixed quantity is ordered each time the inventory level reaches a specific reorder point.

Additionally, the EOQ provides a model for calculating the appropriate reorder point and the optimal reorder quantity to ensure the instantaneous replenishment of inventory with no shortages.

$$N^* = \sqrt{\frac{\sum_{i=1}^n K_{Pi} \cdot D_i \cdot \left(1 - \frac{d_i}{Tp_i}\right)}{2 \cdot (\sum_{i=1}^n K_{ri} + X \cdot Kc)}} \quad (\text{eq D.3})$$

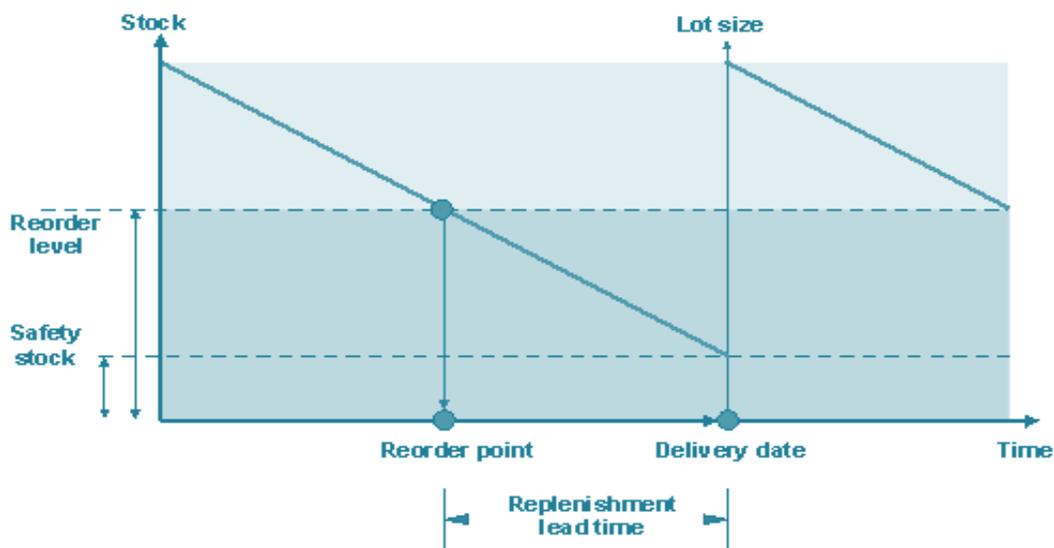
**Table D.2.** Description of the variables used in equation D.3

Variable	Term	Units
$N^*$	Optimal number of orders per period of time	Orders/Time period
$K_p$	Cost of maintaining inventory	Euros
$D$	Demand	Tons/Time period
$d$	Demand rate	Tons/Time period
$Tp$	Production rate	Tons/Time period
$K_r$	Cost of preparation of an order	Euros
$X$	Changes of format per cycle	None
$K_c$	Purchase cost	Euros

## D.4) THE INVENTORY CYCLE

The inventory system determines the volume and timing of orders. In this system, a fixed quantity equal to the economic order quantity (EOQ) is ordered when stock reaches reorder point. The system involves deciding on safety or minimum stock, reorder point and maximum stock for each item, as follows: the reorder point is equal to safety stock plus consumption during lead time. Maximum stock is equal to safety stock plus EOQ. The danger is that extra orders placed at irregular intervals may not be convenient to suppliers and that failure to notice that stocks have reached reorder level may lead to stock-out.

Figure D.1 represents the inventory cycle process flow where the previous concepts are applied.



**Figure D.1.** Inventory cycle

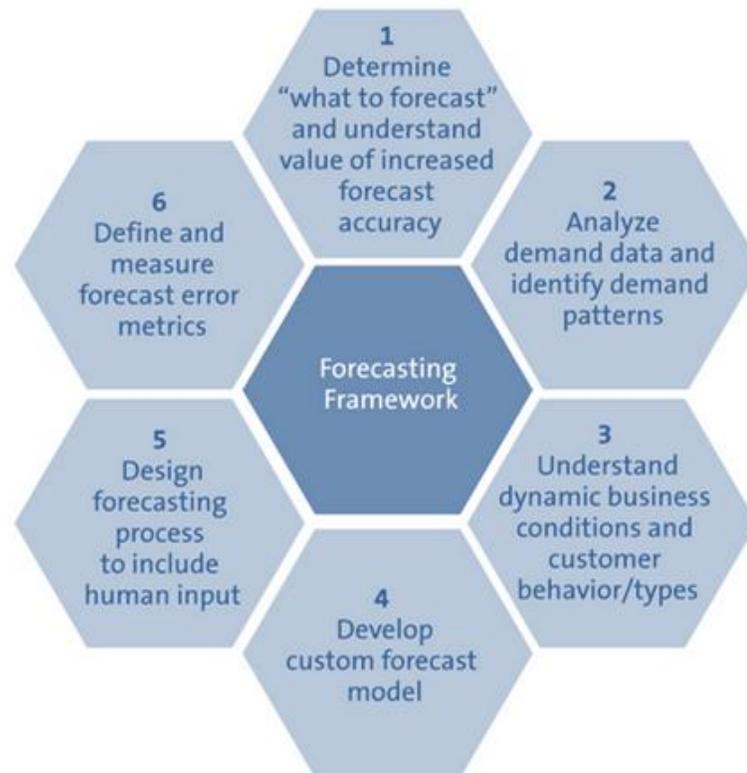
Therefore, as seen in Figure D.1, the reorder level or reorder point is made up of the sum of the safety stock plus the expected average material consumption within the replenishment lead time. Safety stock must be set at a level which covers both excess material consumption within the replenishment lead time and the additional requirements which may occur during delivery delays.

Consequently, the reorder level and the safety stock level are central control parameters within reorder point planning.

## E) FORECASTING FRAMEWORK

Forecasting is the process of making statements about events whose actual outcomes have not yet been observed. It represents a formal statistical method employing time series, cross-sectional or longitudinal data. Risk and uncertainty are central to forecasting and prediction; it is generally considered good practice to indicate the degree of uncertainty attaching to forecasts. In any case, the data must be up to date in order to be as accurate as possible.

In the case of product forecasting, it predicts the degree of success a new product in the marketplace. To that matter, it is critical to take into account the product awareness, distribution, price or fulfilling unmet needs and competitive alternatives. The product forecasting follows a particular process flow represented in the framework of Figure E.1:



**Figure E.1.** Forecasting Framework