DOKUZ EYLÜL UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

PERFORMANCE EVALUATION AND MEASUREMENT OF QUALITY MANAGEMENT SYSTEM IN A PRODUCT DEVELOPMENT DEPARTMENT

by
Gizem ÖZEL

November, 2014
İZMİR

PERFORMANCE EVALUATION AND MEASUREMENT OF QUALITY MANAGEMENT SYSTEM IN A PRODUCT DEVELOPMENT DEPARTMENT

A Thesis Submitted to the
Graduate School of Natural and Applied Sciences of Dokuz Eylül University
In Partial Fulfillment of the Requirements for the Degree of Master of Science
in Industrial Engineering, Industrial Engineering Program

by
Gizem ÖZEL

November, 2014
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M.Sc THESIS EXAMINATION RESULT FORM

We have read the thesis entitled **"NEW PRODUCT DEVELOPMENT PROCESS IN FMCG INDUSTRY: PROJECT LEAD TIME REDUCTION USING STAGE GATE PROCESS"** completed by **GİZEM ÖZEL** under supervision of **ASSOC. PROF. ŞEYDA TOPALOĞLU** and we certify that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

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ACKNOWLEDGEMENTS

First and foremost, I would like to thank my director / contributor of studies, Assoc. Prof. Dr. Şeyda TOPALOĞLU, for her guidance, continuous support and encouragement. Her support and guidance have been always of a great help during my master and bachelor studies. I feel so lucky for being able to work with such an inspiring, supportive an honest individual throughout my whole university study. Her understanding made the difference.

Additionally, I would like to thank my close friends Alper SALTABAŞ and Hülya GÜÇDEMİR for their support during the preparation of my master thesis; have been of a great help.

Very special thanks would be given to my mother, my father, my brother and my sister in law for their never lasting support throughout my whole life. They had to endure all the ups and downs throughout the whole process. I also would like to thank my partner for his continues support.

Without the personal support of these individuals, the master would never come true.

Gizem ÖZEL

PERFORMANCE EVALUATION AND MEASUREMENT OF QUALITY MANAGEMENT SYSTEM IN A PRODUCT DEVELOPMENT DEPARTMENT

ABSTRACT

Quality is the ability of answering the consumer needs where the quality management system (QMS) is the combination of policies, procedures, processes and resources needed to reach required quality level.

Fast Moving Consumer Goods (FMCG) are sold quickly and at relatively low price comparing to the products of other sectors. Competition in the FMCG has always been quite wild. The consumers are demanding and as a mature industry, FMCG has an increasing number of competing brands. This situation has contributed to the need of further react to the changes and to the customer needs very quickly. New product development process for the companies which operate in FMCG industry is under a constant pressure to deliver the goods on time with innovative product propositions which are mostly driven by the consumer needs.

This thesis evaluates the performance of the quality management system of the Product Development Department of ABC Company that operates in FMCG sector. ABC Company has been using the Stage-Gate process as the new product development process. This new product development process also constitutes the QMS of ABC product development. This thesis finds out the drawbacks and gaps that need to be improved for the Stage Gate process of the company. These proposals have been suggested for more effective, leaner and productive product development and QMS process. These new proposals are analyzed with Arena simulation tool and the results reveal that the proposed approaches can effectively be used in practice for a shorter and more effective product development process in FMCG industry and for an increased product and process quality as well.

Keywords: Stage-Gate, quality management system, new product development

ÜRÜN GELİŞTİRME BÖLÜMÜNDE KALİTE YÖNETİM SİSTEMİ PERFORMANS ÖLÇÜMÜ VE DEĞERLENDİRİLMESİ

ÖZ

Kalite müşteri ihtiyaçlarına cevap verebilme yeteneğidir. Kalite yönetim sistemi ise; istenilen kalite seviyesine ulaşılması için yaratılmış, politika, prosedür, proses ve kaynaklardan oluşan, bir sistemler bütünüdür.

Hızlı tüketim malları diğer sektör ürünlerine kıyasla daha ucuza ve daha hızlı satılan mallardır. Hızlı tüketim malları sektöründe rekabet çok ciddi boyutlardadır. Tüketiciler talepkardır ve hızlı tüketim malları sektörü olgun bir sektör olarak bir çok rekabet kabiliyeti bulunan ürün portföyüne sahiptir. Bu ürün portföyü sektörde faaliyet gösteren firmaların zamanla değişen müşteri ihtiyaçlarına daha hızlı cevap vermesi gerekliliğini oluşturmuştur. Bu sebepten dolayı, firmaların yeni ürün geliştirme süreçleri, daha yenilikçi ve daha hızlı ürün geliştirmeleri adına devamlı bir baskı altındadır.

Bu tez, hızlı tüketim malları sektöründe faaliyet gösteren ABC firmasının ürün geliştirme bölümünde yeni ürün geliştirme prosesi olarak benimsenen Aşama Geçit prosesini kullanmaktadır ve ayrıca bu proses ABC firmasının kalite yönetim sistemini oluşturmaktadır.

Bu tezde, firmanın Aşama Geçit prosesinde iyileştirilmesi gereken alanlar belirlenip, giderilmesi gereken eksiklikler bulunmuştur. Daha etkin, daha yalın ve daha üretken bir ürün geliştirme ve kalite yönetim sistemi için çözüm önerilerinde bulunulmuştur.

Bulunan öneriler Arena simülasyon programı ile test edilmiştir. Elde edilen sonuçlar, önerilerin hızlı tüketim malları sektöründe yükselen ürün ve proses kalitesi ile daha hızlı yeni ürün geliştirme süreci için uygun olduğunu ispatlamıştır.

Anahtar kelimeler: Aşama geçit, kalite yönetim sistemi, yeni ürün geliştirme

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CHAPTER ONE
INTRODUCTION

1.1 Rationale and Contribution of Thesis

Quality means the ability of answering the consumer needs in line with their requirements. The aim of every company is to reach this required quality level, to have more and more consumer buying their goods. This aim is also very important for the companies who operate in fast moving consumer goods (FMCG) industry. Especially for the ones who do not have the chance to produce seconds. They have only one level of quality which needs to be reached all the time. These companies must sustain the level of quality in every product they produce.

To have new product development (NPD) process which has shorter lead times plays a key role for FMCG companies, to gain competitive advantage. Shorter lead times of NPD is the greatest in FMCG industry a highly important sector of speed to market.NPD is a significant activity for FMCG owners.

Looking at the literature, it has been seen that since 1950s the need for a structured NPD process is present. However, the start of the need for a shorter NPD process can be seen as of 1980s due to increased competition. The most recent studies of NPD process are those of Cooper and Rothwell. These identify key limitations of the existing literature, and both of relevance to this thesis.

This thesis focuses on a company's NPD process which operates in FMCG industry. This company does not have the chance of producing seconds and quality plays a key role for its business such that, company uses its NPD process as its quality management system (QMS).

This thesis takes up the role of exploring the process management of NPD in an FMCG company. It investigates the lead times needed for the development of a new product by using value stream mapping (VSM) tool and challenges thecurrent NPD

process performance by looking for improvement areas. These proposals have been suggested for more effective, leaner and productive product development and QMS process. Proposals are analyzed with Arena simulation tool and the results reveal that the proposed approaches can effectively be used in practice for a shorter and more effective product development process in FMCG industry for an increased product and process quality.

This thesis contributes to the existing literature on product development by providing conceptually developed, evidence based research.

The initial contribution of this thesis is into the process management of NPD in FMCG industry. A new NPD process has been developed, which identifies the different levels of development activities within the company. This process provides new insights into the opportunities which decreases the development lead times.

The second contribution is the development of a framework to help companies to understand exactly what is going on in their daily business and what the real lead times needed are. This model provides a novel way to understand the NPD capabilities of the company and where the wastages are. The framework also provides insight into the roles of product development team members.

With respect to the above, this thesis provides new insights in regards to NPD in FMCG. The research finds that companies get lost in the process details and forgets to look at the big picture.

With regard to models of NPD, this thesis builds on the existing models of NPD in particular, the work of Cooper.New, more detailed insights into the development of new products of FMCG and decision-making are provided in this thesis.

1.2 Structure of Thesis

This thesis consists of seven chapters, including this introductory chapter. Chapter one presents an overview of the rationale of the research and contribution to the field of thesis.

Chapter two discusses the research context of the thesis: beginning with the importance of quality, the competitive environment of the FMCG industry. It then examines the importance of NPD in FMCG industry.

Chapter three presents and overview of the literature on models of NPD. The NPD models are given in chorological order.

Chapter four presents the details of the NPD process in the respective FMCG Company by examining the current process.

Chapter five defines the problem first then the proposed solutions will be given. The chapter includes three proposed solutions. Then the simulation models of the proposed solutions will be given. They will be followed by the outcomes of simulation studies.

Chapter six presents the conclusions, contributions to literature and implications for further research within NPD.

CHAPTER TWO
RESEARCH CONTEXT

2.1 Introduction

This chapter provides an overview of the research context: what is quality, what is quality management system (QMS), what do they mean in fast moving consumer goods (FMCG) industry, the business environment of FMCG industry. It moves on with the definitions of new products and finally the importance of new product development (NPD) in FMCG industry is given.

2.2 Quality Management System

Quality is the ability of answering the consumer needs. In other words, it is a feature of being good or bad comparing to the required consumer need.

QMS is the combination of systems, which guide the relevant people / employees to show and instruct them with the required procedures, principals and process steps of a certain job, to be able to reach the required quality level.

QMS is a part of visionary statements of a company. The system that the company has established must be serving for its vision as well. Since the main reason of having QMS within the company is to have a consistency in what is being done, another must of the system is to have interaction among the employees and to get their acceptance on the system.

QMS creates motivation and sets clear goals for the employees. It creates a company culture.

This system is the combination of policies, procedures, processes and resources needed to reach required quality level. It also concerns the activities and actions to be taken to raise the awareness of relevant people / employees on the required quality level with the minimum input.

QMS aims to have sustainable quality level by using pre-defined standard procedures, which explain the workflow of a certain job, by defining the responsible and the time needed to complete the job.

For each and every one of the organizations to function effectively, the required work to be done by the employees need to be identified and managed by the interlinked and cross functional processes. The very first aim of these processes is to produce service or product that is required by the consumer. No matter in which sector the company operating is, customer satisfaction is the ultimate goal of each QMS.

A QMS must have seven milestones as stated below;

- Design
- Build
- Control
- Deploy
- Measure
- Review
- Improve

Design and build parts are purely related to the establishment of the QMS in the respective company and setting up its structure. The senior management must lead the design of the QSM. Each required process to achieve the required job to be completed needs to be broken down into the sub processes very carefully and the responsible for each step needs to be defined from the very first beginning. These break downs need to be documented as a basic requirement of QMS.

The control of what has been implemented might be done by local and outside of organization audits. The audit of what has been done based on the processes documented is a key factor to keep the control all over the system.

Since the QMS processes will be used as a hub and will be the first stop shop for each employee, the deployment of the QSM needs to be done and led by the senior management of the company as well.

The measurement part of the system includes the action of setting up objectives and key performance indicators specific for each job. By this way, the improvement where available can be tracked as well.

The review part of the process is relevant to the effectiveness, efficiency and capability of QSM and it observes if there is anything requiring to take immediate action.

Accordingly; in this study, the performance of QMS of the product development department of ABC Company, which operates in FMCG industry, has been evaluated.

In the product development department of ABC Company, Stage-Gate process is being used as the process of new product development. Based on Stage-Gate process, the processes, sub-processes, responsible and the required lead-time of a specific job have been defined, and all the required documentation has been done accordingly.

The control / audit mechanism of ABC Company product development is done by the senior management since the job done in product development is confidential and not open for outside auditors. The company takes the golden rules of widely used new product development process of Stage-Gate process as the reference of QMS. The QMS documents, policies, procedures and source allocations are done based on Stage Gate requirements. This thesis evaluates, the performance of Stage Gate process, finds out the gaps and drawbacks, proposes new solutions and redefines an improved version of Stage Gate process modified for ABC Company which operates in FMCG industry.

2.3 FMCG Industry

Srinivasu (2014) defines the FMCG as the products those are sold quickly and consumed at a regular basis which have a quick turnover, and relatively low cost. These products may be replaced over a period of years. In addition to the above definition, the FMCG industry can be defines as the combination of the marketing and production activities of customer-desired products and the sales and distribution of them.

The FMCG industry includes the products of; pharmaceuticals, electronics, food, dairy, household, detergents, tobacco, cigarettes, toiletries, soap, cosmetics, tooth cleaning products, shaving products, detergents, glassware, bulbs, batteries, paper products and etc…

Srinivasu (2014) indicates that the fast moving consumer goods constitute a large portion of consumers' budget in everywhere.

2.4 Definition of Product

A product may be tangible or intangible. A product is a service or a good which meets the need of particular consumer. As long as we need to brush our teeth, the companies will keep on producing toothpaste. Hence, a product can be defines as anything that can satisfy the consumer need.

2.5 What is "Newness" of a New Product?

Murthy, Rausand & Osteras (2008) indicate, "new products are replacing existing products on a regular basis. The rate at which new products are appearing on the market is growing at an exponential rate" (p. 18). They also share the below points as the reasons for this;

- "Create a differential (product differentiation)

- Support continued growth for the manufacturer
- Capitalize on technological breakthroughs
- Response to changing demographics" (p. 18).

Murthy, Rausand & Osteras (2008) mention, "there are several different notions of what constitutes a new product. The newness of a new product can vary from high to low and depends on whose perspective and what is new" (p. 18).

They share below different perspectives;

- "New to the world
- New to the industry
- New to the manufacturing firm
- New to the market
- New to the customer
- New technology
- New process
- New features
- New uses
- New design" (p. 18).

2.6 New Product Development

Belliveau (2002) defines the new product development as a the top down indicated, pre-defined set of activities and actions that will be helping companies to change their initial new product ideas into reality and tangible goods.

In the last few decades, the number of new product introductions increased drastically as the importance of new products in the industry has become significantly noticeable. Accordingly, managing the NPD process has become a challenge for firms as it requires dedicated financial and human resources and pretty much time sensitive (Bhuiyan, 2011).

2.7 Importance of NPD in FMCG Industry

Faster and more effective product development process is always very important for each and every industrial firm. However, due to the nature of the FMCG industry and due to the competitive characteristics of this industry, the importance of NPD for FMCG is much more intensive.

> The importance of NPD is driven by the dynamics of the modern, competitive environment in which FMCG organizations are operating. The CCFRA (2007)'s industry guide highlights a number of internal driving forces within firms creating a need for new products; particularly new corporate strategies, and the demand to reduce production costs to improve margins. At a basic level, developments can be key to the most fundamental aspects of the company's product, such as safety. A number of factors in the environment have contributed to the importance of NPD: including globalization, new policies and legislation, rising competition, and costs, all of which result in a need for the development of products. In the current environment, there is also an increasing need to improve sustainability, implement standardized technologies, and improve variety to respond to emerging needs. Changes have also occurred in the distribution of products, including growth in convenience stores, home delivery, automatic food dispensers, and take away foods stores. The internet and home delivery are likely to play a particularly significant role into the future. These distribution changes also create new demands on packaging, leading to a need for effective development processes. With respect to the consumer, organizations have had to respond to various factors, including the ageing population, changes in the composition of households, and eating habits. These are central to the importance of NPD (Simms, 2012, p.27).

CHAPTER THREE
LITERATURE REVIEW

3.1 Introduction

With the progress had in the technology and with the effect of globalization, the need for more productive, leaner and rapid product development process for the companies operating in fast moving consumer goods (FMCG) industry is getting more and more necessary day by day.

Cooper (2009) indicates that, the competition is wild, the customers are demanding and the shorter new product developments are needed. Time equivalents are money, quality and innovation.

Therefore a fast and lean product development process is not a “should” anymore, it is clearly a “must” for the companies who would like to stay ahead of the game.

New product development journey starts with proactively or reactively defined customer needs which may be answered in two different ways:

The first way; is to use the current portfolio of the company, already developed product propositions; meaning by supporting the products in such a way that the customer need is answered.

The second way is to develop a new product if that specific company does not have the product proposition that fulfills the customer need, in its portfolio.

In occasions when there is a need for new product proposition developments, to have a proper new product development (NPD) process in place matters for the speed of the company.

NPD process is the complete process; from hearing the voice of customer until delivering the final products to market. “It is a formal blueprint, roadmap, template or thought process for driving a new product project from the idea stage through to market launch and beyond” (Cooper, 1994, p. 3).

Hence, there are so many key and widely recognized models in the literature concerning NPD process. Each of these types of models makes an important contribution to understanding of NPD, but also possess a number of weaknesses (Simms, 2012).

In the context of NPD history there are two main NPD concepts of Copper and Rothwell are present in this thesis since both have made remarkable contributions to the understanding of NPD. In the following sections, the history of NPD process will be summarized first based on Cooper’s concept, then based on Rothwell’s concept. After NPD process history summary other NPD process models relevant to this thesis, will be provided.

3.2 History of NPD Process – Copper’s Concept

3.2.1 First Generation Process Model

Robert G. Cooper established the Stage-Gate process back in 1980s. However, the Cooper’s Stage-Gate was not a brand new product development concept. NASA developed the very first generation product development process in 1960s. It was named as Phased Project Planning, which is called today as Phase Review Process. “It was an elaborate and detailed scheme for working with contractors and suppliers on various space projects. The U.S. military adapted the approach for weapon developments with its suppliers” (Cooper, 1994, p. 4).

The Phased Review Process broke development into discrete phases. There were review points at the end of each phase: funding for the next phase was conditional on the fact that certain prerequisites had been met – typically that all tasks had

been satisfactorily completed for the previous phase. Hence, the method was more of a measurement and control methodology, designed to ensure that the project was proceeding, as it should and that every facet of it, was completed on time (Cooper, 1994, p. 4).

The aim of the process was to complete the tasks as required at the relevant phase. It was not to complete the project on time. The process was very engineering driven, focusing on the technical risks but not business risks.

Today's Stage – Gate is more of a cross-functional and business driven tool. In the following section, we will look in to these models in more detailed way.

3.2.2 Second Generation Process Model

Cooper (2008) defines Stage-Gate process as a "conceptual and operational map for moving new product projects from idea to launch and beyond – a blueprint for managing the new product development process to improve effectiveness and efficiency" (p. 2). Stage Gate was founded by Robert G. Cooper back in 1980s.

New product development begins with an idea, continues with the development of the product and ends with the launch. These are the three main milestones of the new product development process. In between these milestones, there are couples of dynamic process steps what Stage Gate does to divide the dynamic processes into series of activities and series of decision points where the activities are names as stages and the decision points are names as the gates (Cooper, 2009).

In a nutshell, the gates are the stops for project owners to get the green light to be able to continue further with their project and the stages are the periods where the necessary data is gathered to receive the approvals from the gates.

3.2.2.1 The Stages

Innovation process can be visualized as a series of stages, with each stage comprised of a set of required or recommended best-practice activities needed to progress the project to the next gate or decision point. Each stage is designed to gather information to reduce key project uncertainties and risks; the information requirements thus define the purpose of each of the stages in the process. Each stage costs more than the preceding one: The process is an incremental commitment one. However, with each stage and step increase in project cost, the unknowns and uncertainties are driven down, so that risk is effectively managed. The activities within stages are undertaken in parallel and by a team of people from different functional areas within the firm; that is, tasks within a stage are done concurrently, much like a team of football players executing a play. Each stage is cross-functional: There is no R&D stage or marketing stage; rather, every stage is marketing, R&D, production or engineering. No department owns any one stage (Cooper, 2008, p. 3).

3.2.2.2 The Gates

Following each stage is a gate or a Go/Kill decision point. The gates are like the huddles on the football field: Gates serve as quality‐control checkpoints, Go/Kill and prioritization decisions points, and points where the path forward for the next play or stage of the project is agreed to. The structure of each gate is similar. Gates consist of:

- Deliverables – what the project leader and team bring to the decision point (for example, the results of a set of completed activities). These deliverables are visible, are based on a standard menu for each gate, and are decided at the output of the previous gate.

- Criteria – against which the project is judged. These include must meet criteria or knock out questions (a checklist) designed to weed out misfit

projects quickly; and should meet criteria that are scored and added (a point count system), which are used to prioritize projects.

- Outputs – a decision (Go/Kill/Hold/Recycle), along with an approved action plan for the next stage (an agreed-to timeline and resources committed), and a list of deliverables and date for the next gate (Cooper, 2008, p. 3).

In the classic typical Stage-Gate process there are five different stages present.

Stage 0: It serves for discovery part of the process; includes the activities to discover new product ideas and opportunities for answering the consumer need.

Stage 1: It serves for the scoping part of the process; includes the assessment on the technical part of the project, plus on the market insight.

Stage 2: It serves for the business case creation part of the process, includes the feasibility studies for the technical and marketing perspectives.

Stage 3: It serves for development; Cooper (2009) indicates the plans which are translated into concrete deliverables. The actual design and development of the new product occurs, the manufacturing or operations plan is mapped out, the marketing launch and operating plans are developed, and the test plans for the next stage are defined.

Stage 4: It serves for the testing and validation where the entire project validation is conducted and the acceptance of the project is foreseen in terms of whole manufacturing process and economics.

Stage 5: It serves for launch. This is the commercial production and the launch of the new product.

Although each stage has its own objective, they are very similar to each other, each stage has activities, analysis and deliverables. The activities are the studies done by the project team based on the project plan. The analyses are the results as an outcome of the activities performed by the project team and the cross functions.

The deliverables are the results of the analysis and the final information needed for the gate submissions (Cooper, 2009).

After each stage, there is a relevant gate where the project's future decisions are taken. In the classic typical Stage-Gate, there are five gates as well and they also have similar structure. Each gate has deliverables, criteria and outputs. The deliverables are to be reviewed during the gate meetings. The criteria are the points where the projects are judged against, in order to make proper decisions and the outputs are; go or kill the project. Please find below in Figure 3.1 the classic Stage-Gate flow;

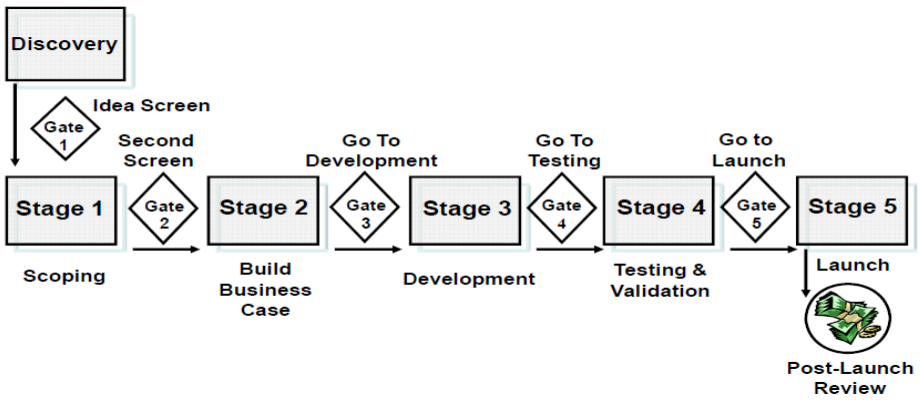


Figure 3.1 Stage gate model of NPD (Cooper, 2008)

3.2.3 Third Generation Process Model

Many different adaptations of Stage Gate model have been developed within the years. Cooper (1994) names these newer variants as third generation process models. He suggests that the third generation models represent a precarious balance between the need for thoroughness of action and complete information vs the need for moving

quickly. He also mentions that the third generation models have four fundamental Fs (fluid, fuzzy, focus, flexible).

1. Fluid and adaptable – Fluidity. Overlapping and fluid stages.
2. Fuzzy gates – Fuzzy. Case by case dependent conditional go decisions.
3. Sharp focus – Focus. Project prioritization.
4. Flexible. Risk and prioritization dependent requirements.

Figure 3.2 represents the first adaptation of Stage Gate process which enables 4Fs to be used.

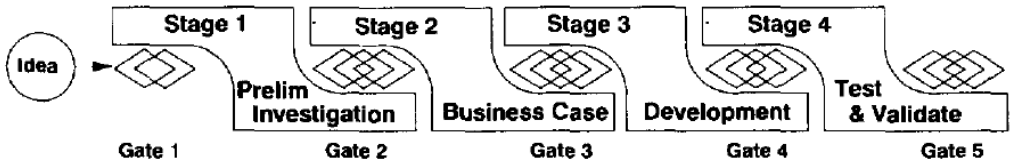


Figure 3.2 Third generation process model (Cooper, 1994)

3.2.4 Next Generation Process Models

> Perhaps the greatest change in Stage-Gate over the last few years is that it has become a scalable process, scaled to suit very different types and risk-levels of projects – from very risky and complex platform developments through to lower risk extensions and modifications, and even to handle rather simple sales force requests (Cooper, 2008, p. 13).

When Stage Gate process first implemented, there was only one way of using the process with five gates and five stages which are following each other in a linear system. However, within the years, it has been recognized that not all the projects have the same risk level and consumes the same amount of resources. Hence, the process has been morphed into different versions to fit the business need.

3.2.4.1 Xpress and Lite Models

Figure 3.3 represents the xpress and lite models of Stage Gate process, which enables to have case by case depended, more flexible and adaptable stage Gate process. The xpress model is to be utilized in the projects which have moderate risk levels whereas the lite model is to be utilized in the projects which have low risk levels meaning relevant to the projects which have minor changes. These models are helping to skip unnecessary gates and helps relevant stakeholders to make conditional decisions.

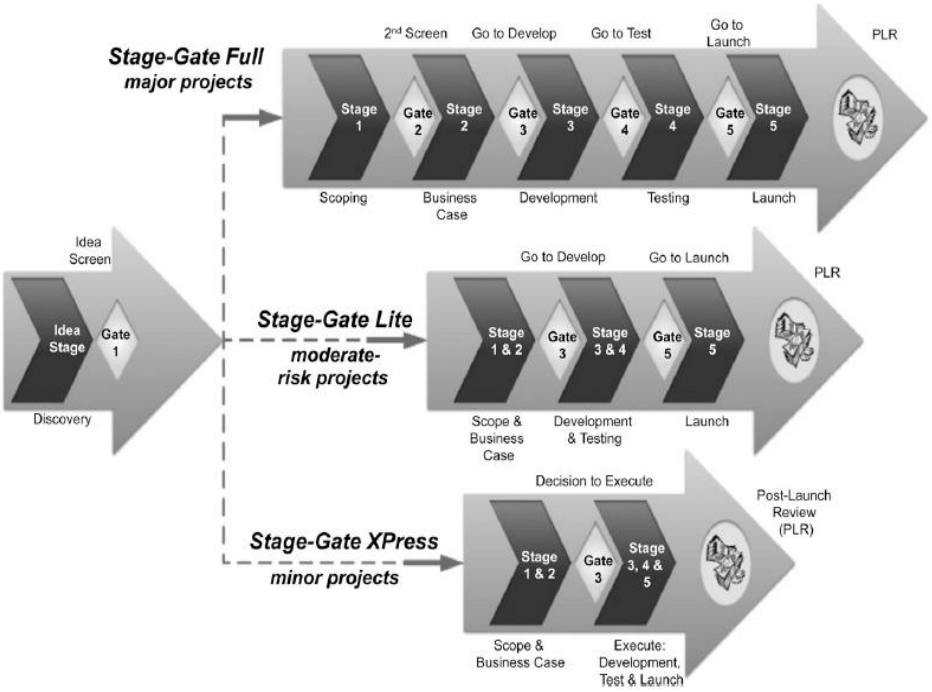


Figure 3.3 Xpress and lite variations of stage gate (Cooper, 2014)

3.2.4.2 Spiral Model

Another next generation model of Stage Gate process is called as spiral development which is shown in Figure 3.4. This process is allowing project teams to move quickly to finalize product design through a continuous build, test, feedback and revise loop. It enables the durable information inflow which includes the customer participation as well.

In the first spiral, project members visit customers to understand their need. In the second spiral the project team proposes the product that will meet the customer need. In the following spirals the project team produces the first prototype and then if needed revises the prototype to have the complete product. In the last spiral the product is tested and validated in the field.

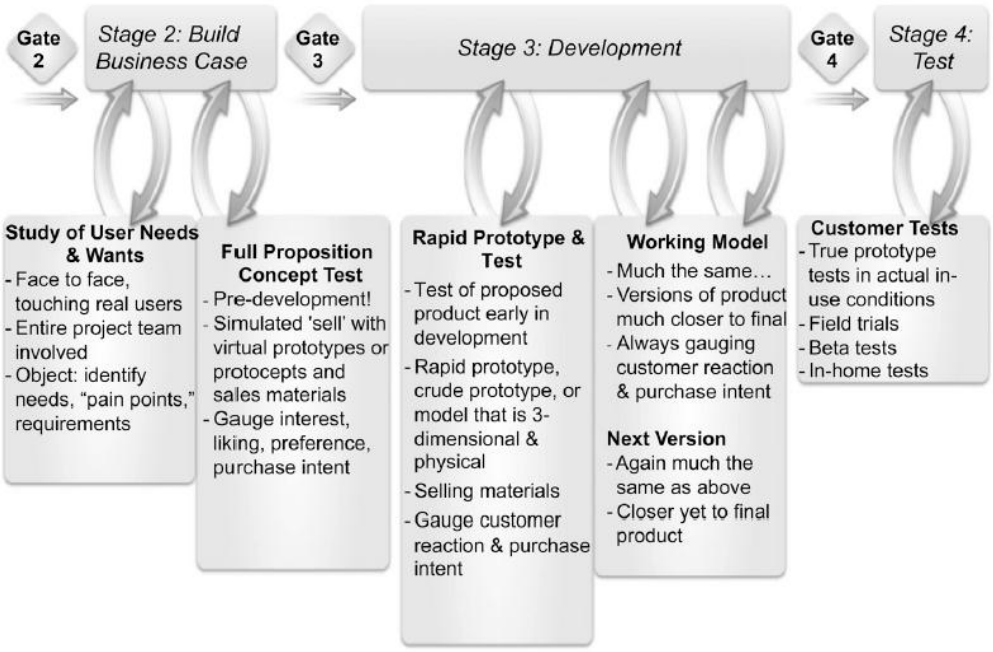


Figure 3.4 Spiral development of stage gate (Cooper, 2014)

3.2.4.3 Open Innovation Model

Open innovation model is another adaptation of Stage Gate model. In the closed NPD models, the inputs are either coming from the internal or external sources. Then the product development organization of the respective company proceeds with the development of the new product. Figure 3.5 shows the representation of open innovation model.

Chesbrough (2003) defines open innovation as a paradigm which directs firms to utilize external ideas as well as internal ideas to advance their technology and to create value. There are two types of open innovation models; outside-in and inside-out open innovation model. "In open innovation, companies look inside-out and outside-in, and across all three aspects of the innovation process, including ideation,

development, and commercialization. In doing so, much more value is created and realized throughout the process" (Cooper, 2014, p. 21). Outside-in open innovation opens up a company's own innovation processes to external contributions whereas the inside-out open innovation model allows a firm's unused and under-utilized ideas to go outside the organization.

In the ideation phase, companies also look at to the needs of inventors, entrepreneurial firms, their partners and apart from only looking at customer needs. In the development stage, companies seek solutions for the technological problems from scientists who are external to the company they or they can even outsource their internally developed intellectual properties. During the commercialization stage companies may out-license their already commercialized products where other may put on more value. This is to allow others to utilize these idea in their businesses (Chesbrough, 2013). They can also acquire already commercialized products (Cooper, 2014).

Simms (2012) indicates that although the open innovation concept is not presented as a model of NPD, Chesbrough's work has been extremely influential in the areas of R&D management, innovation, and NPD.

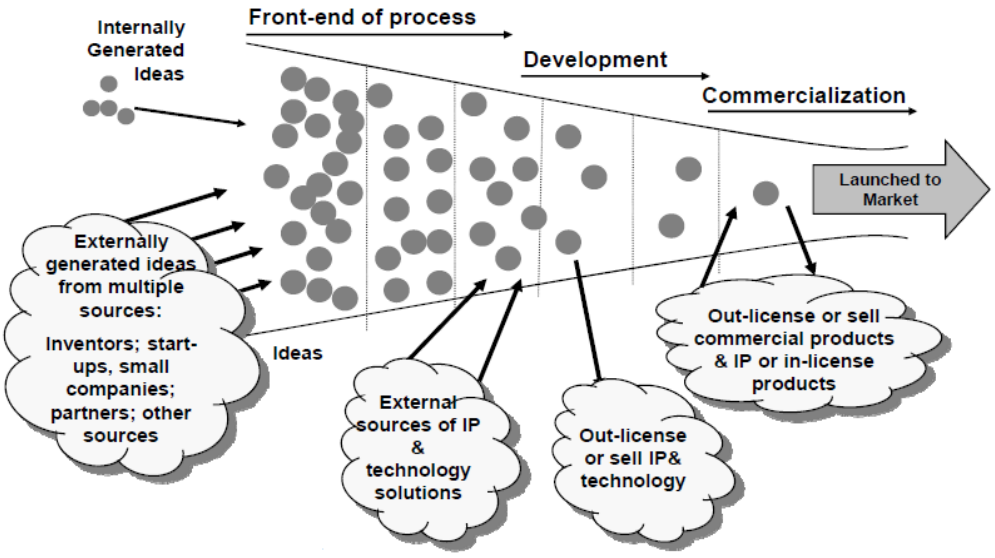


Figure 3.5 Open innovation model (Copper, 2008)

3.2.4.4 Criticisms of Stage Based Models of NPD

The classic Stage Gate model was developed back in the 1980s. Although within the years Stage Gate process incorporated new practices, companies which operate in FMCG industry still suffer from the bureaucratic structure of the process.

Becker (2006) criticizes that the process is not context based and one size should not fit all. Its gates are too structured, too finance based, and the system is too controlling and bureaucratic.

The process is not adaptive enough. It contains non value added paperwork and checklists. The gate approvers might lose their focus and misinterpret of the existence reason of Stage Gate process. They can use it as a controlling area.

Potentially, the process users cannot see the wood for the trees. All of process related demands may seem like extra work. They can think about skipping over some of the tasks and save time and money. This may cause of demotivation within the team. However, bureaucracy shouldn't be confused with sloppy execution.

3.3 History of NPD – Rothwell's Concept

Rothwell (1994), divides the history of NPD process into five generations. The models are not completely independent from one other. While the generation is upgraded, the attitudes are upgraded. It has been indicated thatthe sequence of generations is not a hierarchy of better and better-used models.

3.3.1 First Generation Technology Push Model

The period of 1950s – 1960s is called as post second world war, where the demand for consumption was greater than the capacity of production. The business growth opportunities were hidden under the research and development (R&D) activities. "The market was simply a place that captured the fruits of R&D – people

bought what was currently on offer" (Žižlavsk, 2013). The innovation process was perceived as a linear process from idea generation, through technological development and to the final marketplace. Rothwell (1994) defines this innovation process as the first generation innovation model – the technology push model. Figure 3.6 represents the technology push model.

The major weakness of this model was the absence of feedback loops. The development of laser technology was the outcome of the linear push technology model, back in 1960s (Žižlavsk, 2013).

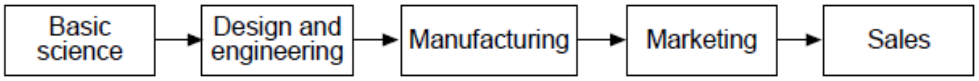


Figure 3.6 First generation technology push model (Rothwell, 1994)

3.3.2 Second Generation Market Pull Model

Between mid-1960s and early 1970s the competition got wild and the customer needs were becoming important parts of the NPD process. This was forming the new process flow of market pull model as shown by linear individual phases in Figure 3.7. In this model, the customer needs were determined through market researches. The customer needs were the key inputs for the NPD process.

However, this model, like the linear model, neglects the other inputs that are necessary for successful innovations. By putting market needs in the driving seat, the model fails to take into account the importance of linkages to the scientific and technological knowledge pool that are essential for innovation (Neely & Hii, 1998, p. 19).

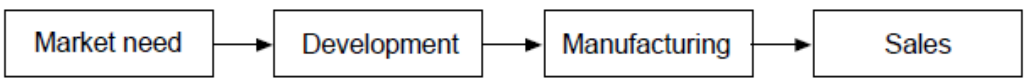


Figure 3.7 Second generation market pull model (Rothwell, 1994)

3.3.3 Third Generation Interactive Model

The early to late 1970s, with two major oil crises, was a period marked by high rates of inflation and demand saturation (stagflation) in which supply capacity generally outstripped demand, and by growing structural unemployment. Companies were forced to adopt strategies of consolidation and rationalization, with growing emphasis on scale and experience benefits. There was associated concern with accountancy and financing issues leading to a strategic focus on cost control and cost reduction (Rothwell, 1994, p. 4).

Due to above mentioned crises, a new NPD model was developed with the interaction of market pull and technology push models. This new model was improved with the feedback loops. It was named as interactive model of technological opportunities and market needs. It was a cross functional tool between R&D and marketing functions (Žižlavsk, 2013). Figure 3.8 represents the model.

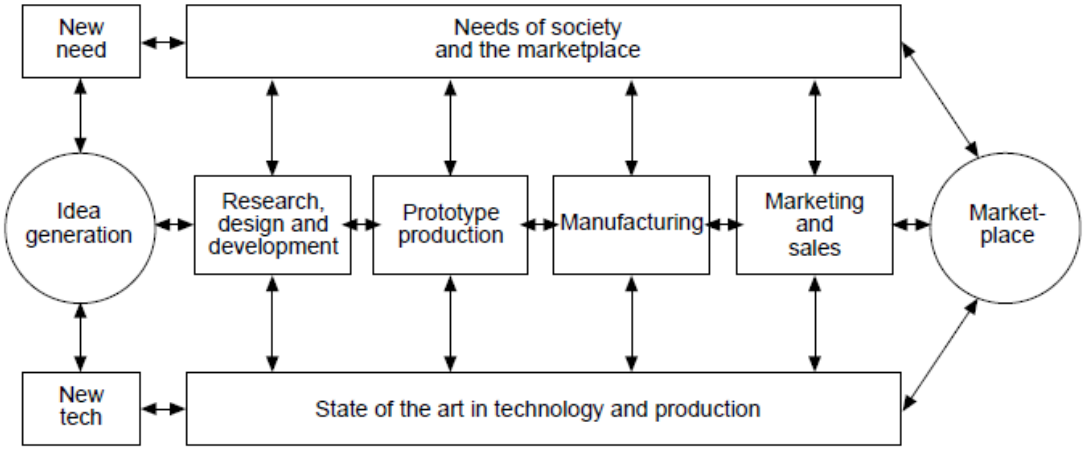


Figure 3.8 Third generation interactive model (Rothwell, 1994)

3.3.4 Fourth Generation Integrated Model

The fourth generation NPD model was in use between early 1980s and early 1990s. It was enhancing the cooperation between production and R&D functions while it also includes the communication with suppliers and customers.

External sources of ideas and thoughts become more important, and the innovation process integrates external resources as well as the activities of different internal departments. This leads to the overlap of various functions and tasks, but mainly to substantial time savings compared with the previous sequence processes (Žižlavsk, 2013, p. 4).

The market was present at the beginning and at the end of the process. the market and the consumer were perceived in the same way. “It demonstrates the necessity of integrating knowledge into innovation process, because knowledge isn’t understood as a result of scientific activities, but rather as a result of interaction between the individual units of a company, the company itself and its environment”(Žižlavsk, 2013). Figure 3.9 represents the model.

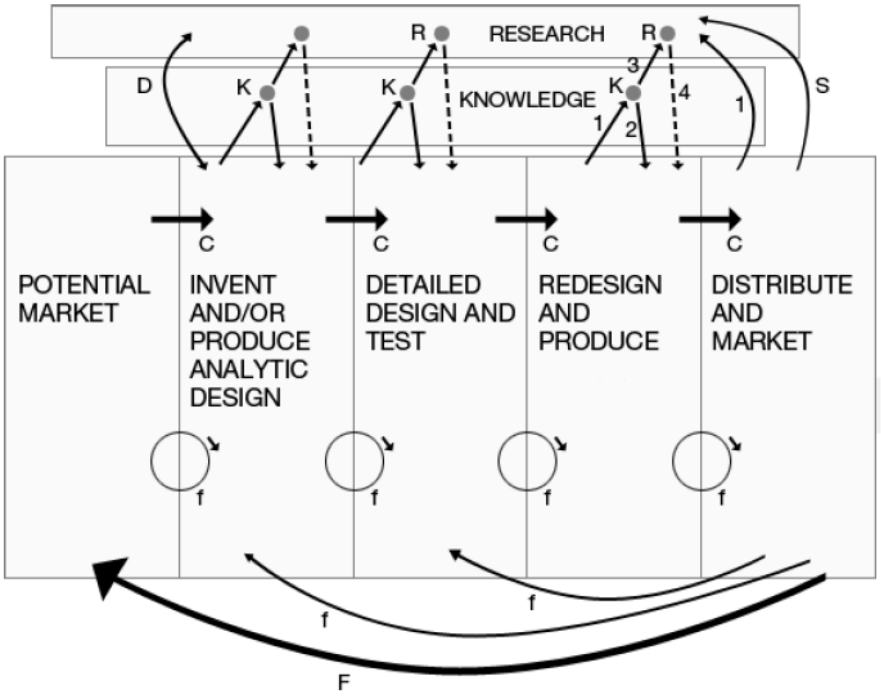


Figure 3.9 Fourth generation integrated model (Žižlavsk, 2013)

3.3.5 Fifth Generation System Integration and Networking Model

Due to constantly growing competition, improved technological tools and the need of shorter product lifecycles, the trend of having time-based NPD processes

increased. Rothwell (1994) defines the fifth generation NPD model as system integration and networking (SIN) model.

This model enhances the NPD process with the integration of fourth generation and IT systems such as simulation modelling, computer-based heuristics, inter-firm and intra-firm co-developments, linkages between buyers and suppliers to support and speed up the process (Neely & Hii, 1998). In this generation the cooperation between external parts and the collaboration between functions are at greatest extend.

3.4 Activity Stage & Simultaneous Models

Apart from the NPD history description of Cooper and Rothwell, in the literature of NPD process there are two other types of NPD process:. activity and simultaneous models of NPD.

Activity stage and simultaneous models may be categorized in 2 different types; first; concurrent nature of stages and second; breaks the product down into a number of modules and relates these to activities required to develop them (matrix structure) (Simms, 2012). Both types are cross-functional and provides greater integration.

Figure 3.10 shows the Crawfords's (1997) activity stage model, which is subject to the first type. This model explains the process as a process, which includes many overlapping stages. This model has four different activities similar to the others. However, the difference of this model comparing to the other models, is the presentation of the model itself. The model shows the activities as they are occurring concurrently at different importance levels in line with the project progress.

"This view overcomes the linear weaknesses of traditional stage based representations" (Simms, 2012, p. 62).

Fuller (1994) illustrates the importance of this perspective, suggesting that the number of steps modelled, their order, and name, which do not matter. What is important is logic; activities overlap and they are concurrent.

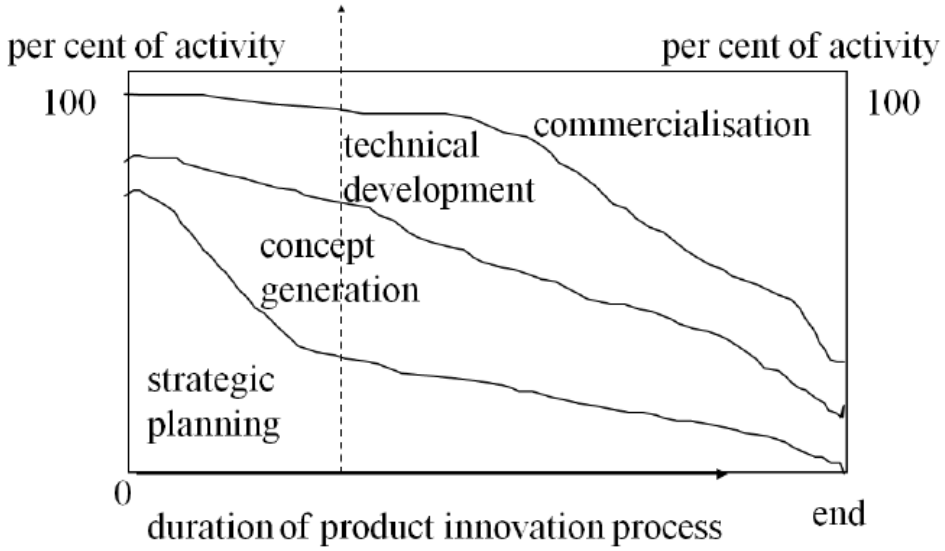


Figure 3.10 Activity stage model of NPD (Crawford, 1997)

Figure 3.11 shows Unger & Eppinger's spiral model (2009). This model also has a different way of representing. The activities are part of the spiral. During the spiraling process, the model allows the accounting for projects moving between each activity, any time, to the end. The other difference of this model is to have less informal reviews. Simms (2012) indicates that the main objectives of these concurrent and spiral models are; reflection of the important information exchanges between departments.

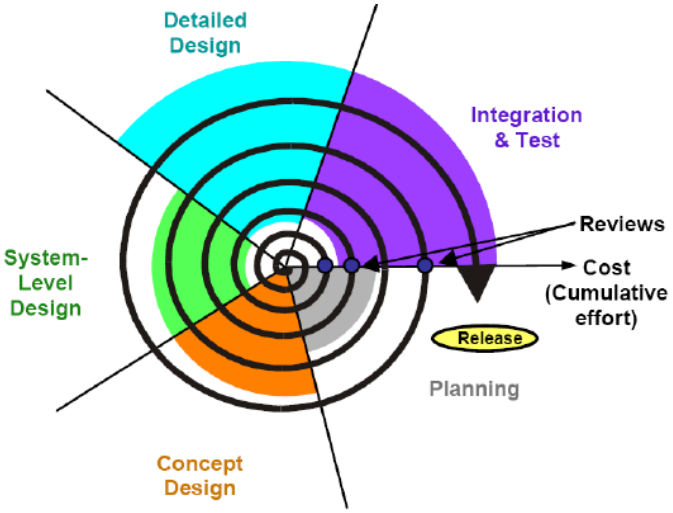


Figure 3.11 Unger & Eppinger's (2009) spiral model

Figure 3.12 sets an example for the second type of models – as matrix of activities, Design Structure Model. This model shows the interaction and the relationship among all technical parameters. "Its structure is based upon specified tasks required (represented in A-D on the horizontal axis), in order to build each component of the product or output required" (Simms, 2012, p. 63s).

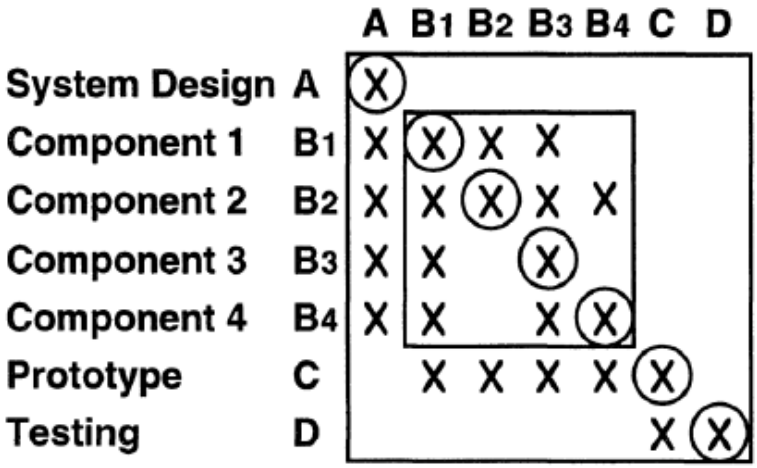


Figure 3.12 Example design structure matrix (Smith & Eppinger, 1997)

These models are good translators in terms of reflecting the technical relations however; they are not representing the overlapping activities.

Different types of NPD models are evident in the literature. By reviewing the literature it has been seen that the main models mostly focused on the stages or activities. Each of these makes an important contribution to understanding how an NPD process can be managed.

However, majority of them represented the NPD process as a series of linear activities. Within the time, the feedback loops between activities or stages were integrated to the processes.

The models that were reviewed during this chapter have revealed that the structured linear process of stage based models will be beneficial to define the tasks to be completed before the approvals. However keeping these models linear without feedback loops, might create problems like prolonging the project timeline unnecessarily in such a speed required industry - FMCG.

In terms of process management on the tasks which are necessary to be completed, the stage based models are perfect. However these models should be open for flexibilities and running parallel activities with feedback loops in between those. Together with quality, the speed to market do matter for the companies which operate in FMCG industry. The literature review showed that the linearity of stage based models might create non-value added waste of time during the NPD process.

In the following chapters, the NPD process of ABC Company will be reviewed under these circumstances, while benefiting the linear control mechanism of stage based models the feedback loops and overlapping activity features will be integrated to the process.

CHAPTER FOUR
NEW PRODUCT DEVELOPMENT PROCESS IN ABC

4.1 Introduction

This chapter provides the details of new product development (NPD) process in ABC Company. The chapter starts with the examination of the existing NPD process of the company. It continues with the examination of the NPD process steps by Value Stream Mapping (VSM) tool.

There are three main departments within the ABC Company. These departments are Marketing, Product Development (PDD) and Operations (the factory), respectively. Marketing Department (MD) collects the consumer needs/insights, does the market researches, and develops the new ideas. PDD is the first stop shop of marketing who collects and understands the needs of the market, proposes new product ideas to marketing, which can be solutions for their needs, develops the new products and translates the marketing language into operations language for the operations in order to run the real production at the desired quality level.

ABC Company uses the Stage-Gate process for their NPD since 2000. From that time up to now, the Stage-Gate process of ABC has been changed and adapted to the requirements of the timely generated changes.

Before 2000, ABC Company was using a NPD process which had only two different decision points. The first decision point was developing the idea of new product. Then following the NPD idea generation, the new product was being developed. After the development phase the second decision point was whether to go ahead with the commercial production or not. However if the second approval was negative then all the work done behind developing the new product idea was turning in to a dump. Therefore, ABC started using Stage-Gate process as of 2000 to be able to take decision before it is too late, and to have a more transparent system among all relevant parties.

4.2 ABC Portfolio Card

ABC Company is operating in FMCG sector and the products that ABC is producing mainly have two components; the pack and the product which is put inside the pack.

Company has 92 different brands, 2000+ types of products and 400+ types of packaging items. The packaging items and the products are the combination of some materials. These three variables; brands, packaging items and products are combined in a database, which is named as ABC Portfolio Card. This card has its own characteristics and combination rules. For instance, there may be some golden rules dictating that brand A can only be used with product type B1, C3, E6, F4, etc. and packaging type X4, Y3, A9, B0. These rules result in having different types of product development procedures. There are two different ways to make a product development in ABC Company.

1. The Brandnew
2. The Done

The Brandnew way of product development, as it can also be understood from its self-speaking name, means that the development is to be done from scratch. Either MD or PDD initiates a new idea to be developed or PDD reacts before or after the request based on an initiator. The materials or components (do not have to be necessarily all, can also be only one) that are to be used in the requested new product are not yet developed, qualified or validated in the production. Therefore, PDD has to start the developments from scratch. Developments are done in cooperation with the suppliers, operations, marketing and legal authorities. This kind of NPD (The Brandnew) takes 24 to 36 months based on the number of brand new items to be developed and the confirmation received from legal authorities.

The Done way of product development is the way of developing new products by using already validated materials and components and combining them in such a way

that the development was never done before. The Done way of product development only allows marketing to come up with an idea. PDD does not take the role of marketing and it proposes a NPD idea by using the already developed materials or components. PDD understands the marketing need and proposes a new product solution. If MD and PDD agree on the product concept, then PDD works on the development of this new product. This kind of NPD takes 6 to 12 months of lead-time to finish.

In ABC Company the 82% of the NPDs are done with "The Done" way of NPD. Therefore, in this study we will focus on the improvements on the second way of NPD – The Done way.

4.3 The Done Way of Product Development and Stage-Gate Process in ABC

The product development process of ABC Company has been running based on Cooper's Stage-Gate process since 2000. The Stage-Gate process that was used back in 2000 was exactly in line with the classic Stage-Gate approach. Within the time, since Stage-Gate itself is not a rigid and lock-step process, ABC Company has adapted the classic Stage-Gate process to the needs of their product development process.

Today, in ABC Company, the Stage-Gate process has five stages and five gates. However, for some of the product developments these stages and gates differentiate from each other.

ABC Company is an international company, which operates and has sales forces around the world in five continents. It has 92 brands. Of course, not in every country these 92 brands are on the shelf for consumers to buy. The presence of these brands in the countries are based on the needs of the consumers, financial / economic capabilities of these countries and ABC long-range strategies.

The ABC brands are separated as local and global. The global brands are mostly in every country.

The global brands have the highest recognition level all around the world, the popularity, and the highest number of brand equity. If there is a new market opening within the sales area of ABC, this market, firstly has to launch a brand from global brands. After then, the market can consider launching a local brand from other markets or inventing another local brand specific for that country.

The local brands may be specific for the relevant country while the other countries, who are interested in, may also launch other countries' local brands. Hence, it is not "a must" for a local brand to be localized only for that specific country; the others may use it as well. Today ABC Company has 10 global brands while there are 82 local brands.

Based on the global and local brand differentiation within the company, ABC applies a different gating system comparing to the classic Stage-Gate tool concerning The Done way of product development.

In ABC Company, The Done way of product development can be done in four different ways since the finished good (final product) has two major parts; the product and the packaging.

The requested new product may be a combination of;

1. a new packaging and an already developed product
2. an already developed packaging and a new product
3. an already developed packaging and product
4. a new packaging and product at the same time

However, looking at the latest figures, MDs of ABC Company are not interested in just changing the product only. The developments are always done with the change of packaging as well. If NPD requires a new development on the product, it

does not matter if the packaging is already developed or not, this new product concept has to be prototyped and validated by the professional users.

4.4 Examination of Current NPD Process of ABC Company

Examination of the current process flow of NPD of ABC Company was conducted by using VSM tool. Cooper (2014) defines VSM as the linkage of all value-added and non-value-added activities. The mapping of value stream is used to define the value streams in product innovation and to identify value added and non-value-added activities (Cooper, 2014). This tool was developed in 1995 to help researches to identify waste in individual value streams and to find appropriate route to remove the waste (Hines, 1998).

The execution of VSM in ABC Company was started by creating a task force who was to create the map of value stream from idea generation till seeing the final product on the shelf. Hence, from each department which has contribution to the NPD process, a representative has been selected. These representatives were selected to map out the current process, to indicate who is doing what and to map out the lead times needed for each activity.

The aim of this activity was to see the difference between the theory and practice. Once the big picture was mapped out, the task force dissected the process and assessed it by asking four key questions;

1. What work gets done at this stage?
2. How long does it take?
3. Is this stage really needed? If yes, how can we make it better?
4. How can we decrease the timings?

Representatives from product development, quality assurance, marketing, finance, supply chain, procurement and sales joined the exercise. Moderator of the mapping gave one empty map to representatives. This empty map was representing the whole

NPD process of ABC Company. Moderator also gave stickers to each representative to place them on the empty map. Each sticker had different colors representing different departments. Representatives were asked to write the names and the real times needed to complete the tasks that they handle in each stage. These stickers were put on the map by each representative.

Based on these inputs, the NPD process map was created. The map of the current process showed how things really worked or not – the condition with all of the problems, issues and discrepancies for the entire team to see. The key elements of the VSM are documented on the map as follows:

- The Customer
- Main Process Steps
- Process Time, Wait Time
- Supplier with Material Flows
- Information & Physical Flows
- Overall Performance of the value stream with total lead time and total value added time

Figures 4.1, 4.2, 4.3 and 4.4 represent the VSM maps of current ABC NPD process which was created by the task force. The map is divided in 4 pieces. Each piece represents one stage of NPD process. Stage 5 is not included since it is purely related to post launch evaluation and follow up on the launch progress and it indicates the performance of sales. The map represents the process steps in sequence. The sub-processes are also identified.

After the creation of the current process map, the task force specified what value means from the customer standpoint and how their current products and processes disappoint the customer's value expectations; the price, the quality, the rapid response to changing needs etc. The most important ones were selected as the speed to market and the quality level of the products.

Based on the defined values, the force team revisited and challenged every single task to identify the non-value added ones. This is done to find out the present need of the task, if necessary or not, or to see if the lead time needed for that task can be decreased.

Following these discussions, in stage 1 there is no non-value added task identified. The total lead time of the whole process was found as 138 days whereas the value added time was also found as 138 days.

In stage 2 and stage 3 “waiting for meeting minutes to be issued” and “waiting for approval meeting date” tasks were identified as non-value added tasks. In stage 2 the total lead time of the whole process was found as 51 days whereas the value added time was found as 28 days. In stage 3 the total lead time of the whole process was found as 60 days whereas the value added time was found as 34 days.

In stage 4 “material preparation and arrival” task was identified as non-value added task. The total lead time of the whole process was found as 125 days whereas the value added time was found as 85 days.

In the following section, as an outcome of VSM study, the process flow of NPD process of ABC Company will be explained in more details.The lead times needed for each task in each phase will be given.

Responsibility, Accountability, Consulted and Informed (RACI) matrix will be used to describe the participation by different roles in completing tasks or deliverables.

The R-responsible represents the person who does the work to achieve the task. The A-accountable represents the person who approves the work that responsible delivers. The C-consulted represents the subject matter experts whose opinions are sought.

Finally, the I-informed represents the people who should be up to date on the project. This matrix will be useful to clarify the roles and responsibilities on each task in each stage.

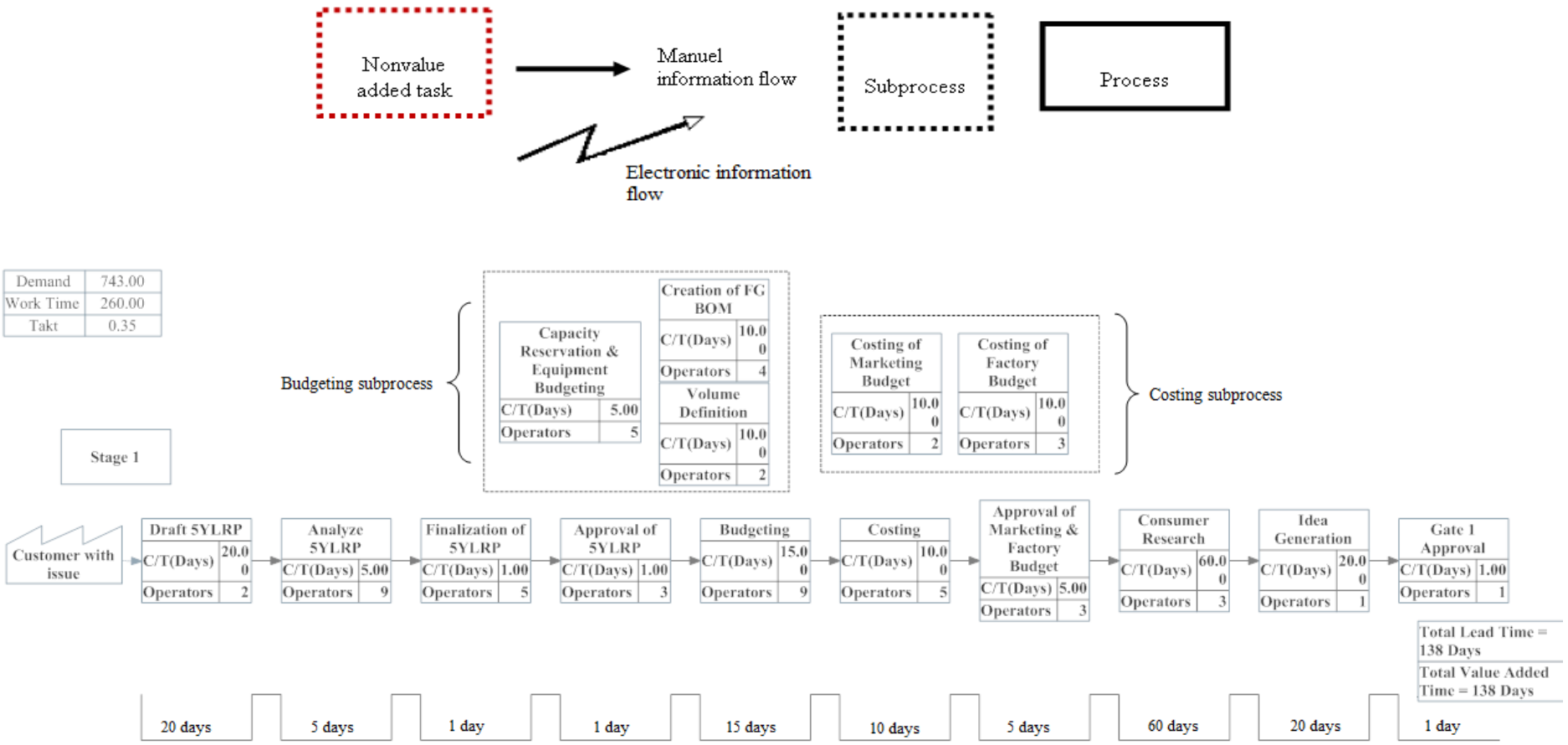


Figure 4.1 VSM map of Stage 1 (5YLRP: 5 year long range plan, FG: finished good, BOM: bill of material, C/T: cycle time)

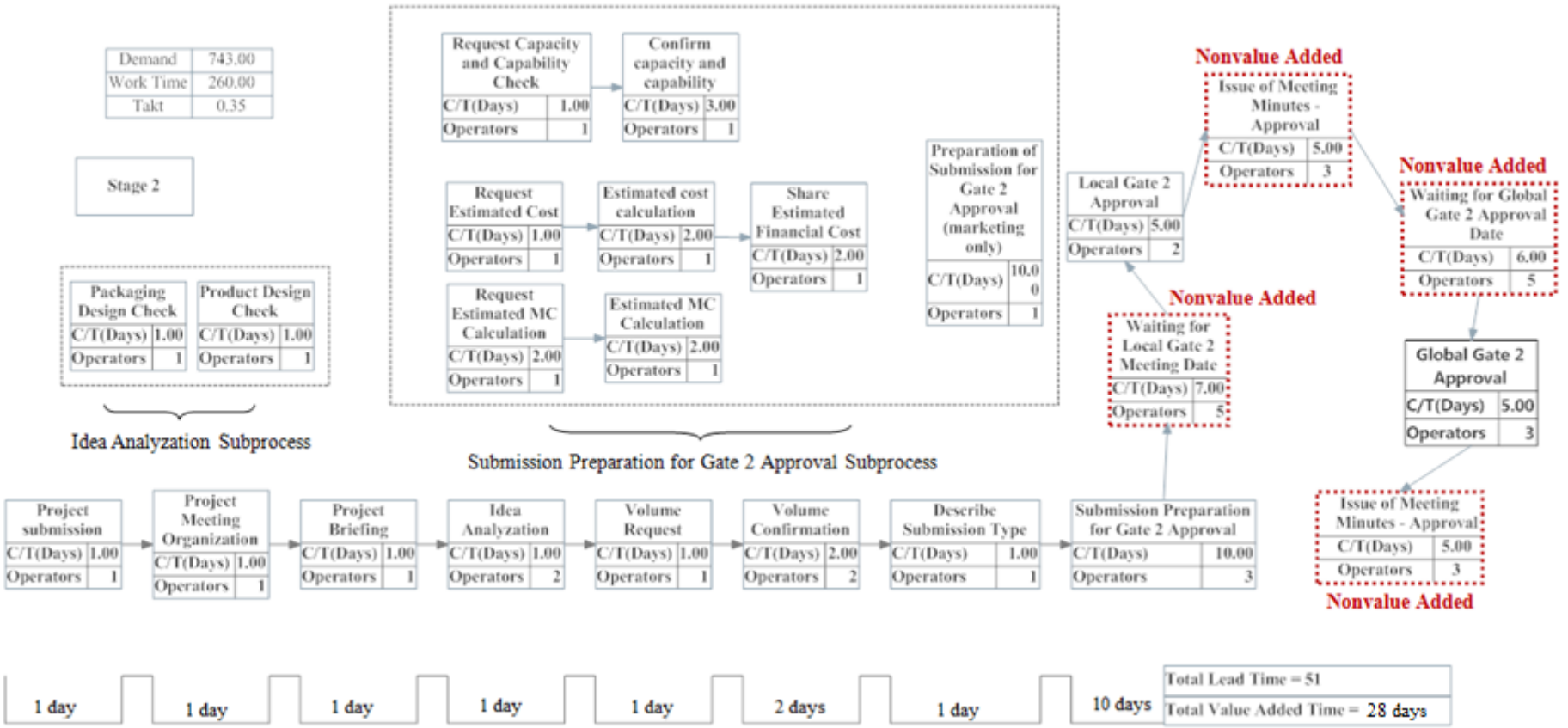


Figure 4.2 VSM map of Stage 2 (MC: marginal contribution, C/T: cycle time)

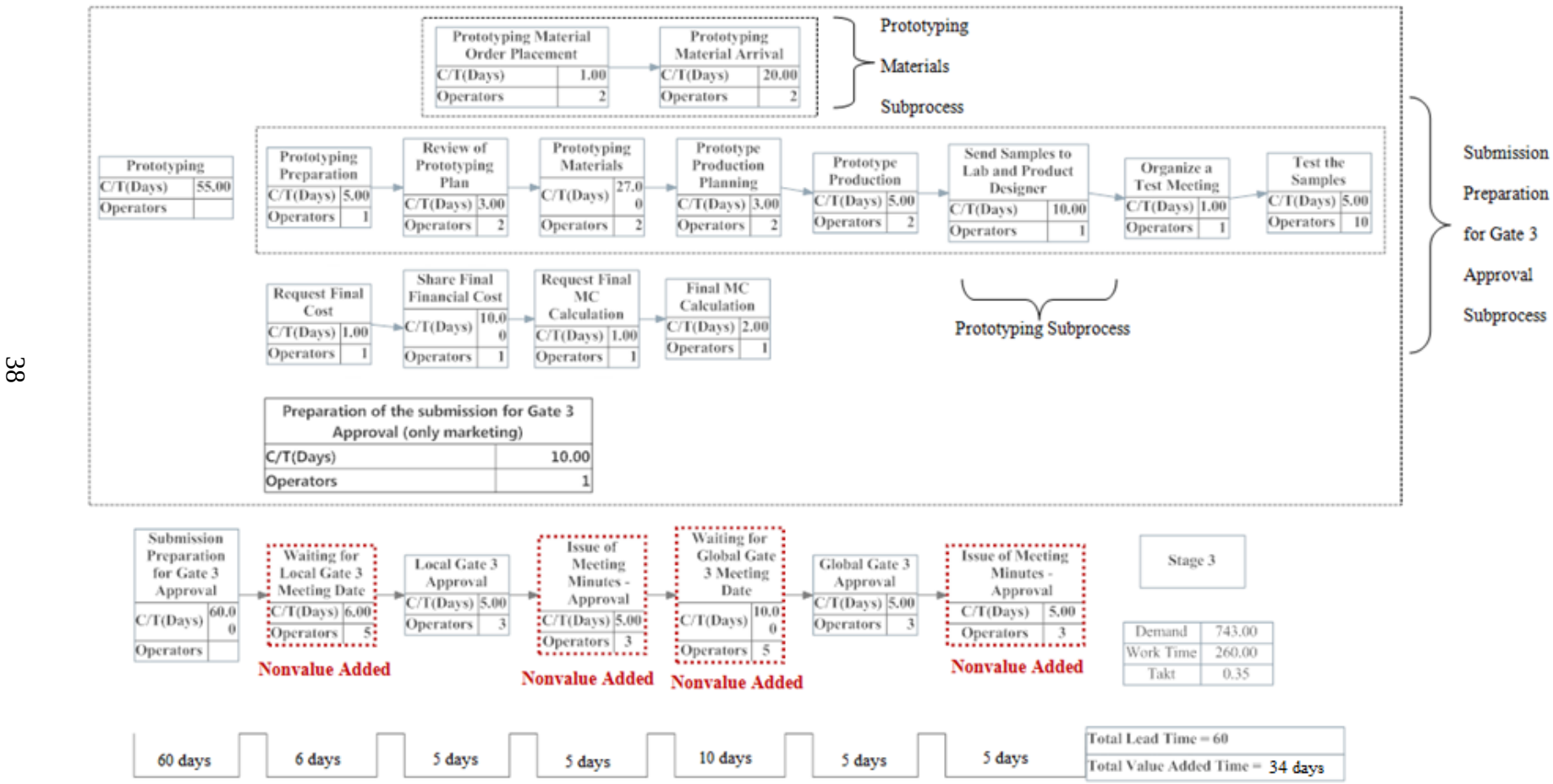


Figure 4.3 VSM map of Stage 3 (MC: marginal contribution, C/T: cycle time)

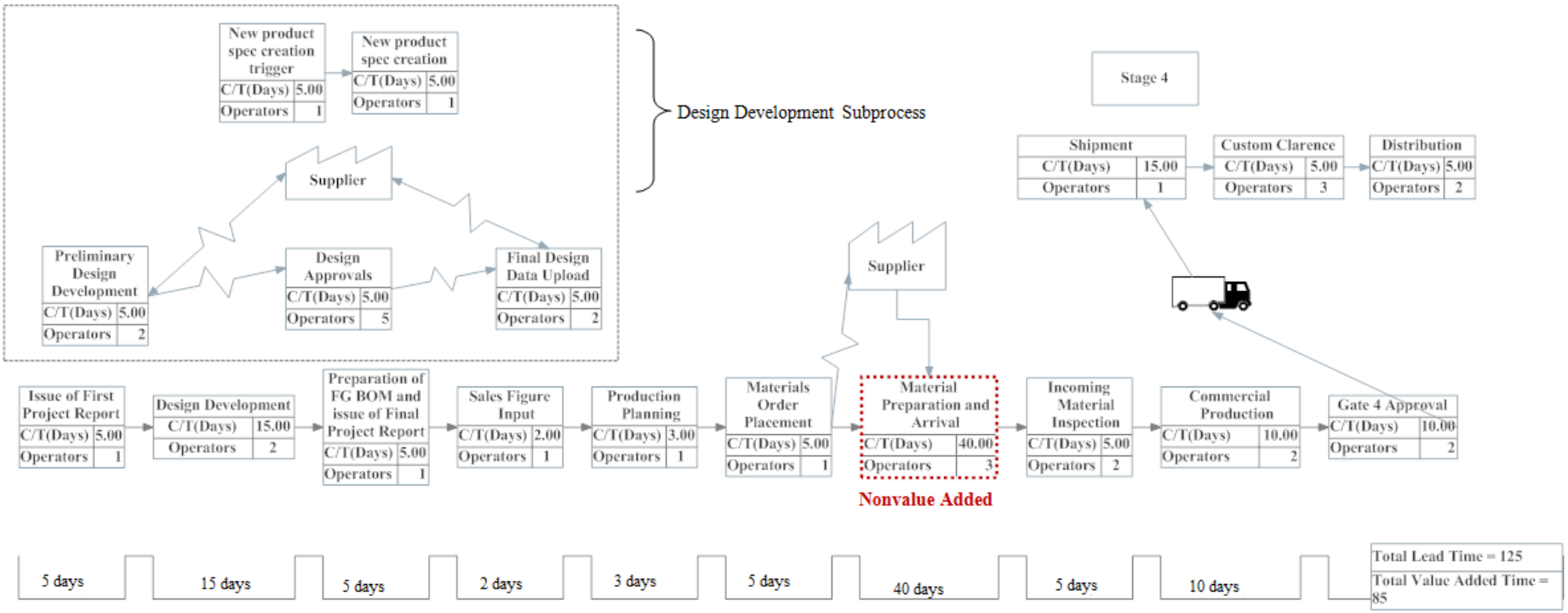


Figure 4.4 VSM map of Stage 4 (FG: finished good, BOM: bill of material, C/T: cycle time)

4.5 The NPD Process of ABC Company

4.5.1 Stage 1: Idea Generation

Like the other FMCG companies, the ABC Company also has a budget period. During the budget period, marketing, sales, product development, finance and operations departments are working together. The process starts with MD identifying the upcoming initiatives concerning the next five years. These initiatives are analyzed together with marketing and product development departments. Afterwards, based on the agreed marketing plans, the product development department identifies the materials / items to be used for those initiatives. In the meantime, working in parallel, the sales department identifies the volumes for those initiatives. Based on the identified volumes, operations reserves the capacity for the relevant products and budgets the necessary equipment investments. At the end of the process, finance department reports the budget needed for the next five years.

The budget period starts at the beginning of the last quarter of the year, ends at the end of the year, and it is planned for the next five years. During the budget period, apart from the NPD initiatives, MD also budgets the consumer researches to be conducted within the upcoming five years.

After the budget period, MD conducts a consumer research for the upcoming year. The start of the consumer research is treated as the trigger point of Stage 1 by the ABC Company.

Either for a global or local brand; after receiving the consumer research results, the final research report is built by the marketing and the research agency. Before presenting the report to the line management, the report must be reviewed by the legal authorities. When legal authorities approve the final report, MD prepares a presentation to be presented to their marketing line management together with the idea of a NPD that is to address the consumer needs as in the final research report.

This presentation includes the research results. Based on the results with which idea the marketing group is coming up with, the design direction of the pack, the draft product concept, the volume considered, and the consumer engagement plans are conceived.

4.5.2 Gate 1 Approval

The approval given for the presented idea by the marketing line management is called as Gate 1 approval.

Figure 4.5 represents the process flow of till Stage 2. Please refer to Table 4.1 for relevant RACI matrix.

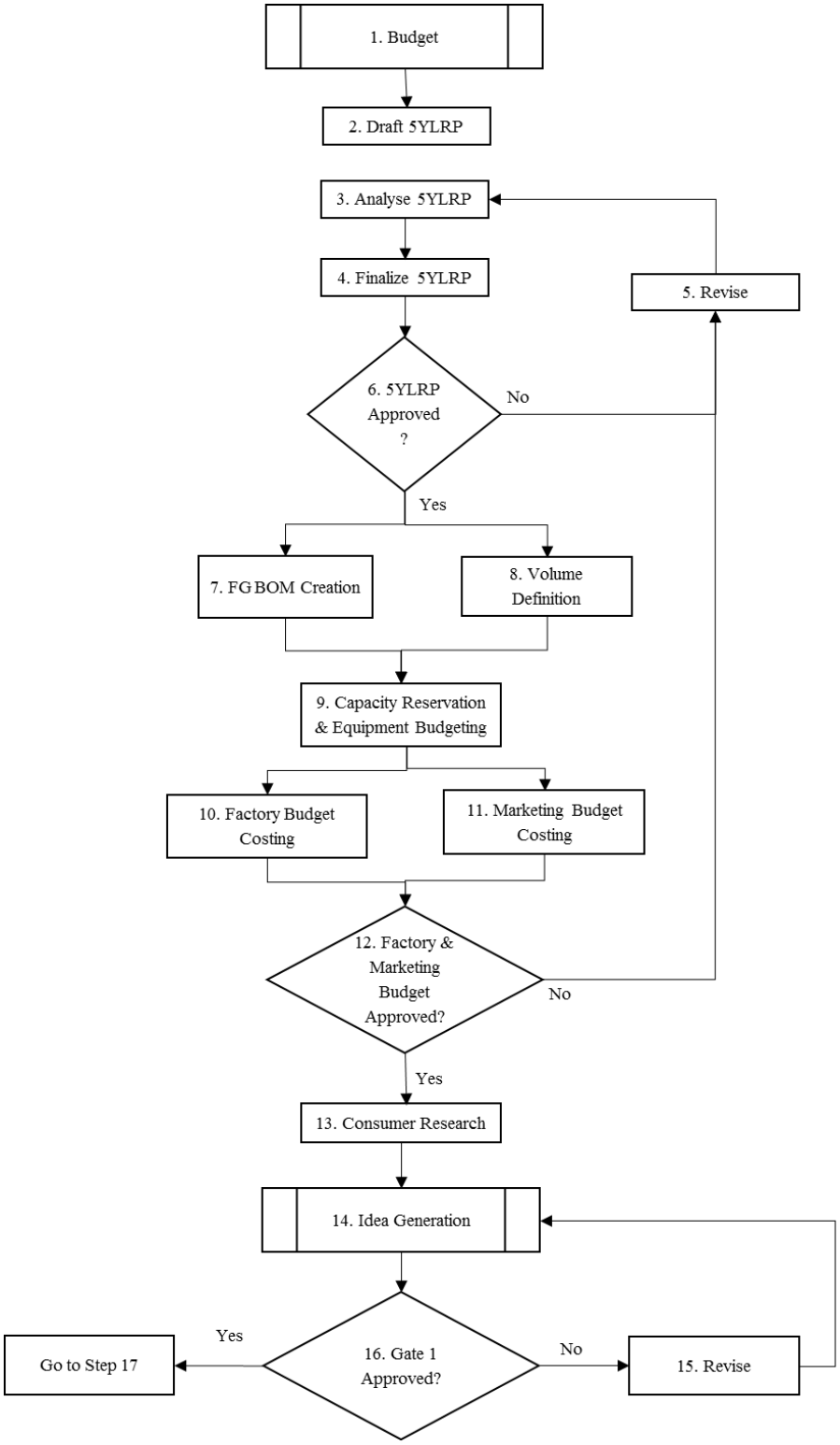


Figure 4.5 NPD process flow of Stage 1 and Gate 1 (5YLRP: 5 year long range plan, FG: finished good, BOM: bill of material)

Table 4.1 RACI matrix of stage 1 and gate 1 tasks

#	Description	Responsible	Accountable	Consulted	Informed
1	**Budget**				
2	Draft 5 year long range plan (5YLRP)	Marketing			Product Development (PD)
3	Analyse of the 5YLRP	Marketing PD	Marketing Mng (Management) PD Mng	Factory	Marketing Mng PD Mng
4	Finalization of 5YLRP	Marketing	PD	PD Factory	Marketing Mng PD Mng
5	Revise	Marketing	PD		Sr (senior) Local Marketing Mng
6	Approval of the 5YLRP	Sr Local Marketing Mng Sr Local PD Mng			Marketing Mng PD Mng
7	Creation of FG BOM (Bill of material)	PD	Marketing		Factory
8	Volume definition	Sales	Marketing		PD
9	Capacity reservation & equipment budgeting	Factory Planning	PD		Factory Mng
10	Costing of the factory budget	Factory Finance	Factory Planning		Factory Mng
11	Costing of marketing budget	Market Finance			Marketing Mng
12	Approval of Factory and Marketing Budget	ABC Sr Mng	Sr Marketing Mng Sr Factory Mng		PD Mng Marketing Mng Factory Mng
13	Consumer Research	Brand Manager		PD Outside research agencies	
14	Idea Generation	Brand Manager		Marketing Mng	PD
15	Revise	Brand Manager			Marketing Mng
16	Gate 1 Approval	Marketing Mng			Brand Manager

4.5.3 Stage 2: Concept and Planning

When the NPD idea is approved at Gate 1 by marketing line management, the marketing group knocks the door of PD. The role of product development is to understand the need and to offer a new product proposition that will address the need from the ABC portfolio card. At this stage, marketing comes to product development with the following readiness:

- The results of the consumer research
- The business objective that they are trying to reach
- The competitor product that is to be fought with
- The desired packing design direction
- The price segment (premium, medium, low or under low) that the brand will be placed
- The highest cost that we can achieve or the desired marginal contribution level
- The volume
- The preferred source – the factory
- The desired communication messages to consumers via the promotional items placed on the product together with the sales duration of the promotional items and the sales volume

The consumer researches are not only done for the NPDs but can also be done for the products which are already in the market. Therefore sharing the consumer research results with product development will help them to understand where the real problem is. For the current products on the market, is it the packaging or the product itself? If it is the product, what is the problem? Is it something perceptional or is it related to the taste of the product? Moreover, for the completely new products, the image that is to be reached is important to be understood.

The business objective will help product development to understand which messages that MD would like to give to the consumer with the launch of this product

or for the current products and what differences they would like to show to the consumers.

Knowing the competitor product that is to be fought with is also important since the product development will first assess the competitor product and then develop a new product that is similar or better comparing to that of the competitor.

The price segment also plays a very critical role since the product development will offer a new product concept to marketing from this price segment. They will not offer a new product in premium segment for a product that is considered to be launched in medium or low segment. At this point, the same logic applies for the highest cost and desired marginal contribution information.

The desired volume and the desired source are very critical. The desired source is important since the ABC products claim the country of origin on the products. Since some countries are sensitive about the source of the products, the desired source information plays a very critical role. The desired source is shared by marketing based on the product concept. The factory capacity is checked against the desired volume by product development.

The desired communication messages on the products are something different then advertisement. Advertisement is something not put on the product. ABC has equipment installed on their machines that allows company to put communication messages on the products via some additional materials. However, not every machine is capable of doing this or has the capacity to do. Therefore, the product development needs to receive the information for the promotional items and check the capacity in the relevant factory.

Based on these details the product development department offers a combination for a new development or for an update on the current product from ABC portfolio card. If the marketing agrees on the concept then the necessary deliverables will be developed by marketing and product development departments.

The NPD idea may be one of the NPD initiatives that was considered during the budget period or may be a completely new idea that was not considered during the budget period. Anyhow, today in ABC Company, there is no differentiation between an initiative that was budgeted or not budgeted in terms of product development process.

When the product concept and packaging design direction are clarified and agreed on both from MD and PDD side, the feasibility study will be done. The deliverables to be presented in Gate 2 meetings are being prepared by marketing and product development departments in Stage 2. The meeting of Gate 2 requires information as an output of a very high-level feasibility study. These details are to be presented at the Gate 2 level to receive the approval. The requested information is as follows:

- A presentation explaining the business objective and the business problem that is to be solved
- The product concept
- The insight of the design direction to be followed (if the design is new)
- The estimated cost of the product
- The estimated volume of the product
- The estimated time of launch

4.5.4 Gate 2 Approval

The Gate 2 approval is given once all Stage 2 required deliverables are completed and approved by management team.

4.5.4.1 Gate 2 and Gate 3 Meeting Platform

In ABC Company, when there is a need for a new product concept development, these kinds of projects are subject to Gate 2 approvals. When the new product concept is finalized, projects are subject to Gate 3 approvals.

Gate 2 and Gate 3 approvals differentiate based on project type;

- *New packaging and already developed product:* Gate 2 and Gate 3 approvals together
- *Already developed packaging and new product:* Gate 2 first and then Gate 3 approvals
- *Already developed packaging and product:* Gate 2 and Gate 3 approvals together
- *New packaging and product:* Gate 2 first and then Gate 3 approvals

As seen from the different approvals based on project types, the one that requires a new packaging development are not subject to Gate 2 approval. Validation of the new packaging designs are done after Gate 3 approval. These projects can directly skip second gate and can be submitted to the third gate for approval. These kind of approvals are called as Gate 2&3 approvals in ABC Company.

The Gate 2 and Gate 3 meetings are also divided into two different meetings in ABC Company. These meetings are separated based on the brand types; local or global. As in line with the types of brands, the meetings are named as Local Committee Meeting (LCM) and Global Committee Meeting (GCM). The gatekeepers of the local committee meeting are the local senior managers of relevant marketing and PDDs, whereas the gatekeepers of global committee meeting are the global senior managers of relevant MD and PDD.

Local senior managers must review projects, related to local or global brands, at Local Committee Meeting. Moreover, global senior managers must review projects related to global brands at Global Committee Meeting if the project gets the first approval at the Local Committee Meeting. Hence, the first sieve is the Local Committee Meeting for the global brands.

This meeting flow and rules are valid both for Gate 2 and for Gate 3 approval points.

If the project type concerns a new product concept development for a global brand then approval flow of the project at Gate 2 and Gate 3 approvals will be as shown in figure 4.6;



Figure 4.6 Gate 2 and Gate 3 approvals of global brands which require prototyping

Figure 4.7 and 4.8 represent the process flow till Stage 3. Please refer to Table 4.2 and 4.3 for relevant RACI matrix.

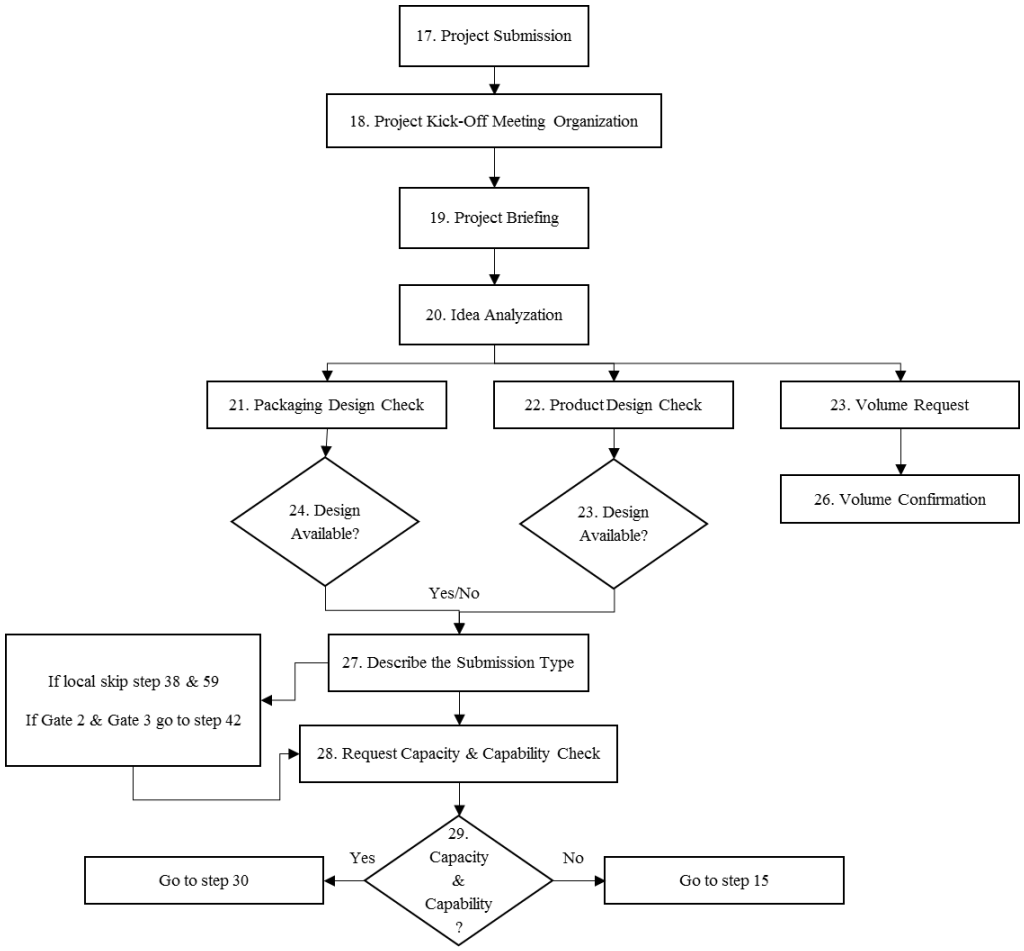


Figure 4.7 NPD process flow of Stage 2 and Gate 2 between steps 17-29

Table 4.2 RACI matrix of Stage 2 and Gate 2 tasks between step 17-29

#	Description	Responsible	Accountable	Consulted	Informed
17	Project Submission	Brand Manager	Marketing Mng		Project Leader
18	Project Meeting Organization	Project Leader	PD Mng		Marketing Packaging Designer Product Designer
19	Project Briefing	Brand Manager	Marketing Mng		Project Leader Packaging Designer Product Designer
20	Idea Analyzation	Brand Manager Project Leader Packaging Designer Product Designer	PD Mng Marketing Mng	Factory Engineer	PD Mng Marketing Mng
21	Packaging Design Check	Packaging Designer	Project Leader		Brand Manager
22	Product Design Check	Product Designer	Project Leader		Brand Manager
23	Volume Request	Project Leader	Brand Manager		Sales Executive
26	Volume Confirmation	Sales Executive	Brand Manager		Project Leader
27	Describe Submission Type	Project Leader			Brand Manager
28	Request Capacity and Capability Check	Project Leader	Brand Manager		Factory Engineer Factory Planning
29	Confirm Capacity and Capability	Factory Planning	Factory Engineer		Project Leader

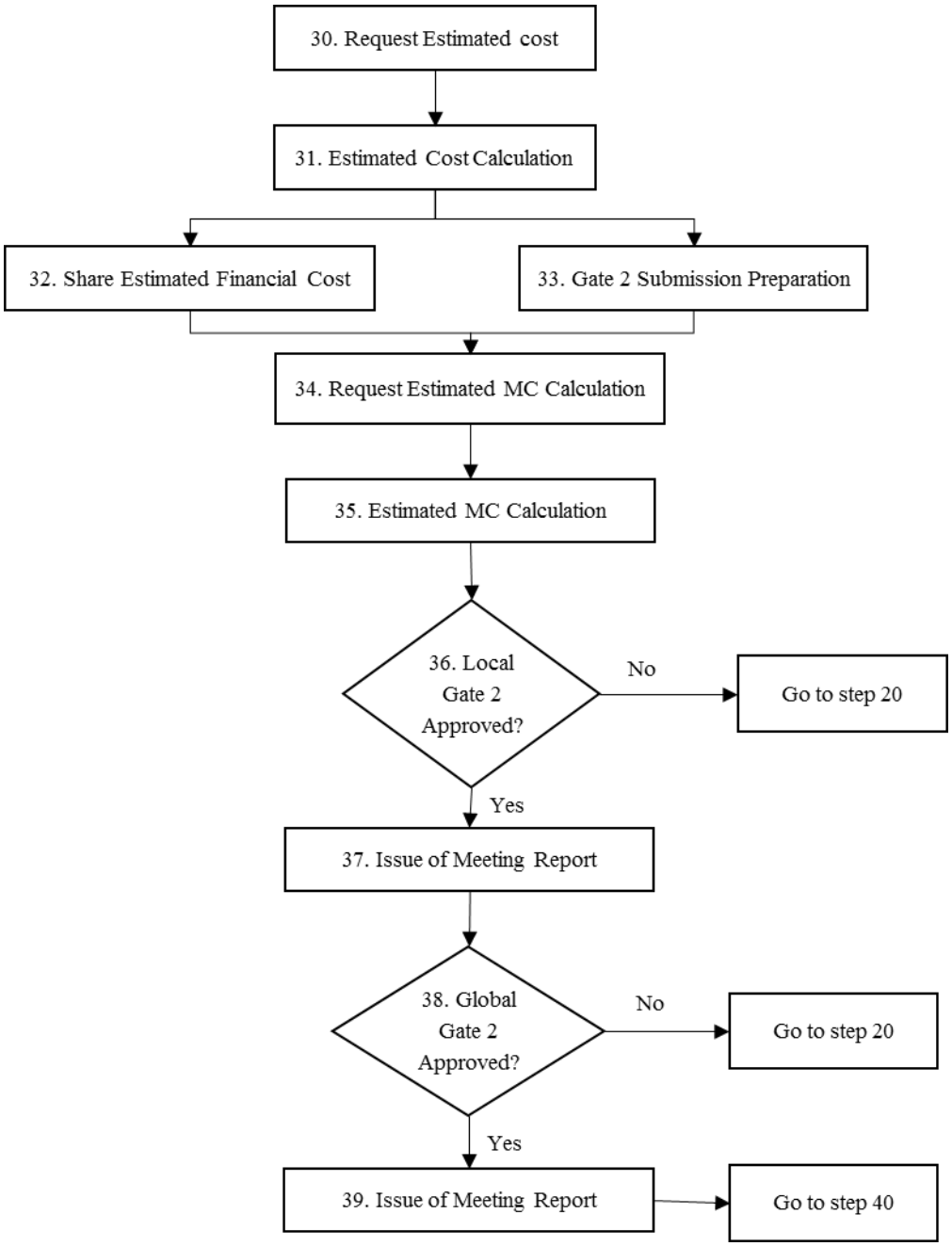


Figure 4.8 NPD process flow of Stage 2 and Gate 2 between steps 30-39 (MC: marginal contribution)

Table 4.3 RACI matrix of Stage 2 and Gate 2 tasks between step 30-39

#	Description	Responsible	Accountable	Consulted	Informed
30	Request Estimated Cost	Project Leader	Brand Manager	Packaging Designer Product Designer Procurement Executive	Factory Fianance Analyst Procurement Executive
31	Estimated Cost Calculation	Factory Finance Analyst			Project Leader
32	Share the Estimated Financial Cost	Project Leader		Finance Analyst	Brand Manager
33	Preparation of the Submission for Gate 2 Approval	Project Leader Brand Manager		Packaging Designer Product Designer	PD Mng Marketing Mng
34	Request for Estimated MC Calculation	Brand Manager		Project Leader	Marketing Finance Analyst
35	Estimated MC Calculation	Marketing Finance Analyst			Brand Manager
36	Local Gate 2 Approval	Local PD Sr Mng Local Marketing Sr Mng			
37	Issue of Meeting Minutes - Approval	Meeting Administrator		Local PD Sr Mng Local Marketing Sr Mng	PD Mng Marketing Mng Local PD Sr Mng Local Marketing Sr Mng
38	Global Gate 2 Approval	ABC Sr Mng		Global PD Sr Mng Global Mng Sr Mng	
39	Issue of Meeting Minutes - Approval	Meeting Administrator		Global PD Sr Mng Global Marketing Sr Mng	PD Mng Marketing Mng Local PD Sr Mng Local Marketing Sr Mng Global PD Sr Mng Global Marketing Sr Mng

4.5.5 Stage 3: Validation and Prototyping

The third stage of the ABC Stage-Gate process may start in two different ways based on the project type. As mentioned earlier, if the project type requires a new product concept development, this project – as a must – is subject to a Gate 2 approval to get the green light for prototyping. If the project type is such that the Gate 2 approval is not required and the project may be directly submitted to Gate 2&3, then the Stage 3 rules apply as well.

If the project is in Stage 3 due to the prototyping need, then at this stage the prototyping activities are planned, run and the results are received. When the day comes for the Gate 3 meeting, all necessary results related to the prototyping must have been received including the validation results. The final product is also requested to be sent to the meeting physically. The gatekeepers will make a decision after testing the product.

Just like Gate 2, the deliverables for local committee meeting and global committee meeting are the same for Gate 3 approval. The deliverables to be presented in Gate 3 meeting are prepared by marketing and product development departments in Stage 3. The meeting of Gate 3 requires information as an output of a very detailed feasibility study. The requested information is as follows;

- A presentation explaining the business objective and the business problem that is to be solved
- Business Case
- The product concept
- The final design files (if the design is new)
- The precise cost of the product
- The precise volume of the product
- The precise time of launch

These details are to be presented at the Gate 3 to receive the approval.

4.5.6 Gate 3 Approval

The Gate 3 approval is given once all Stage 3 required deliverables are completed and approved by management team.

Figure 4.9 and 4.10 represent the process flow till Stage 4. Please refer Table 4.4 and 4.5 for relevant RACI matrix.

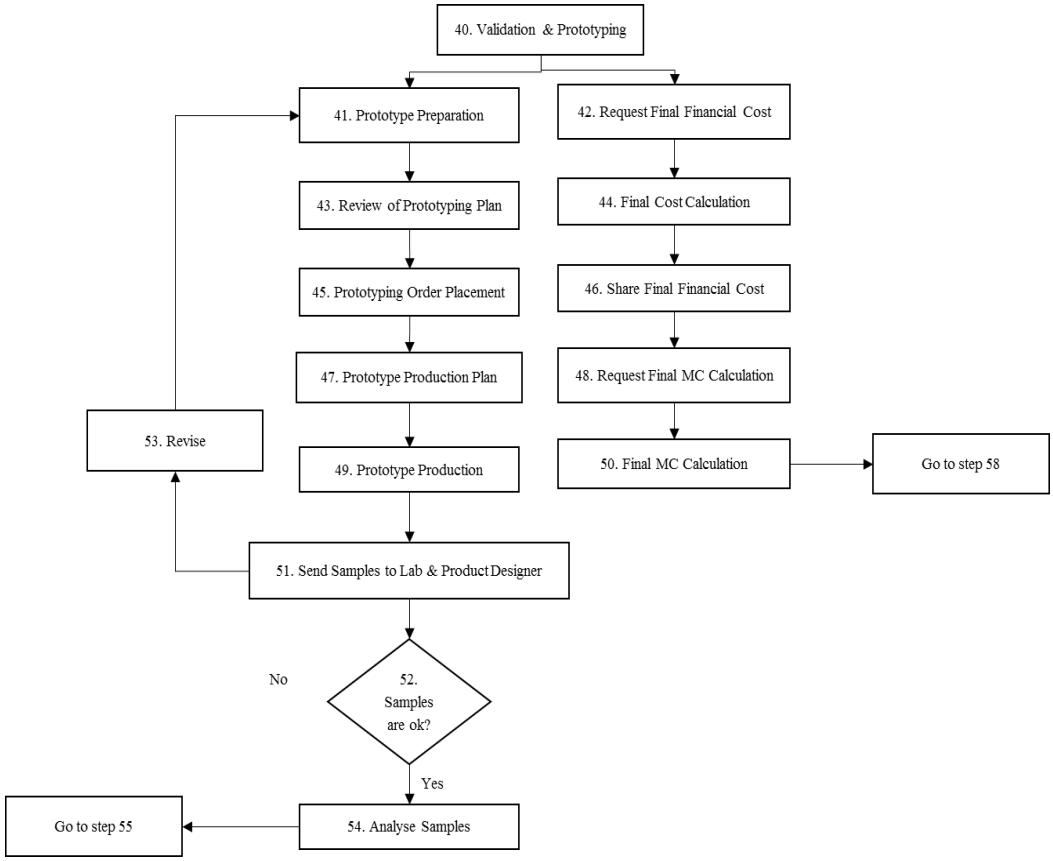


Figure 4.9 NPD process flow of Stage 3 and Gate 3 between steps 40-54 (MC: marginal contribution)

Table 4.4 RACI matrix of Stage 3 and Gate 3 tasks between step 40-54

#	Description	Responsible	Accountable	Consulted	Informed
40	**Validation & Prototyping**				
41	Prototyping Preparation	Product Designer	Project Leader		Factory Engineer
42	Request Final Cost	Project Leader	Brand Manager	Packaging Designer Product Designer	Factory Finance Analyst Procurement Executive
43	Review of the prototyping plan	Factory Engineer		Product Designer	Procurement Executive
44	Final Cost Calculation	Factory Finance Analyst		Procurement Executive	Project Leader
45	Material Order placement required for prototyping	Procurement Executive	Factory Engineer		Product Designer Production Planner
46	Share the Final Financial Cost	Project Leader		Finance Analyst	Brand Manager
47	Prototype Production Planning	Production Planner	Factory Engineer		Product Designer
48	Request for final MC Calculation	Brand Manager		Project Leader	Marketing Finance Analyst
49	Prototype Production	Factory Engineer			Product Designer
50	Final MC Calculation	Marketing Finance Analyst			Brand Manager
51	Send samples to lab and to Product Designer	Factory Engineer			Product Designer Laboratory
52	Revise	Product Designer			Project Leader Brand Manager
54	Analyze the samples	Laboratory	Factory Engineer		Factory Engineer Product Designer

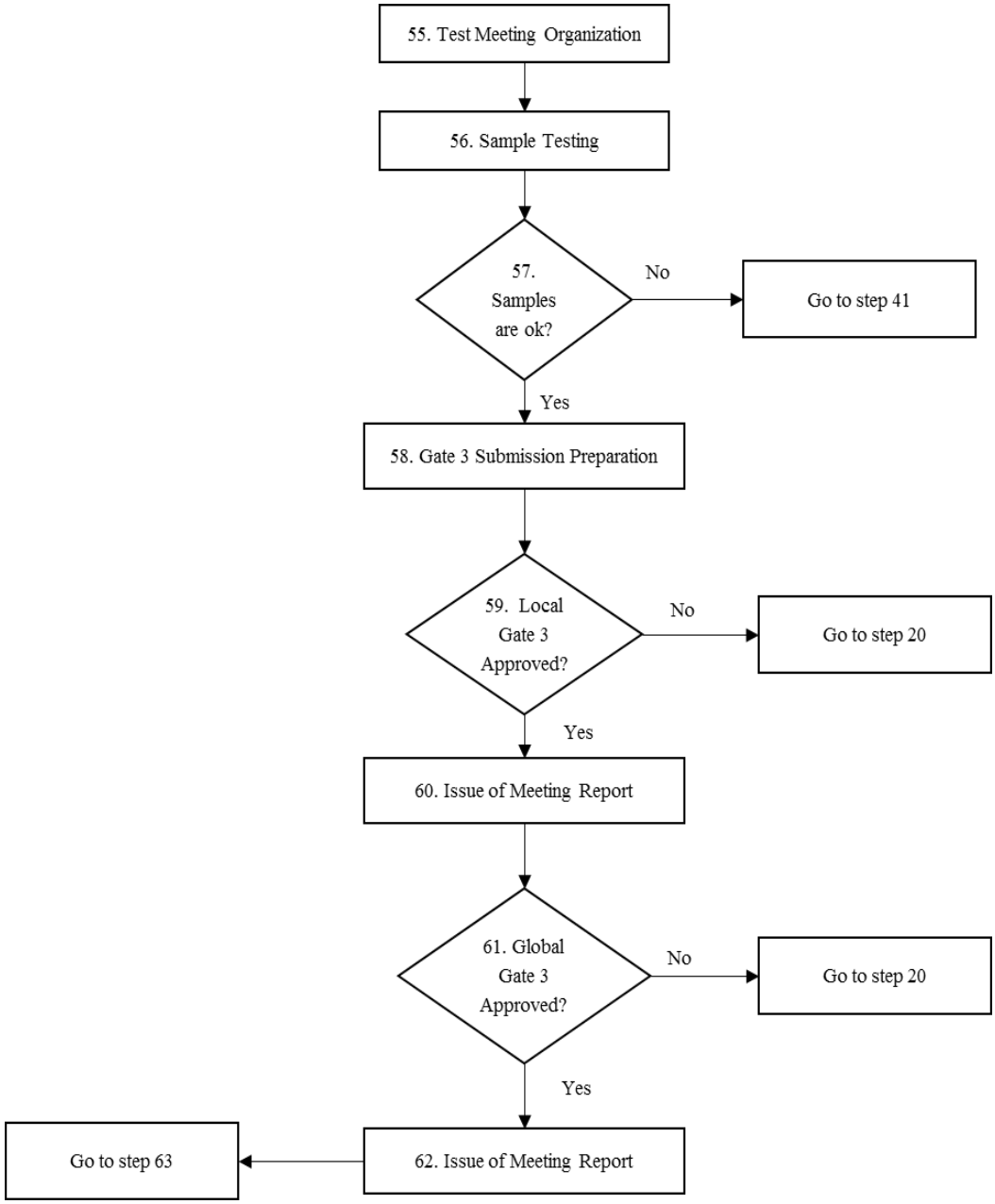


Figure 4.10 NPD process flow of Stage 3 and Gate 3 between steps 55-62

Table 4.5 RACI matrix of Stage 3 and Gate 3 tasks between step 55-62

#	Description	Responsible	Accountable	Consulted	Informed
55	Organize a testing meeting	Product Designer			Other Product Designers
56	Test the samples	Product Designer Other Product Designers			Project Leader PD Mng
58	Preparation of the Submission for Gate 3 Approval	Project Leader Brand Manager	Packaging Designer Product Designer		PD Mng Marketing Mng
59	Local Gate 3 Approval	Local PD Sr Mng Local Marketing Sr Mng			
60	Issue of Meeting Minutes - Approval	Meeting Administrator		Local PD Sr Mng Local Marketing Sr Mng	PD Mng Marketing Mng Local PD Sr Mng Local Marketing Sr Mng
61	Global Gate 3 Approval	ABC Sr Mng	Global PD Sr Mng Global Marketing Sr Mng		
62	Issue of Meeting Minutes - Approval	Meeting Administrator		Global PD Sr Mng Global Marketing Sr Mng	PD Mng Marketing Mng Local PD Sr Mng Local Marketing Sr Mng Global PD Sr Mng Global Marketing Sr Mng

4.5.7 Stage 4: Commercialization and Launch

When the respective project is approved at Gate 3 or Gate 2&3 levels, the product development department waits for the meeting report to be published by the meeting administrator. The meeting report of LCM and GCM are published one week later than the original meeting taking place. It is forbidden for product development to

start the execution prior to receiving the meeting report and seeing the project in approved status. If the project is approved then product development may start running the execution phase in Stage 4.

There are three different players in the product development group. These players are the project leader of the project, the packaging designer and the product designer. The project leader is the person who receives the initial request from marketing, coordinates every activity and prepares the deliverables together with marketing. They also prepare the product bill of material (BOM) in the system since they are the ones who know every single detail about the product both from product and packaging point of view. The packaging designer is the designer of the new packaging designs. This person gets the design need from marketing and translates the marketing design into the technical design that the factory can produce. Briefly, the packaging designer designs the requested design by combining the technical data and the marketing imagination. The product designer only takes care of the product concept development part. This person is the one who runs the prototyping and at the same time the expert of testing the development of new product concept.

Stage 4 starts with the project leader initiating the first project report. This project report is sent to each stakeholder. In this report, project leader explains the project for each stakeholder and also explains what should be done in terms of development and shares the project timeline. In ABC Company, the project milestones are planned from the beginning of the first report being published until the launch of the new product. Together with this report, the packaging designers start working on the design developments and the product designers start working on the creation of the product specifications. When all developments are completed, the project leader prepares the final product bill of materials in the relevant system and publishes the final project report. Together with the final project report being published, the project leader gives the green light to factory to place the necessary material orders. When the materials are received by the factory the production starts.

4.5.8 Gate 4 Approval

Once the production is finished, the first production products are analyzed by the laboratory. When everything is in line with the expected parameters and approved by the experts then the laboratory management gives the Gate 4 approval. After receiving the Gate 4 approval, the finished goods are released from the factory and shipped to the relevant market. Based on the launch date, the products are being placed on the shelf for sale.

Figure 4.11 represent the process flow till Stage 5. Please refer to appendix Table 4.6 and 4.7 for relevant RACI matrix.

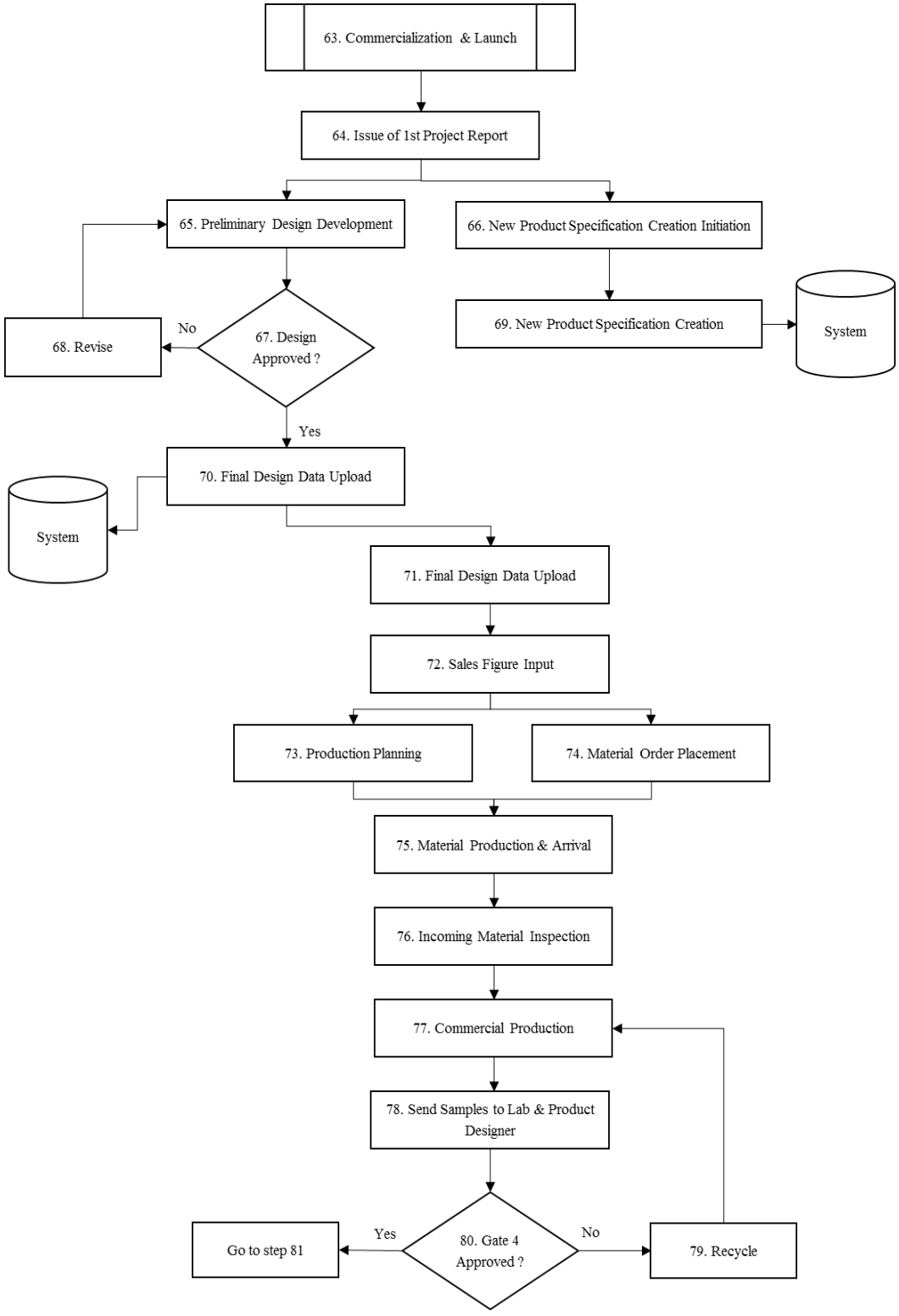


Figure 4.11 NPD process flow of Stage 4 and Gate 4

Table 4.6 RACI matrix of Stage 4 and Gate 4 tasks between step 63-72

#	Description	Responsible	Accountable	Consulted	Informed
63	**Commercialization & Launch**				
64	Issue of First project report	Project Leader			PD Marketing Factory Sales
65	Preliminary Design Development	Packaging Designer			Project Leader Brand Manager
66	New product specification creation trigger	Product Designer			Project Leader PD Administrator
67	Design Approvals	Legal Council Factory Engineer Brand Manager			Project Leader
68	Revise	Packaging Designer		Brand Manager Legal Council	Project Leader
69	New product specification creation	PD Administrator			Project Leader Product designer
70	Final Design Data Upload	Packaging Designer			Project Leader Brand Manager Legal Council
71	Preparation of FG BOM and issue final project report	Project Leader			PD Marketing Factory Sales
72	Sales Figure Input	Sales Executive		Brand Manager	Factory Planning

Table 4.7 RACI matrix of Stage 4 and Gate 4 tasks between steps 73-80

#	Description	Responsible	Accountable	Consulted	Informed
73	Production Planning	Production Planner			Factory Engineer Procurement Executive
74	Material Orders Placement	Procurement Executive		Factory Engineer	Supplier
75	Material Preparation & Arrival	Supplier		Packaging Designer Product Designer	Procurement Executive
76	Incoming Material Inspection	QA Engineer		Factory Engineer	Production Planner Procurement Executive
77	Commercial Production	Production Area		Factory Engineer	Project Leader
78	Send samples to lab and to product designer	Factory Engineer			Product Designer Laboratory
79	Rip	Factory Engineer			PD Mng Marketing Mng Factory Mng
80	Gate 4 Approval	Laboratory Mng	Factory Engineer		Project Leader Product Designer

4.5.9 Stage 5: Post Launch Evaluation

After the launch Stage 5 of post launch evaluation is started.ABC Company requires the first post launch evaluation three months after the launch. This evaluation requires following criteria to be investigated:

- The unexpected and unplanned leftover material due to the issues occur during production.
- The unexpected cost variance of the actual production versus planned cost.
- If there is a delay in the planned launch date, the reason of the delay.

4.5.10 Gate 5 Approval

The second post launch evaluation is required six months after the launch, the third is twelve months after the launch and the last one is eighteen months after the launch. These post launch evaluations are purely related to the market share and sales volume trend of the product. If the product is not at the desired level of market share and the sales volume then based on the last post launch evaluation figures, the marketing management takes the decision of delisting, supporting or continuity of the product in the market. This decision is so called Gate 5 approval given by the marketing line management.

In ABC Company, after receiving the Gate 3 approval the project execution starts. The Project Leader in product development department initiates the project execution trigger by sending out the first official project report to relevant departments as marketing, factory, product development and sales. This report is the delivery way of the very detailed information regarding the project scope together with the task assignments that need to be done by all relevant parties. The report also includes the very important details of project timeline as per the milestones.

The project milestones also show the tasks that need to be done. These milestones are as they are self-speaking very important and critical for the project launch date.

Figure 4.12 represent the process flow till Stage 5. Please refer to 4.8 for relevant RACI matrix.

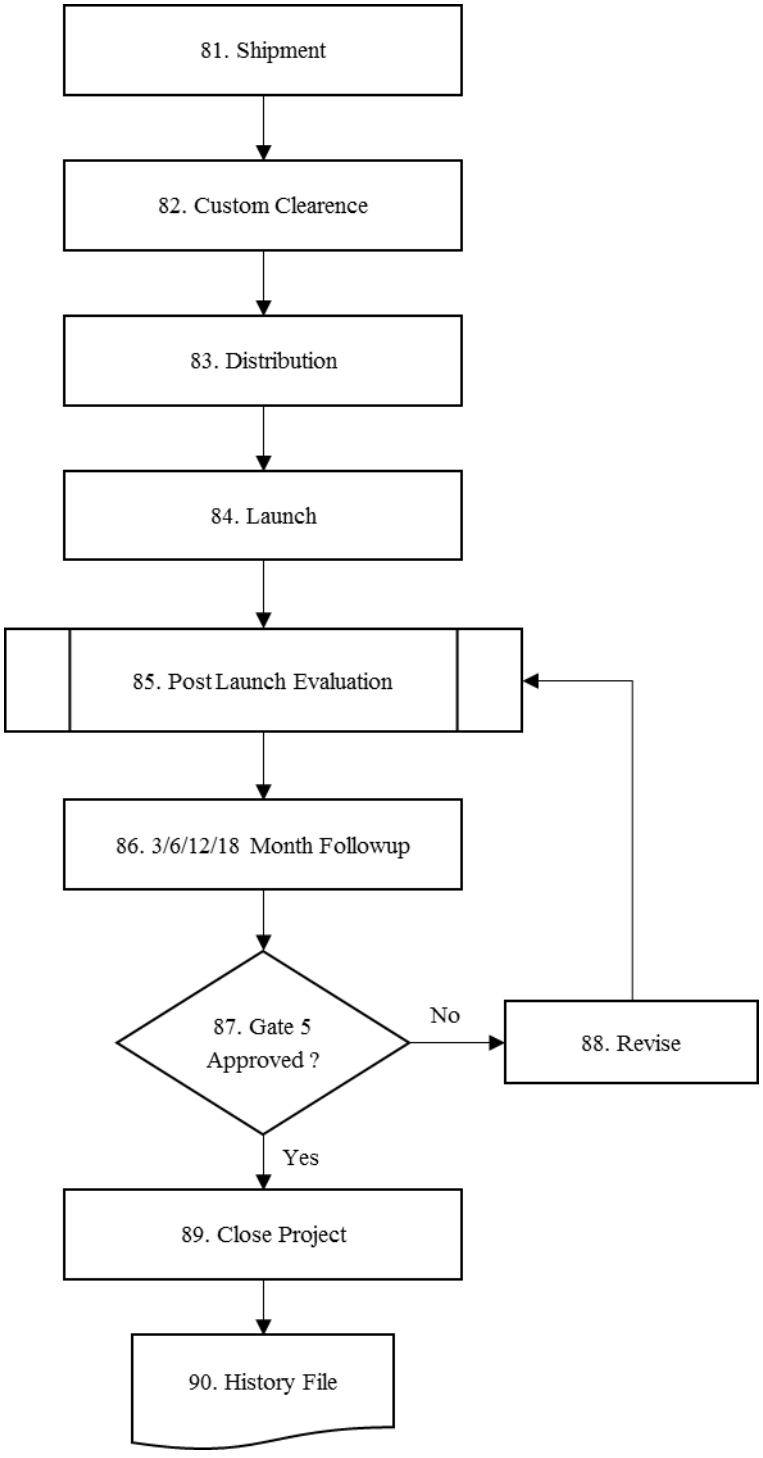


Figure 4.12 NPD process flow of Stage 5 and Gate 5

Table 4.8 RACI matrix of Stage 4 and Gate 4 tasks between steps81-90

#	Description	Responsible	Accountable	Consulted	Informed
81	Shipment	Supply Chain Executive		Factory Engineer Project Leader	Project Leader
82	Custom Clearance	Sales Executive		Brand Manager	Project Leader
83	Distribution	Sales Executive		Brand Manager	Project Leader
84	Launch	Brand Manager			Project Leader Marketing Mng
85	**Post Launch Evaluation**				
86	3/6/12/18 Month Follow-up	Brand Manager			Marketing Mng
87	Revise	Brand Manager			Marketing Mng
88	Gate 5 Approval	Marketing Mng	Brand Manager		Project Leader
89	Close Project	Brand Manager			Project Leader
90	History File	Project Leader			

4.6 The Project Milestones Based on Project Type

If the project is only concerned with the new packaging design development process, the packaging designers start the process with the preliminary design development. This preliminary design development takes one week of lead-time. Once it is finished, the preliminary design is sent to Legal Department (LD) & MD to review and to give approval or to receive comments on the design.

When the marketing approval is received on the preliminary design, the packaging designer sends the preliminary design to the LD in order to review the design developed and to see if there is anything against the law or against the company rules. When the legal approval is received according to the preliminary design, the packaging designer sends the design to factory to review the design from technical point of view and to receive a comment if there is anything wrong on the design that might prohibit factory to produce it.

These approval steps take one week of lead-time to be completed. The functions may reject the design or approve the design with comments or approve it clean. If the design is rejected by any of the functions (does not make any difference if just only one function rejected) then the packaging designer has to re-do the preliminary design development as in line with the rejecting reasons. Then the cycle re-starts. If the design is approved with comments, then the packaging designer amends the design based on the comments at the final stage.

When everything is clear from the preliminary approval point of view, then the packaging designer gets in contact with the supplier of the new design item, sends them to the preliminary design and asks them to work on the preliminary design data and to give him the final design data that are in the factory language format. After receiving the final design data from the supplier, the packaging designer releases the new packaging design item to be used. This releasing process takes one week of lead-time to complete. In total, a three-week time period of work starts with the project leader sending out the first project report and after at least three weeks of time the new design is being ready to be used by all relevant parties including the suppliers.

If the project concerns the new product concept development, as explained earlier, all prototype related work needs to be done in Stage 3 before Gate 3, after Gate 2 (these type of projects are subject to Gate 2 due to prototyping need) meeting since the final product concept is required to be tested in the Gate 3 meeting.

When the Gate 2 meeting is finished – LCM only for local brands and LCM+GCM for global brands – the meeting minutes needs to be waited to be issued. The minutes are being issued one week after the meeting date. The Gate 2 meeting minutes are the trigger for prototyping activities to start. The prototyping requires prototype planning, production of the prototypes, prototype results to be received and the tasting of the prototypes. The product designer in PDD does the prototype planning which takes one week of lead-time. The production is done by the relevant factory, which takes four weeks of lead-time. The four-weeks of lead-time is due to the unbranded, prototype specific material arrangement and transportation to the relevant factory. The prototypes are sent to the laboratory for the evaluation and this takes two weeks of lead-time. When the results from the laboratory are received, the product designers in product development test the prototypes and evaluate if they are in line with the desired level.

When the product designers' analysis is completed, the products are sent to the Gate 3 meeting together with the product development validation report. This takes one week of lead-time. In total a prototyping takes fifty five days of lead-time from start to be 100% completed. Following the prototype completion, date upcoming Gate 3 meeting is targeted.

When the product concept is approved at the Gate 3 meeting and when the meeting minutes are received, the project leader sends out the first project report for all necessary activities to be started.

The product designer initiates the process of new product specifications creations in the system. The initiation takes one week of lead-time whereas the new product concept specification creation takes one week of lead-time.

However, the product specification creation and new design development activities are not predecessor to each other. Therefore, those activities can be done in parallel if the project requires new product concept and new packaging design development.

When the new design development and the product specification creations are completed, the project leader combines both of them in the system and creates the finished good bill of material in the system. This takes one week of lead-time. Upon finished good bill of material completion, the project leader sends out the final project report. Together with the final report project leader gives the green light to the factory procurement to proceed with the orders and factory to plan the production. Those two activities take one week of lead-time and are processed in parallel. The new packaging and product related material arrivals to the factory takes eight weeks of lead-time and are processed in parallel. Upon receiving the materials, the initial inspection is done on the materials by the quality assurance department of the factory, which takes one week of lead-time. After the inspection, the production of the commercial product starts. Based on the initial volume, the production takes from three days to two weeks to complete. After the first production, if the project requires new product concept development, some samples need to be taken from the first production and send to the laboratory for inspection. The inspections take two weeks of lead-time. If everything is at desired quality level, then the finished good is approved as Gate 4 and means ready to be shipped to the relevant market. Based on the market distance to the factory the shipment takes from 2 days of standard lead-time to three weeks. When the market receives the finished goods they place the products on the shelves as per their launch date.

Please find below in Table 4.9 the summary of the project milestones after Gate 3 or Gate 2&3 approvals, starting with Gate 3 or Gate 2&3 meeting date (the timings are given in weeks, i.e., 1W means 1 week).

Table 4.9: Project timeline

Task	Timeline
Meeting report to be issued	1W
First project report to be issued by the project leader	1W
Preliminary packaging design development	1W
Preliminary packaging design approvals by marketing, legal and factory	1W
Final packaging design data to be uploaded to the system	1W
New product specifications creation initiation	1W
New product specifications creation	1W
Finished good bill of material creation and final project report initiation	1W
Material order placements	1W
Production planning	1W
Packaging and product related material arrival to the factory	8W
Initial material inspection	1W
Production	2W
Lab results to be received	2W
Shipment	3W
Custom clearance	1W
Distribution	1W
Launch	

After the launch, the Stage 5 of post launch evaluation is started.

ABC Company requires the first post launch evaluation three months after the launch. This evaluation requires following criteria to be investigated:

- The unexpected and unplanned leftover material due to the issues occurring during production.
- The unexpected cost variance of the actual production versus planned cost.
- If there is a delay in the planned launch date, the reason of the delay.

The second post launch evaluation is required six months after the launch, the third is twelve months after the launch and the last one is eighteen months after the launch. These post launch evaluations are purely related to the market share and sales volume trend of the product. If the product is not at the desired level of market share and the sales volume then based on the last post launch evaluation figures, the marketing management takes the decision of delisting, supporting or continuity of the product in the market. This decision is so called Gate 5 approval given by the marketing line management.

Please see below the figure shows the flow of ABC Stage-Gate process

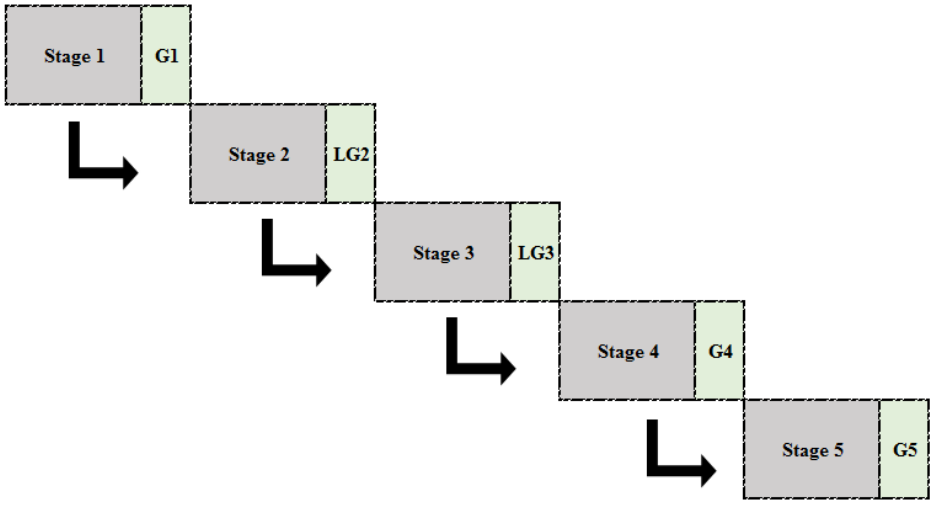


Figure 4.13 The done stage-gate steps for local brand

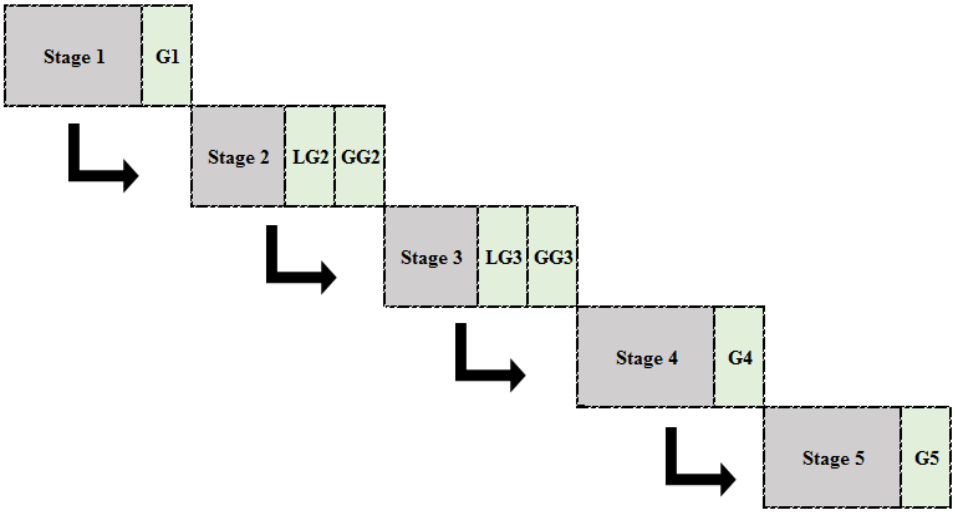


Figure 4.14 The done stage-gate steps for global brand

In such a speed-requiring consumer based sector, having 5-6 months of lead-time for local brands,7-8 months of lead-time for global brands is slowering the reactiveness of the company to the consumer needs. Therefore, currently used Stage-Gate approach does not answer the company needs on the NPD process.

4.7 Task Owners of the NPD Process in ABC Company

Above, the overview on the product development process within the ABC Company is given. Although the company has adapted Cooper's Stage-Gate approach and the process starts with Stage 1, in this study we will concentrate on the development parts and look for the improvement opportunities starting as of Stage 2 since the actual and tangible product development starts after receiving the idea generation approval on Gate 1. Below, you will find the explanation of the longest product development model of ABC Company, which concerns the new packaging and NPD.

4.7.1 Task Owners of Stage 2

At this stage, PDD knows what MD is looking for. The experts in PDD looks into the ABC portfolio card to be able to find the best fulfilling product proposition what will address the consumer need. The project leader coordinates and organizes the

meetings with all relevant parties. These parties are, MD, the product experts and the packaging experts from product development side. MD explains the need and the designers start working on their expertise areas. The product designer looks in to the ABC portfolio card and tries to find an already developed product. The packaging designer does the same thing. Both designers can revert to the marketing and the project leader in one day. They can work in parallel, nobody will be blocking the other one's job since the platforms that they are working on and their focus areas are completely different.

In the meantime, the project leader gets in touch with the sales department, and requests the required yearly volume of the new product. This action is also done in parallel with the design checks and requires only one day.

When the packaging and the product direction are also clarified, based on the preferred factory, the project leader gets in contact with the relevant factory and asks for a capacity and capability confirmation. This confirmation may change based on the product & packaging direction and depends on volume. The capacity and capability confirmation is taken in 5 working days.

If the capacity and capability is confirmed by the relevant factory, then the project leader requests the estimated cost of the product from finance department, by providing them the details of the product, packaging and the respective volume. The reply of finance department is expected to be received in 5 days as well.

When all the necessary actions are done from product development side, the cost information is shared with MD for them to be able to prepare their financial analysis like, marginal contribution… In the meantime, they are also preparing their project for the Gate 2 approval. The final preparation of MD – including financials – takes 5 days.

Then the Gate 2 approval is awaited. The publishment of the official meeting minutes meaning the approvals take 5 days.After receiving the Gate 2 approval, the Stage 3 Validation & prototyping starts.

4.7.2 Task Owners of Stage 3

The product designer sets the trial plan and agrees with the factory about which materials will be issued for the prototyping. The factory organizes the material transfer and informs the product designer about the trial date. After that, the trial takes place and the newly produced prototypes are sent to laboratories for the analysis. In the meantime, the factory sends some samples to the product designer to product development. Once the laboratory results are received, the product designer tastes the product with a group of product designer experts. If everything is ok in terms of product characteristics, the product designer gives green light to the project to further proceed with the project meaning Gate 3 approval. The product designer issues the trial plan to the factories in 5 days. Accordingly, upon receiving the material transfer and production slot, the factory spends in total 20 days. The production is being complete in one day only. Then the laboratory results being received including the transportation take 10 days (Gate 4 approval). For product designers to analyze the products, one day is enough. Hence, a prototyping period is almost taking in total 2 months of lead-time.

In the meantime, as Gate 3 approval readiness, the preparations from marketing and product development project leader side are ongoing. The marketing finalizes all the promotional items to be used in the launch and this action takes 15 days. The product development project leader requests the accurate cost figures from finance, and this action takes 10 days for finance to complete their calculations.

After receiving all the necessary inputs from finance, the project leader shares the information with MD to finalize their financials studies. Then the Gate 3 meeting date comes. After the Gate 3 meeting date, the approval – meaning the official meeting minutes are awaited to be published for 5 days.

Once the Gate 3 approval is taken, then the Stage 4 – Commercialization & Launch phase starts.

4.7.3 Task Owners of Stage 4

When the Gate 3 approval is taken, the project leader issues the first project report and sends to the all relevant parties like, factory, marketing, finance and sales. This communication is the very first official communication of the project in such a platform where every stakeholder is on board. In the project report, the details of the product, the details of the packaging design, the project timeline and the required action list are shared with the stakeholders. This action is also the kick off action for packaging designer to start the respective packaging design development. The design development that packaging designers are doing is the transfer of the marketing visualized data into a very technical format where the design adaptations are done based on the legal requirements, supplier and factory machine related data. They need to design the packaging items in such a format that, when the supplier is producing the packaging the outcome material of this production must directly fit in to the machine format of the factory. The project leader needs 5 days to prepare the report and issue the first project report. Upon receiving the first project report, the packaging designer starts working on the preliminary design development which takes 5 days, then this action is followed by Preliminary packaging design approvals by marketing, legal and factory which also takes 5 days and finally with final packaging design data to be uploaded to the system which will result in 5 days of lead time.

Once the design development is finished, the packaging designer is informing the project leader. In parallel to the packaging related work, the product designer is triggering the new product specifications creation in the system. This action takes 5 days for a product designer. Following the initiation, the product development administrators are creating the new product specifications in 5 days of time. After the finalization of new product specification creation and the packaging related design works, the project leader prepares the finished good bill of material and issues the

final project report. This action requires 5 days. Upon receiving the final project report, the sales department inputs the requested sales figures in to the system which is visible both for marketing and factory. Based on this confirmed and finalized volume, the factory planning department plans the production date and does the machine allocation. Based on that, the factory procurement places the orders for the required materials. All these actions are done 5 days. After the placement of the material orders and receiving the material prices, the factory finance calculates the real / final cost of the finished good. This action requires 5 days, in parallel to the lead-time of 40 days needed for the material arrival to the factory.

Once the material arrived to the factory the quality assurance department of the factory does the incoming inspection. This action requires 5 days of lead-time. If the inspection result is green then the quality assurance department releases the materials for the respective production. Based on the volume, the production may take from 2 up to 10 days. After the first production, the product samples are sent to the laboratory for the inspection. The results are taken in 10 days including transportation. As the final step before the launch of the finished good, the factory ships the finished goods to the relevant market. The shipments take 2 to 15 days depending on the distance of the market to the factory. Once the finished good is sent, the sales team needs one week for the custom clearance and one week for the distribution.

CHAPTER FIVE
PROBLEM DEFINITON AND PROPOSED SOLUTIONS

5.1 Introduction

This chapter will define the problem that ABC Company currently faces due to its new product development (NPD) process. After the problem definition, the current process will be analyzed with the simulation model and the outcomes of the model will be assessed. Following the current process assessment, the proposed solutions will be explained and assessed with the simulation model.

5.2 Problem Definition

ABC Company is a large scaled company who operates in fast moving consumer goods industry. Although the Stage-Gate process defines the responsibilities and the accountabilities in a good manner, in terms of administrative workload, the Stage-Gate process in its current form is becoming a burden for the stakeholders. Moreover, due to the nature of Stage-Gate process, there are too many gates and stages that need to be waited for certain actions to be taken. The present model of ABC, sort of Stage-Gate, is now clearly answering the need of the company and the need of the industry.

The Value Stream Mapping (VSM) tool was used to identify the tasks of the current process. After assessing the current tasks and placing them on the map, all these tasks were put in a Gantt chart. The Gantt chart is a type of bar chart which presents the project schedule. The Gantt chart includes the start and end date of tasks and shows the dependencies and relationships between the tasks. After placing the outcome of VSM in Gantt chart, the critical path which is the longest necessary path through the network of interdependent tasks is found. Figure 5.1 represents the Gantt chart of the tasks to be completed till Gate 1. The red lines show the critical paths. In the chart, the lead times are shown as working days. 1 week is 5 working days as general rule of the company.

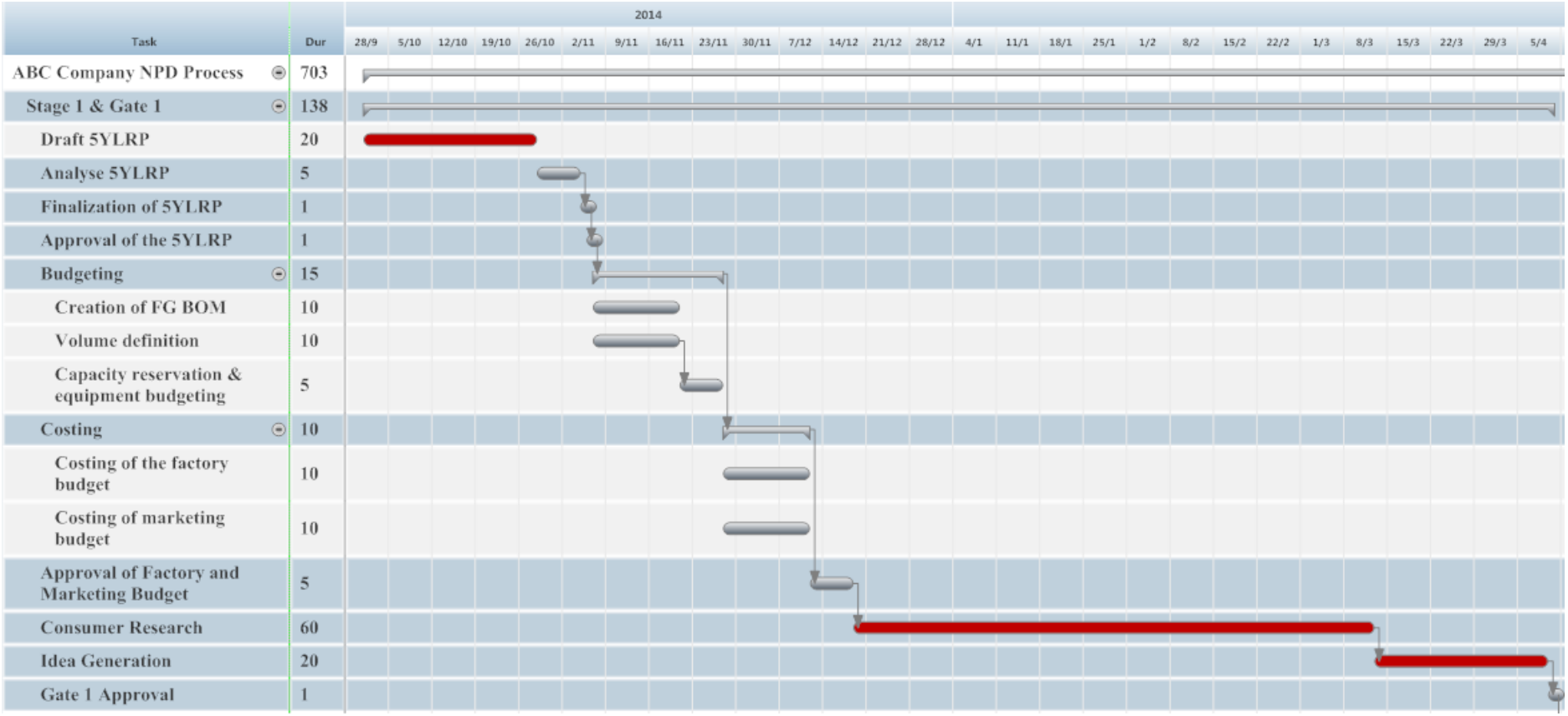


Figure 5.1 Gantt chart of the tasks to be completed till Gate 1

Critical path is a method of reviewing all activities in the Gantt chart, including the timing and precedence relationships of each. It means calculating the longest path from start to the end of the project. It defines the steps which are critical and cannot be delayed without risking making the project late. As shown in Figure 5.1 the most critical path is found as consumer research which takes 3 months to be completed. Following this, the idea generation and draft 5-year long range plan (5YLRP) establishment comes which take 20 days to be completed.

Figure 5.2 represents the Gantt chart of the tasks to be completed till Gate 2. As shown in the chart there is no critical path found during Stage 2 and Gate 2. Figures 5.3 and 5.4 represent the Gantt chart of the tasks to be completed till Gate 3. During this process the critical path is found as the prototyping which takes 55 days to be completed.

Looking at Figure 5.5 and 5.6 which represent the Gantt charts of Stage 4 & Gate 4, the critical paths are found as material preparation and arrival which takes 40 days to be completed and the design development which takes 15 days to be completed. Figure 5.7 represents the Gantt chart of the tasks to be completed till Gate 5. The critical paths are found as shipment and follow ups which are out of the focus of this thesis.

The critical paths in each phase are as follows:

- Consumer research: 60 days
- Prototyping: 55 days
- Material preparation: 40 days
- Idea generation: 20 days
- Draft 5YLRP: 20 days
- Design development: 15 days



Figure 5.2 Gantt chart of the tasks to be completed till Gate 2

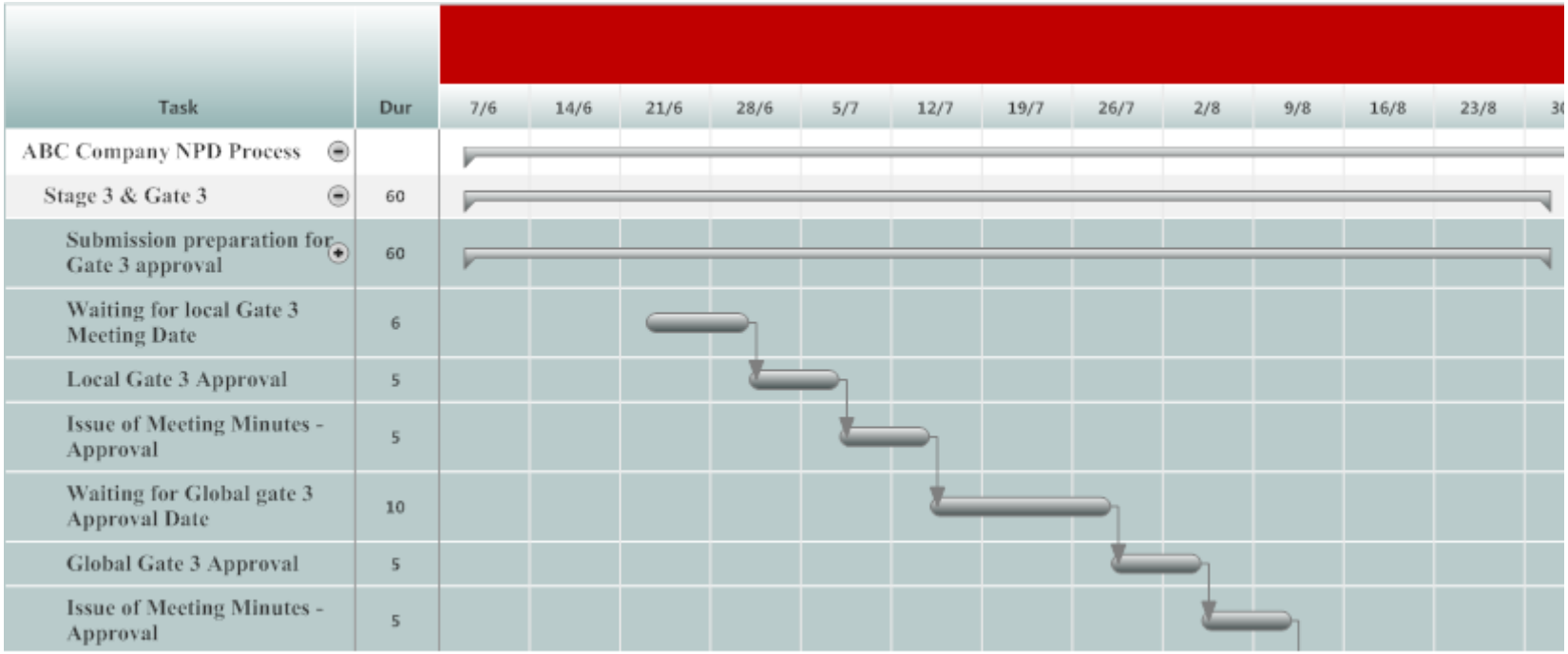


Figure 5.3 Gantt chart of the tasks to be completed till Gate 3



Figure 5.4 Gantt chart of the tasks to be completed till Gate 3 - continued

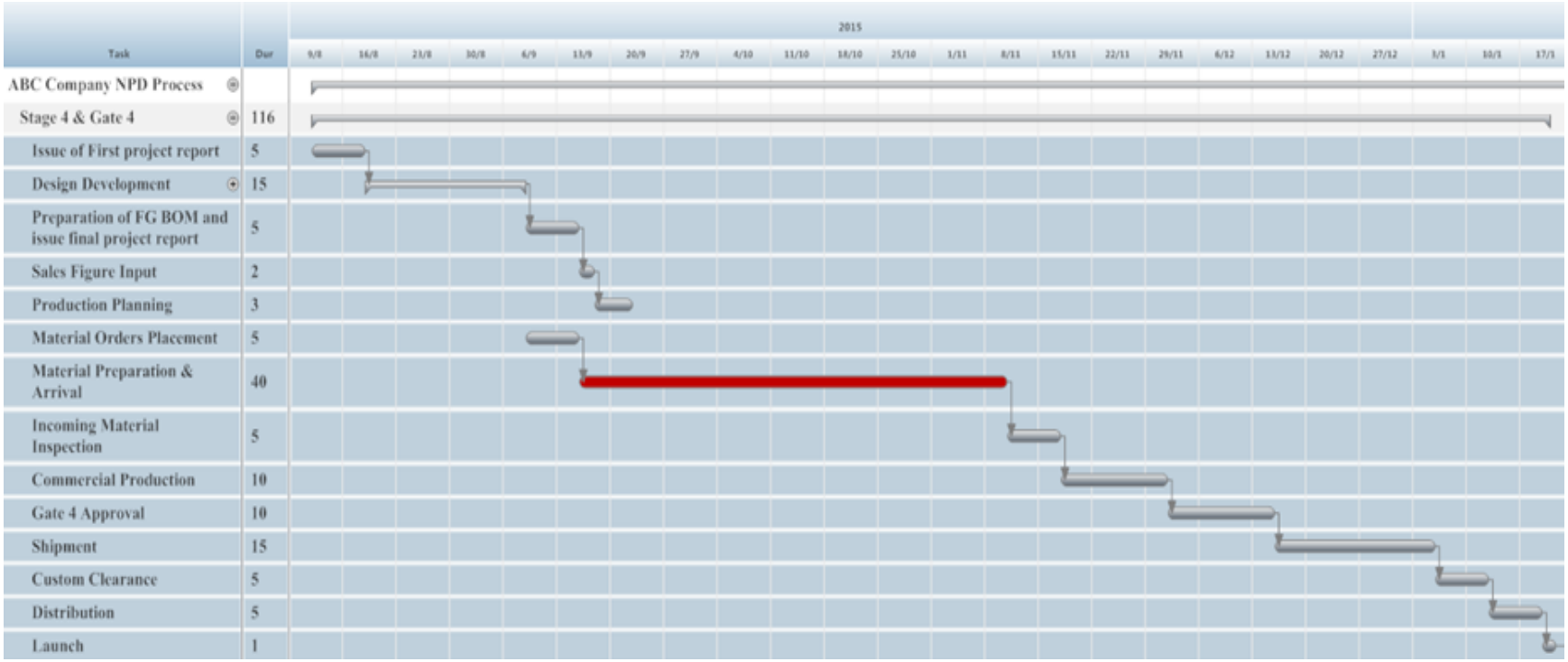


Figure 5.5 Gantt chart of the tasks to be completed till Gate 4

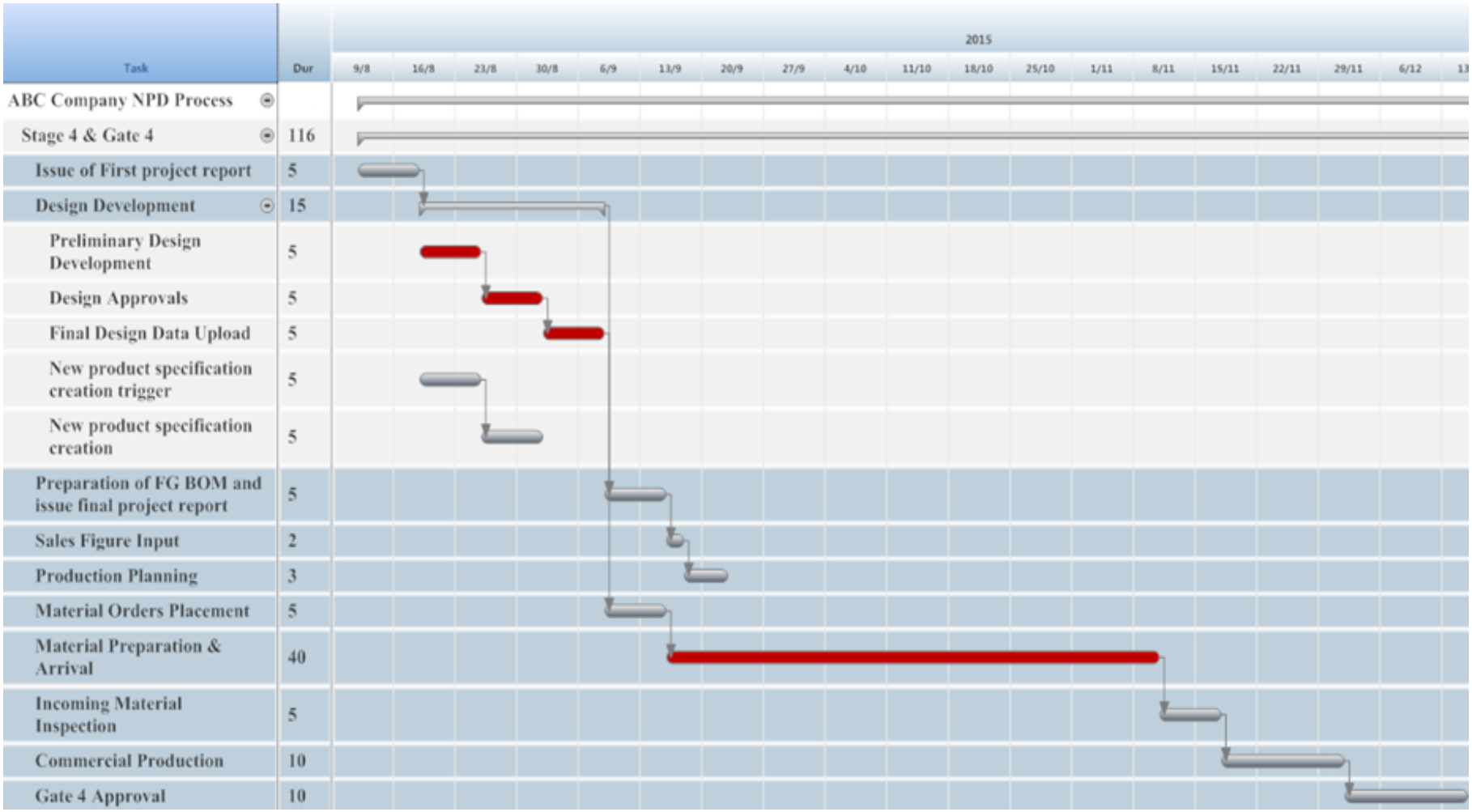


Figure 5.6 Gantt chart of the tasks to be completed till Gate 4 – continued

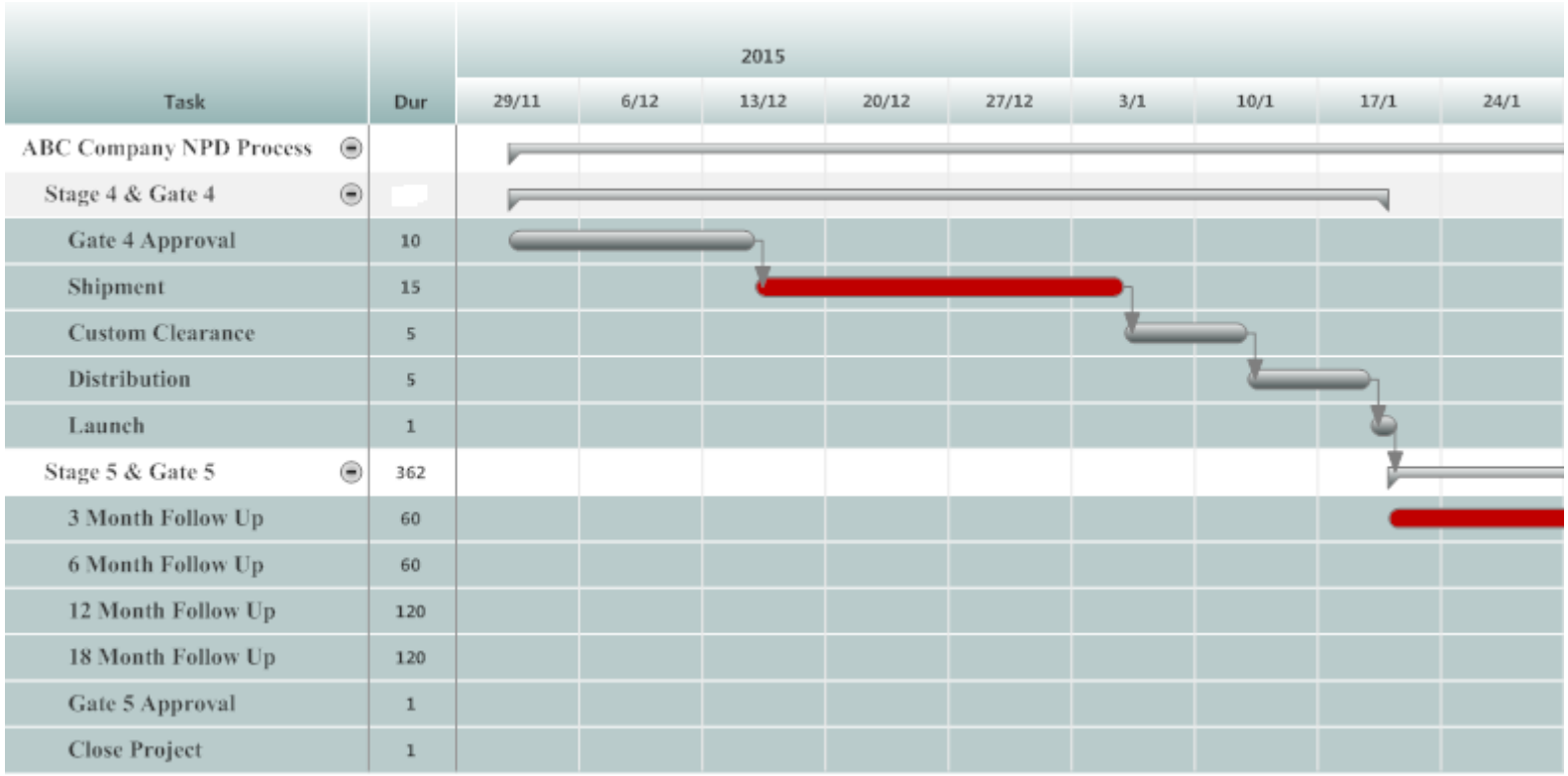


Figure 5.7 Gantt chart of the tasks to be completed till Gate 5

If we look at above critical paths that are defined for the NPD process of the company, the longest lead-time belongs to consumer research, prototyping and material preparation. The consumer research and material preparation are due to the supplier and agency readiness. Which means, in order to shorten the lead times, the supplier must prepare the materials and the agencies must run the researches more quickly. This may call an option, however, before moving out of the ABC Company direct controlling area, the ABC should first look into the activities within its own controlling area, and try to find the ways of how to decrease the total lead-time for each type of project.

The idea generation and draft 5YLRP preparations also require long lead times, however, these are the points where ABC Company is not willing to make any sacrifice. The company suggests task owners to spend time as much as they need on these two topics.

Therefore, in this part we will mostly concentrate on the design development and prototyping.

During VSM exercise, the current tasks were challenged by asking four key questions - what work gets done at this stage, how long it takes, is this stage really needed. If yes, how can we make it better and how can we decrease the timings. The main purpose of this was to identify the non-value added tasks and to improve the process by benefiting the Stage-Gate process' flexibility.

The force team revisited and challenged every single task. Following these discussions, in Stage 1 there was no non value added task identified. In Stage 2 and Stage 3 "waiting for meeting minutes to be issued" and "waiting for approval meeting date" tasks were identified as non-value added tasks. In stage 4 "material preparation and arrival" task was identified as non-value added task.

In this chapter, the proposed solutions will be given based on the critical paths and non-value added tasks.

5.3 Current NPD Process Assessment

5.3.1 Overview of the Outcomes of Current NPD Process

ABC Company runs around 700 projects in a year. This means monthly around 60 projects are subject to gate approvals and are reviewed by senior management team for NPD ideas in order to be turned into a reality.

Considering that the half of the projects are subject to the NPD on the global brands, that is subject to global committee meeting reviews, at the end of the day, the time spent for the project executions is significant.

Looking at 2013 figures, ABC Company had 743 projects which were reviewed in gate approval meetings.

The number of G2 projects were 210, whereas the number of G3 were153 and the G2&3 submissions were 380.

450 of these projects were related to local brands, whereas 293 were related to global brands. Table 5.1 shows the distinction between the project types.

Looking at the latest figures, 42% of the projects are related to the global brands. These projects are differentiated among themselves as 27% G2, 23% G3 and 50% G2&G3 projects. Half of the projects that ABC Company is running are G2&G3 projects. This means that half of the projects require a NPD, which includes; a new packaging and an already developed product or an already developed packaging and product. This results in having half of the other submissions to require; an already developed packaging and a new product or a new packaging and product at the same time. Half of the ABC Company's projects are subject to prototype development. The 62% of local brand related submissions are subject to G2&G3 approvals. This number will be revised as 34% for the global brands. Looking at the historical

figures; in ABC Company there has never been a NPD conducted without a new packaging design development.

Table 5.1 Number of projects and gate differentiators among 2013 (GCM: global committee meeting, LCM: local committee meeting, G: gate)

Month	Year	# Projects	# G2		# G3		# G2&3	
			GCM	LCM	GCM	LCM	GCM	LCM
Jan	2013	64	11	6	19	6	7	15
Feb	2013	49	4	4	4	7	14	16
Mar	2013	49	5	3	19	3	8	11
Apr	2013	34	6	2	2	9	4	11
May	2013	78	9	11	7	4	11	36
Jun	2013	48	10	7	4	6	8	13
Jul	2013	48	8	6	5	6	9	14
Aug	2013	83	12	9	8	10	10	34
Sep	2013	74	12	11	2	7	4	38
Oct	2013	77	12	10	3	11	6	35
Nov	2013	78	13	12	2	4	9	38
Dec	2013	61	17	10	3	2	6	23

5.3.2 Arena Simulation of Current NPD Process

For the current situation, an Arena simulation model has been developed to see the average brand type dependent flow times. The model has run for a year of period and ten different observations have been collected. Please refer to appendix B for the visual of the model.

The Arena model starts by creating entities every month. This represents the monthly submission of the projects. The create block is followed by the assign block which includes “ptype”. The ptype represents the global (ptype 1) and local (ptype 2) brands. If ptype is 1 meaning project is related to global brand, then the project is subject to global committee meeting (GCM) and local committee meeting (LCM). The upper branches are separated as follows: 33.8 % of global brand projects are subject to Gate 2&3 approvals, 24.4% percentage of global brand projects are subject

to Gate 3 approvals and 41.8% percentage of global brand projects are subject toGate 2 approvals.

The lower branches are separated as follows; 62.1% of global brand projects are subject to Gate 2&3 approvals, 19% percentage of global brand projects are subject to Gate 3 approvals and 18.9 % of global brand projects are subject to Gate 2 approvals.

The following assign blocks represents the differentiation between gate types by "type2".

If type2=1→ Gate 2 approval
If type2=2 → Gate 3 approval
If type2=3 → Gate 2&3 approval

The assign blocks are followed by the delay blocks where the timings are represented in working hours. 1 week is equal to 5 working days and 120 hours. 1 day has 24 hours. These timings are observed from the previously completed projects. Any task can be done in any hour of the day based on the workload of the task owner. A task owner does not have only one task. He/she has several tasks to be completed. Therefore, a task may be completed in any time of the day. This prioritization is up to the task owner and his/her experience in sequencing the projects. There is only one constraint; the task owner must complete the task within the lead time. The timings are indicated to delay blocks as follows;

- Local gate 2 approval: 1 week – 120 hours
- Local gate 3 approval: 1 week – 120 hours
- Global gate 2 approval: 3 weeks – 360 hours. This is due to having GCM at the last week of every month. It also includes the time in between LCM and GCM.

- Global gate 3 approval: 3 weeks – 360 hours. This is due to having GCM at the last week of every month. It also includes the time in between LCM and GCM.
- Prototyping: 55 days – 1320 hours.

- 1st project report initiation: 1 week – 120 hours.
- Packaging design development: 3 weeks – 360 hours
- Production planning & orders placement: 1 week – 120 hours
- Material arrival: 8 weeks – 960 hours
- Initial material inspection: 1 week – 120 hours
- Production: 2 weeks – 240 hours
- Gate 4 approval: 2 weeks – 240 hours
- Shipment: 3 weeks – 360 hours
- Distribution & Custom Clearance: 2 weeks – 240 hours

The outcomes of the model are the flow time for local brand projects and global brand projects. It also gives the number of local and global brand projects executed and completed within one year of period. Table 5.2 shows the number of projects executed within a year of period and the average flow time of these projects based on current ABC Company NPD process.

Table 5.2 Current process flow time and number of projects

# Replication	# Global Projects	# Local Projects	Global Project Flow Time (months)	Local Project Flow Time (months)
1	146	230	7.25	5.96
2	159	256	7.49	5.96
3	142	250	7.19	5.94
4	163	272	7.35	5.92
5	132	235	7.02	5.96
6	133	254	7.29	5.91
7	135	259	7.47	5.95
8	112	272	7.41	5.85
9	128	272	7.48	6.02
10	131	255	7.14	5.96

Based on the latest project characteristics and using the current ABC Company NPD process; the average number of global brand projects which are executed within a year of period results as 138 while the local brand projects are around 255. The average flow time of global project execution is around 7.3 months where this number for local brand project executions is around 6 months. These figures, for a company operating in FMCG industry is significantly long. When there is a need for urgent development, this means the company needs minimum of 5-6 months to place the new products on the market shelves.

5.4 Proposed Solutions

5.4.1 Proposal 1

R. G. Cooper's Stage-Gate NPD process was exactly what ABC Company was looking for in 2000. However, within the years, with the globally increased speed of developments and very swiftly changing consumer needs and requirements, ABC Company needs to be looking into improvement points. The NPD process of ABC Company has been analyzed with this perspective.

The first proposal focuses on one of the non-value added task – material preparation & arrival and the critical path of design development.

One of the critical paths of design development in Stage 4 takes 15 days to be completed. The non-value added task of material preparation and arrival takes 40 days. This task is completely allocated to the suppliers. These timings are the standard lead times for material preparation and arrival. Surely, ABC has voice to raise to the suppliers for them to shorten their lead times, which is another subject that needs to be evaluated by the central procurement of ABC Company. They will get in contact with the suppliers and support the idea of decreasing the lead times together with packaging designers. This is a project in the near future pipeline of ABC Company as well. Putting the process allocation to the supplier aside, during the VSM discussions among the force team, it's been found out that, the NPD

process has room to improve and avoid the non-value added task of material preparation and arrival. This improvement will be processed by benefiting Cooper's (1994) third generation models – overlapping gates.

Today in the current NPD process model, for the projects that require Gate 2 approval, a packaging designer cannot start the design developments without receiving the first project report which is issued by the project leader. The project leader cannot issue the first project report before the project is being approved in Gate 3 approvals.

The packaging related design development and the prototyping are two different subjects that do not have any input or output to each other with the start or the finish of each task. Basically, waiting for Gate 3 approval for a project which requires a Gate 2 approval before purely means waiting for prototype development to be completed for packaging designer to proceed with packaging design development and upon finalizing the designs, for procurement to proceed with orders placement and for supplier to produce the packaging materials. The time needed for prototyping becomes a big bulk for the packaging related development processes to be started.

Therefore, benefiting the 4F (fluid, fuzzy, focus and flexible) improvement of Stage-Gate process, it is suggested to ABC Company to overlap the Gate 2 and Gate 3 approvals for those projects which require prototype development. This will enable a Gate 2 approval for prototyping and Gate 3 approval for packaging. The packaging designer will start working on design developments. The legal approvals will be taken and upon finalizing the designs, procurement will place the orders and the supplier will start working accordingly on material preparation and arrival. Please refer to Figure 5.8 for the revised flow of the process. Please refer to figure 4.11 for the original process.

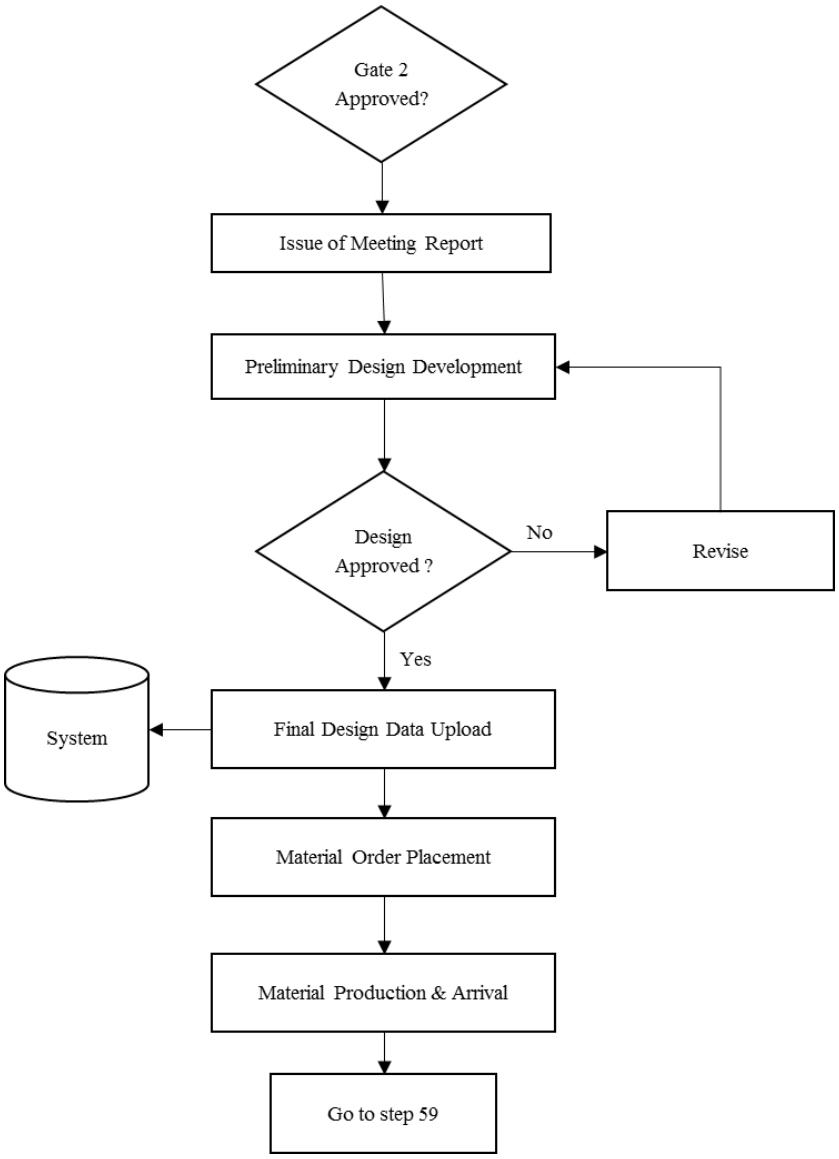


Figure 5.8 Flow chart after proposal 1 implemented

5.4.2 Arena Simulation of Proposal 1

For proposal 1, an Arena simulation model been developed to see the average brand type dependent flow times. The model has run for a year of period and ten different observations have been collected. Please refer to appendix B for the visual of the model.

In this model, the same structure as the previous model is followed. The difference from the current NPD process is the removal of packaging design development and material arrival. Packaging design development had 3 weeks – 360

hours of lead time and material arrival took 8 weeks – 960 hours. These lead times are included in the time duration of prototyping. These tasks are completed in parallel.

Table 5.3 shows the number of projects executed within a year of period and the average flow time (by months) of these projects.

Table 5.3 Proposal 1 improvement

# Replication	# Global Projects	# Local Projects	Global Project Flow Time (months)	Local Project Flow Time (months)
1	239	338	4.71	3.17
2	223	355	4.74	3.18
3	213	356	4.99	3.17
4	202	386	4.72	3.27
5	195	344	4.71	3.27
6	216	338	4.64	3.28
7	221	372	4.66	3.15
8	205	331	4.75	3.31
9	223	355	4.63	3.21
10	230	365	4.71	3.17

Based on the latest project characteristics and using the newly proposed NPD process; the average number of global brand projects which are executed within a year of period results as 217 while the local brand projects are around 354. The average flow time of global project execution is around 4.7 months where this number for local brand project executions is around 3.2 months. The improvement results in 57% increase in number of executed projects for global brands, 39% increase in number of executed projects for local brands, 35% decrease in flow time for global brand projects and 46% for local brand projects.

5.4.3 Proposal 2

The second proposal focuses on other non-value added tasks – waiting for approval meeting dates and issue of meeting minutes (approvals). These non-value added tasks consume almost 40 days in total.

Today in the current process, the local gate approval meetings are held in the first week of every month and the global gate approval meetings are held at the last week of the month. Following the meetings, to start prototype development the project designer waits for meeting minutes to be issued in the following week after Gate 2 and to issue the first project report the project leader waits for meeting minutes to be issued in the following week after Gate 3. The meeting minutes issue takes a week of time since all the entries are done manually. Also, the local senior management and global senior management meetings are separated from each other due to the travelling schedules of the senior management. The meeting calendars are organized a year before for the upcoming year.

Therefore, the second proposal includes the automatization of the meeting minutes issuing process and re-arrangement of the local and global meetings. The company IS department developed a software which will enable the meeting administrator to enter the inputs in to the system by just filling the required information and then after 24 hours, the meeting minutes will be visible to the relevant stakeholders. Also, the local and global meetings will be re-arranged as they will be both handled in the first week of the month. In the first day, the local gate approval meeting will be held, following the day the minutes will be issued. Then two days later (two have the minimum gap in between the meetings), the global gate approval meeting will be held.

At the end of the week, the meeting reports will be issued and beginning of the following week the project leader and the product designer can start working on their to-do list.

5.4.4 Arena Simulation of Proposal 2

For proposal 2, an Arena simulation model has been developed to see the average brand type dependent flow times. The model has been run for a year of period and ten different observations have been collected. Please refer to appendix B for the visual of the model.

In this model, the same structure as the previous model is followed. It has been observed that the meeting durations are decreased to 1 week – 120 hours of lead time.

Table 5.4 shows the number of projects executed within a year of period and the average flow time (by months) of these projects.

Table 5.4 Proposal 2 improvement

# Replication	# Global Projects	# Local Projects	Global Project Flow Time (months)	Local Project Flow Time (months)
1	270	339	3.82	3.09
2	244	344	4.06	3.06
3	226	350	3.85	3.07
4	246	360	3.92	3.12
5	216	371	3.84	3.14
6	248	355	3.87	3.07
7	235	388	3.87	3.12
8	355	356	3.86	3.12
9	241	346	3.68	3.05
10	263	367	3.92	3.05

Based on the latest project characteristics and using the newly proposed NPD process; the average number of global brand projects which are executed within a year of period results as 254 while the local brand projects are around 358. The

average flow time of global project execution is around 3.8 months where this number for local brand project executions is around 3.1 months.

Comparing to the current situation; the improvement results in 84% increase in number of executed projects for global brands, 40% increase in number of executed projects for local brands, 47% decrease in flow time for global brand projects and 48% for local brand projects

Comparing to the proposal 1; The improvement results in 17% increase in number of executed projects for global brands, 1% increase in number of executed projects for local brands, 18% decrease in flow time for global brand projects and 4% for local brand projects.

5.4.5 Proposal 3

During the discussions after VSM study, the force team realized that they spend a significant amount of time and effort on budget process, which takes 57 days. The improvement idea was to benefit from what is budgeted.

Today in the current process, during the budget period, all new product initiatives are reviewed and analyzed by all relevant parties. After the preparation of five-year long range plans, product development reviews these plans in terms of product and packaging propositions and reviewed by factories in terms of capacity and capability. Moreover, reviewed by line manager and approved by senior management.

The budget period of ABC Company answers the questions of; when a new product will be launched, at what volume, from which factory, with how much cost and with which materials. This data set is reviewed and approved by the senior management of the company before the upcoming year. Nevertheless, it can be clearly said that, during the budget process, all the administrative and process related requirements are being completed beforehand. For the projects that are budgeted and

there is no change in the scope, product, packaging, cost, timeline and the strategy, the gate approvals will be a rework that is done for a project execution to start.

This year, the budget process was conducted very differently. Each and every market initiative have been reviewed in detail from all different angles by the local and global senior management lines. The process took six months to be completed. However, this is why the senior management is present in the company. To review the new initiatives and to correctly direct and lead the other management teams in order for them to take the correct actions are their responsibilities. After such a long journey of setting the long-range plans and new product initiatives, the ABC senior management put a target of 70% budgeted project execution for the next year.

Based on this objective, the proposal 3 aims to skip the gate approvals, for the projects that are budgeted and there is no change in the scope, product, packaging, cost, timeline and the strategy.

5.4.6 Arena Simulation of Proposal 3

For proposal 3, an Arena simulation model been developed to see the average brand type dependent flow times. The model has run for a year of period and ten different observations have been collected. Please refer to appendix B for the visual of the model.

In this model, same structure of previous model is followed. However, in this model "type3" represents whether the projects are budgeted or not.

If type 3=1 → non budgeted
If type 3=2 → budgeted

The model directs the projects which are not budgeted to the gate approvals, whereas the budgeted projects directly enter the model from "1st project report" block since they are not subject to gate approvals.

Table 5.5 Proposal 3 improvement

# Replication	# Global Projects	# Local Projects	Global Project Flow Time (months)	Local Project Flow Time (months)
1	250	358	3.42	3.04
2	254	343	3.54	2.98
3	236	348	3.58	2.89
4	264	347	3.35	2.97
5	265	382	3.57	2.93
6	261	343	3.5	2.95
7	246	362	3.39	2.94
8	261	323	3.42	2.91
9	269	355	3.52	2.96
10	263	350	3.38	2.95

Based on the latest project characteristics and using the newly proposed NPD process; the average number of global brand projects which are executed within a year of period results as 257 while the local brand projects are around 351. The average flow time of global project execution is around 3.5 months where this number for local brand project executions is around 2.9 months.

Comparing to the current situation; the improvement results in 86% increase in number of executed projects for global brands, 37% increase in number of executed projects for local brands, 52% decrease in flow time for global brand projects and 50% for local brand projects.

5.4.7 Proposal 4

During the discussions after VSM study, the force team realized that between every process step a manual information flow exists via exchanging emails except the flow between suppliers during packaging design development. This process is controlled by the project leader. When any information is needed, the project leader

sends emails to the relevant parties/individuals to collect the information. The email may be overlooked.

When a process is stuck somewhere nobody knows where and how long it gets stucked. Emails also do not have any standard. Exchanging emails also consumes time which is completely non-value added. Today it is not seen as non-value added since there is no other option.

Therefore proposal 4 suggests ABC Company to invest in its software system which will avoid exchanging emails. This investment will include a software setup for the computers of each ABC employee. It is a business process model (BPM) to be used during whole NPD process. BPM is the representation of the tasks of the processes. It enables the processes to be analyzed and improved. The outcomes of VSM will be used to develop BPM.

The BPM model of ABC Company will include all required tasks in each phase. The model will define each task owner. The standard start and end dates of a task, the standard lead times needed to complete a certain task and the actual start and end dates of a task will be predefined for each project type. The standard lead times needed to complete a task which is described as Key Performance Indicator (KPI), will also be included. The task delegations will be done by the system automatically. When the deadline of a task approaches the system will send reminder to the task owner automatically.

When the task owner receives the task delegation and has comments on the task content or the deadline, he/she may make comments, explain the reasons on the system and revise the deadline. This will be visible to everyone. This transparency will be helpful to report the KPIs in a better way.

The model also defines the predecessors among the tasks. Once a predecessor task is completed, the system will automatically inform the following task owner by alerting. Whenever the system is checked by someone, the progress will be visible.

What is the current task waiting to be completed, when it will be completed and by whom it will be completed etc. At this point, the human psychology will be on board since nobody likes to be displayed by not doing the work that was required to be delivered.

This BPM will not shorten the lead times however it will make the system transparent and visible for everyone. This BPM will avoid the usage of emails. All required task allocations and task related activities will be managed through the system itself.

The BPM model will also be used during gate approval meetings. All required tasks will be done on the system online. Whenever there is a need for a specific information, the management team will be transparently reaching it in every platform by just one click since the system will be visible to the whole company.

CHAPTER SIX
CONCLUSIONS AND FUTURE STUDY

6.1 Conclusion

The consumers have been demanding increasingly. Accordingly the FMCG industry has become increasingly and constantly competitive. Within this competitive and swiftly demanding environment, the companies are under a constant pressure of launching new products or revising the current products on the market with more and more appealing and consumer needs addressing features. The design and the implementation of a new product process is clearly not a single route or a procedure to be followed. Today, reviewing the literature, we have seen that the second and third generation models are the good representatives of showing that the new product development process cannot be stucked to one single line process but should also have overlapping processes among the entire process and that the Stage-Gate should be enriched with such fuzzy gates and conditional go/kill decisions.

Simms (2012) points out the overlooked new product development processes in many FMCG firms.

ABC was not one these companies. On the contrary, ABC Company deeply analysis the new product development process. Therefore, the company was a perfect example for setting up the new product development procedures, and defining the roles and responsibilities, who should be doing what, when, how, with whom, as of when the task needs to be completed, what needs to be completed before the gate approvals, what needs to be prepared in the system administratively before the gate approvals, etc.

The ABC Portfolio Card was a perfect company tool for packaging designers and product designers to look at whenever needed and to see what needs to be proposed to markets as a perfect proposition for the consumer needs.

However, ABC Company was so much focusing on defining the procedures, defining the roles and responsibilities that they lost their focus area and became a process-oriented organization. This was clearly misleading the company and the benefit of Stage-Gate process was choked in the details.

With the help of this study, ABC Company analyzed every single step of new product development process. This analysis pointed out the bottlenecks of the new product development process of ABC Company, the reasons and the owners of the bottleneck.

There were two main bottlenecks identified. The first one is the prototyping and the second one is the procurement of material on the supplier side. The material procurement lead time is purely not under the control of ABC Company. Therefore, the company has to consider an improvement on this side as an idea. Accordingly, the company central procurement will get in touch with the suppliers and support them for the lead time reduction.

The prototyping process is also not under the control of ABC Company. This is again due to the material production and the arrival of the material to the factory for the prototyping purposes. Other than that, when the whole prototyping process is evaluated, no significant improvement area has been found.

These two identified bottlenecks are left to be discussed and to be worked on later by the central functions. Hence, the other process steps are analyzed to see which parts are open for discussion and open for improvement.

Three proposals have been suggested to improve the performance of Stage-Gate process. The first proposal benefits the flexibility of Stage-Gate process. Accordingly, it is suggested to advance the start of packaging design development that has no prerequisite for the projects which require prototyping. Because the packaging related design development and the prototyping are two different activities that do not have any input or output to each other for the start or the finish of each

task. Basically, waiting for Gate 3 approval for a project which requires a Gate 2 approval beforehand was non-value added waste of time. Therefore, it was suggested to ABC Company to overlap the Gate 2 and Gate 3 approvals for those projects that require prototype development. This enables a Gate 2 approval for prototyping and Gate 3 approval for packaging. As a result, the packaging designer can start working on design developments beforehand. The legal approvals would be taken upon finalizing the designs, procurement would place the orders and the supplier would start working accordingly.

The second proposal is to address the very basic need of a better organization. The proposal was related to the gate approval dates and the meeting minutes issues. In the current process, the local gate approval meetings was held in the first week of every month and the global gate approval meetings was held at the last week of the month. Following the meetings, to start prototype development the project designer was waiting for meeting minutes to be issued in the following week after Gate 2 and to issue the first project report the project leader was waiting for meeting minutes to be issued in the following week after Gate 3. The reason for minutes to be issued in one week was the meeting administrator doing the issue manually. The proposal was enabling an automatized way of issuing the meeting minutes and the re-arrangement of the local and global meetings.

The third proposal was reviewing the process from the very first beginning. It was aiming to skip the gate approvals for the projects that are budgeted and there is no change in the scope, product, packaging, cost, timeline and the strategy. The Company aim was to have 70% budgeted projects, which fall in to these descriptions.

These three proposal have been analyzed with Arena simulation programme. Table 6.1 shows the project number increase and the flow time decrease in percentage, for each proposal comparing to the current situation.

Table 6.1 Improvement percentages based on proposal type

vs. current	# Global Projects	# Local Projects	Global Project Speed	Local Project Speed
Proposal 1	57%	39%	35%	46%
Proposal 2	84%	40%	47%	48%
Proposal 3	86%	37%	52%	50%

In the fourth proposal, ABC Company was suggested to invest in their software system via creating a business process model that will avoid the usage of emails via embedding all process steps analyzed using VSM tool. It is aimed to automatically inform all the users when it is their turn to complete a task. The tasks, the task owners and the lead times are to be defined in the system.

Accordingly, starting as of next year, ABC Company senior management has decided to use proposals 1, 2 and 4.

Since ABC Company is operating in FMCG industry, the ABC senior management commented that although the budgeted project execution is 70%, they would like to see and review the project with the outcomes of the consumer researches.

With the implementation of proposal 1 & 2 and 4 the ABC Company will be running projects in a faster way and at the end of the day the number of projects executed within a year will be increased significantly.

6.2 Future Study

The research presented in this thesis seems to have raised more questions that need to be answered.

ABC internally will further improve its NPD process by decreasing the lead times required for each task. It will be focusing on decreasing the timeline for the material production and arrival. In the scope of this initiative, the central procurement function and the product development packaging designer will be working together.

This has triggered an investment for prototyping purposes. This investment will include a small packaging production shop. This will ease the prototyping process by producing the special materials needed in house for prototyping purposes only. Then the lead-time needed for material arrival will be decreased drastically.

Although having monthly gate reviews for a company who operates in FMCG industry may seem like an optimal option, decreasing the frequency of gate reviews may change the project lead time on the other hand. On top of this, involving top management in gate meetings all the time may seem necessary today. For this reason, management responsibility delegation should be seen as another option to proceed with the project steps. Do they have to see everything? Can projects be prioritized among themselves? Can Gate approvals be re-organized? Does Stage-Gate process answer the need of FMCG Companies?

As a next step, these questions will be answered by using another NPD process benefiting from a currently developed or a new one.

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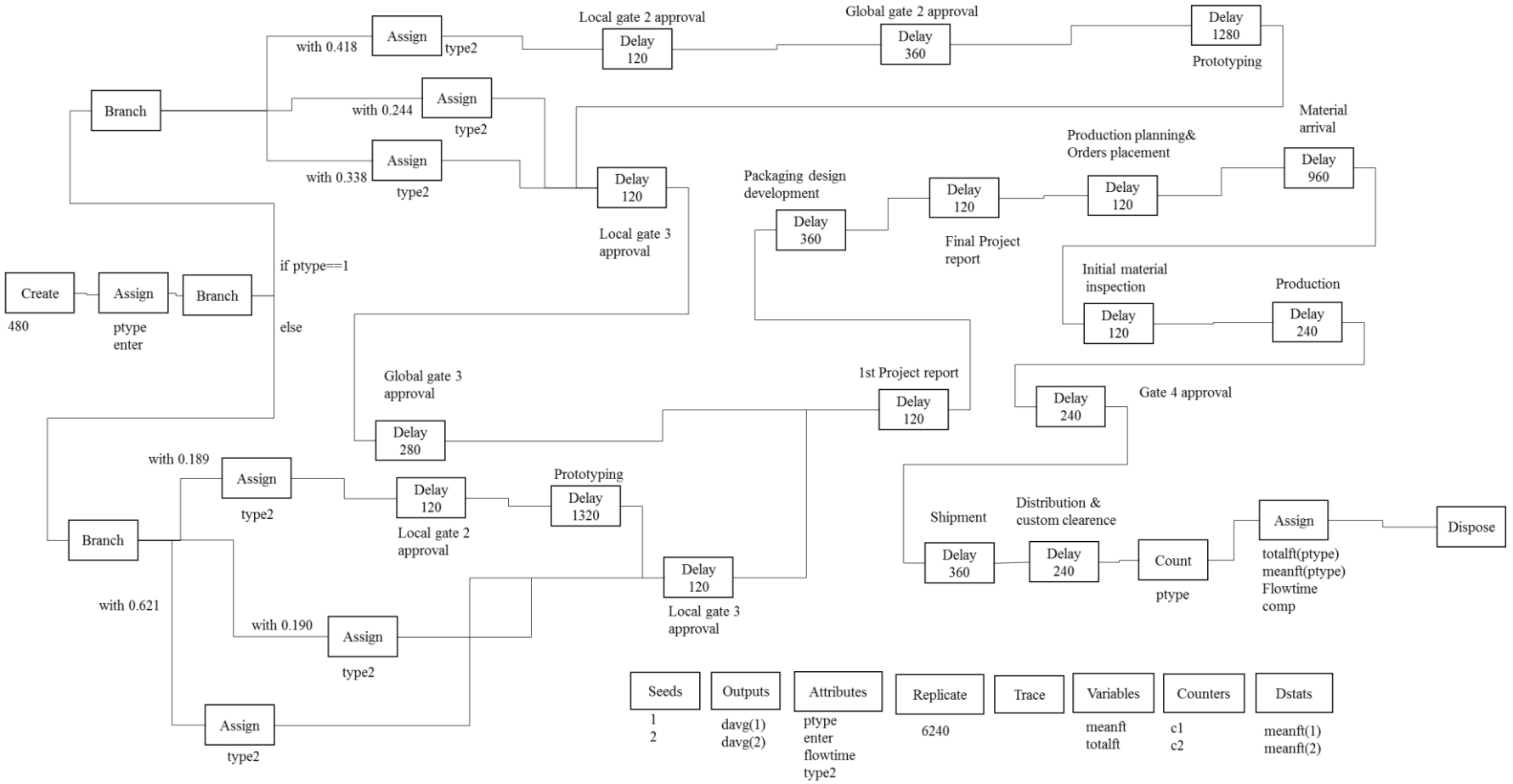
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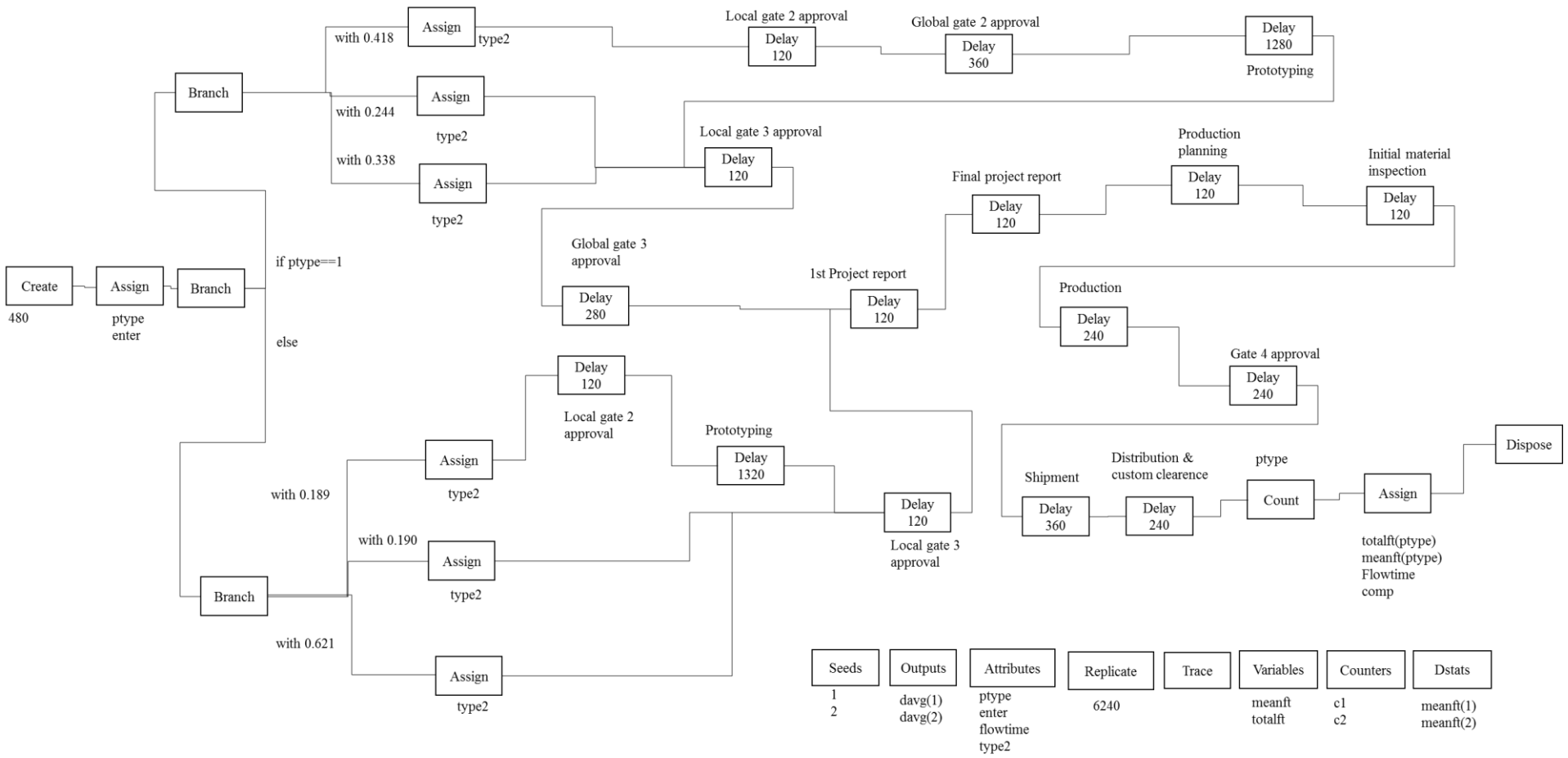
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APPENDICES

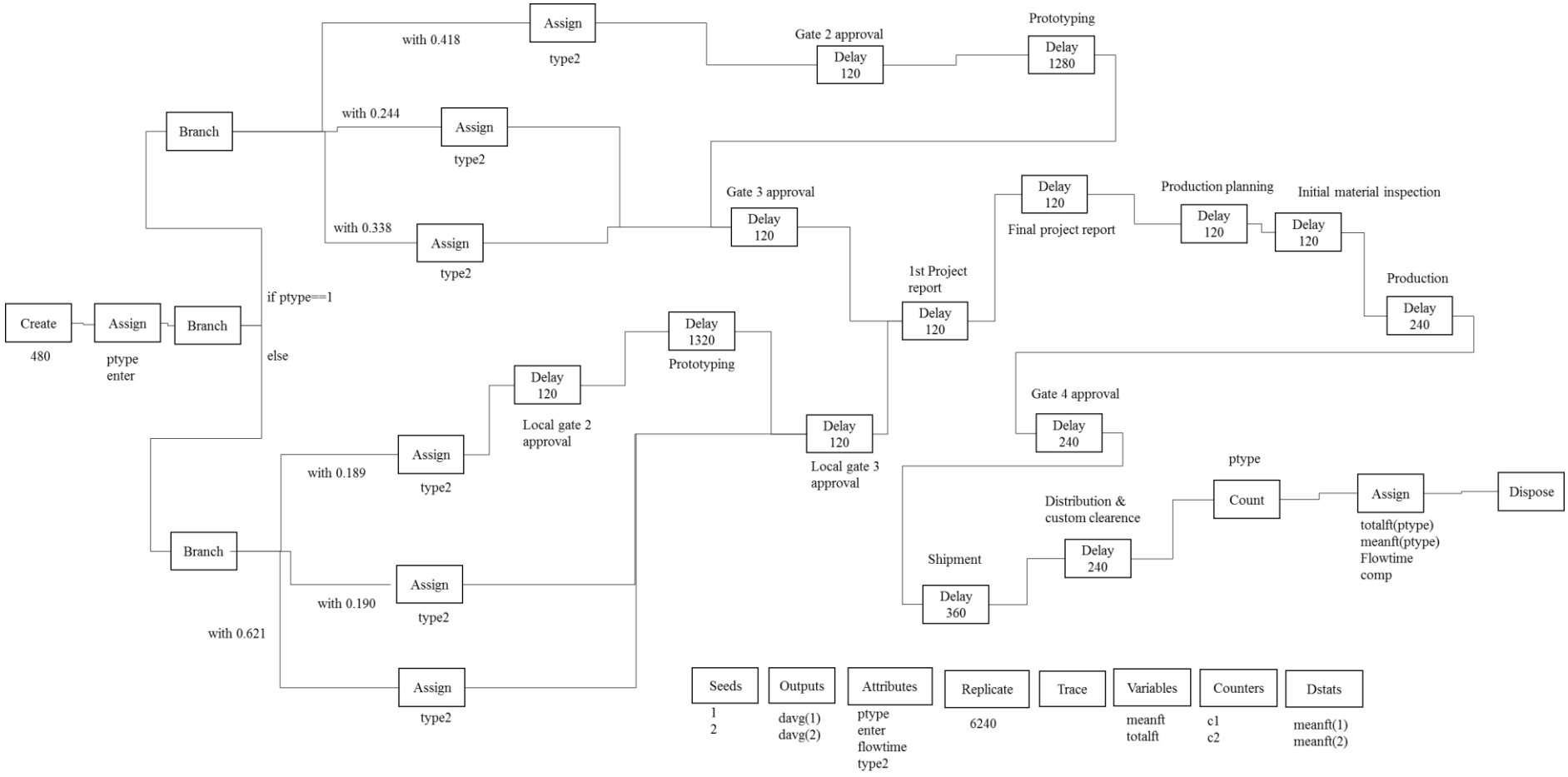
APPENDIX A – ARENA SIMULATION MODEL OF CURRENT NPD PROCESS



APPENDIX A – CONTINUED ARENA SIMULATION MODEL OF PROPOSAL 1



APPENDIX A – CONTINUED ARENA SIMULATION MODEL OF PROPOSAL 2



APPENDIX A – CONTINUED ARENA SIMULATION MODEL OF PROPOSAL 3

