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ASSESSMENT OF SUCCESS FACTORS IN INNOVATION MANAGEMENT: THE CASE OF YASART ENGINEERING PLC

BY

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By

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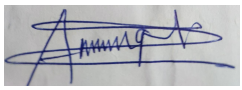
Dr. Afework G.		July 2024
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DECLARATION

I certify that this research work on the topic “Assessment of success factors in innovation management: the case of Yasart Engineering Plc” is original and the author alone and the work has not been submitted for partial fulfillment for a degree or certificate to this or any other university. The assistance and references have been duly acknowledged.

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ABSTRACT

This research study aims to investigate the success factors of innovation management contributing to the low success rate of new product development (NPD) at Yasart Engineering. It focuses on examining the company's innovation management practices, identifying key challenges within the NPD process, and proposing recommendations for improvement. A descriptive research design with a mixed-methods approach, combining quantitative surveys and qualitative interviews, was employed. Data was collected from employees to assess their views on innovation strategy, organizational innovation culture, resource availability, and the NPD process. Additionally, semi-structured interviews with employees and top management provided deeper insights into innovation management and challenges. The investigation reveals several critical issues impacting the success rate which include a lack of clarity and communication in the innovation strategy, A disconnect between the desired collaborative innovation culture and the current organizational structure, financial and technological resource constraints, inefficiencies in the current NPD process and the absence of a structured NPD framework. The primary limitation of this study is its small sample size, limited to Yasart Engineering employees, which may affect the generalizability of the findings. Future research should include a larger sample size across multiple companies to validate and extend these conclusions.The findings provide valuable insights for Yasart Engineering to improve their NPD process. By implementing a structured framework, fostering a more collaborative culture, addressing resource limitations, and investing

Key words: Innovation, New Product Development, innovation success factor, innovation management

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ACRONYMS

NPD: New Product Development

SPSS: Statistical Package for the Social Sciences

KPI: Key performance Indicators

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

Innovation entails new products, processes of production, new sources of supply, new markets and new ways in which the businesses carry out activities (Osuga,2016). Damanpour (1991) presents a typology of innovation types; innovation can be radical, incremental, product, process, administrative or technical. New Product Development (NPD) is a type of product innovation in which it is a critical organizational activity that involves technical, marketing, and financial risks while providing future commercial opportunities (Pons, 2007). The new product development leads to the firm changing its strategic position in the industry or, changing its potential position in the industry gaining some measure of competitive advantage.

There are many challenges companies face in the innovation and product development process from conceptualization to market introduction. These challenges can manifest in various forms, including technical constraints, market uncertainties, resource limitations, and regulatory requirements Ulrich et al., (2015). Importing products poses challenges, particularly in acquiring foreign currency which is a major problem in Ethiopia. Moreover, reliance on imports expose companies to supply chain vulnerabilities, to entail lengthy lead times, bureaucratic hurdles, fluctuating exchange rates, and logistical challenges, resulting in project delays that reverberate throughout the entire operational ecosystem. These challenges underscore the importance of fostering domestic capabilities in innovation and product development.

Yasart Engineering Pvt. Ltd. is a dynamic and innovative company specializing in the designs, supply, installation, maintenance, assembly, and after-sales service of a wide range of electromechanical product. Established in 2005 G.C, the company has rapidly emerged as a trusted partner for industries requiring reliable and efficient solutions for their pumping and machinery needs. The company engaged in designs, develops and installation of water supply and solar pumping systems. These clean energy systems are used for irrigation, urban and rural water supply systems and for many commercial applications.

In 2017 G.C. Yasart established a dedicated Research and Development (R&D) department. The focus areas of the R&D department are product Innovation and manufacturing of goods. The R&D department places a strong emphasis on enhancing manufacturing processes and capabilities. For manufacturing of innovative products Yasart has built a new manufacturing workshop in Dukem, Oromia region.

1.2 Statement of the problem

Research indicates that despite substantial investments, new product development (NPD) success rates generally remain below 25% (Gaubinger et al., 2015; Cooper & Kleinschmidt, 2011). Kuen.w.c et al., (2012) also stated that even while project management, especially for NPD projects, is being used more often in businesses, 75% of NPD programs have been found to be unsuccessful.

Over the previous five years, Yasart Engineering has seen a noticeably low rate of new product commercialization. In particular, only 7.5% of inventions have made it to market. This statistic highlights a significant gap between the company's innovative efforts and their ability to bring these innovations to consumers. Additionally, while

15% of products managed to pass through all the stages of development, they ultimately did not make it to the market. This indicates that despite thorough development processes, these products faced insurmountable challenges in the final stages or failure to meet customer needs and expectations. These figures underscore the critical issues within Yasart Engineering's innovation management practice pointing to inefficiencies and obstacles that prevent the successful commercialization of their innovations.

This study aims to systematically assess the innovation management practices at Yasart, identify the reasons for low NPD success rates, and investigate the challenges in NPD procedures and processes within the company. The research will pinpoint existing strategies, gaps, and deficiencies in Yasart's current practices that hinder effective NPD implementation. knowledge of the key success elements and objectively and methodically evaluate these factors will help to foresee potential consequences, and then identify and select the best course of action to attain the innovation management and NPD success.

1.3 Research question

- What are the key factors contributing to the low success rate of innovation and new product development at Yasart Engineering?
- What specific challenges does Yasart Engineering face during the various stages of the new product development process?
- How can Yasart Engineering improve its innovation management practices to enhance the success rate of new product development?

1.4 Objectives of the study

1.4.1 General objectives

The primary objective of this research is to systematically assess the innovation management practices at Yasart Engineering and identify the reasons behind the low success rate of new product development.

1.4.2 Specific objectives

- Identify and analyze the key factors contributing to the low success rate of NPD at Yasart Engineering.
- Investigate the challenges encountered throughout the various stages of the NPD process within Yasart's operational framework.
- Provide recommendations for improving innovation management practices to enhance the success rate of NPD at Yasart Engineering.

1.5 Scope of the study

The study focuses on the assessment of challenges encountered in product development. The study addresses the success rates of product development in the company. The effect of use of project management frameworks on innovation practices is considered.

This study employs a mixed-methods approach to comprehensively investigate the management of innovation and new product development (NPD) at Yasart Engineering Plc. The methodology includes both qualitative and quantitative research techniques. The study focuses on the internal operations, processes, and practices

related to innovation and NPD at Yasart Engineering's facilities in Addis Ababa and Dukem. While the findings may offer insights relevant to similar contexts in the Ethiopian electromechanical and manufacturing sectors, the primary data collection and analysis are limited to these locations. This study will review practices, processes, and data from the past Five years to ensure that the findings reflect the current state of innovation and NPD at Yasart Engineering Plc.

1.7 Significance of the study

This study will contribute to a better understanding of the product innovation process and possible challenges in developing new products. It will add to the existing body of knowledge through developing a new project management framework of strategic innovation of technology and product development to gain competitive advantage by managing the process. The study findings will provide knowledge necessary for the product development process of planning, implementation and involvement of the team to increase success rate the project outcome.

1.8 Limitation of the study

The primary limitation of this study is the small sample size, constrained to 33 respondents due to the limited staff at Yasart Engineering, potentially impacting the generalizability of the findings. Additionally, the study focuses on a single firm within Ethiopia, which may limit the applicability of the results to other companies or contexts. While the findings provide valuable insights into the innovation and NPD processes at Yasart Engineering, further research with a larger and more varied sample across multiple firms is recommended to validate and extend these conclusions. Despite these limitations, this research offers a meaningful case study

that can serve as a reference for other emerging engineering and manufacturing firms in Ethiopia, which often have similar workforce sizes and operational challenges.

1.9 Structure of the study

The research report is structured into five chapters. Each chapter of the study illustrates different aspects of the research work. Chapter 1 introduces the study, providing background information, stating the problem, outlining research objectives and questions, and discussing scope and limitations. Chapter 2 reviews relevant literature and research pertaining to the investigated problem. Chapter 3 details the methodology and procedures employed to collect information for the study. Chapter 4 presents the results of analyses and findings, accompanied by discussion. Finally, Chapter 5 offers conclusions drawn from the study and provides recommendations.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Theoretical Literature Review

2.1.1 Innovation

Many scholars defined innovation in different contexts. Acs and Audretsch (1988) see innovation as a process that begins with an invention, proceeds with the development of the invention, and results in the introduction of a new product, process, or service to the marketplace. In OECD (2007) innovation is defined as the implementation of a new or significantly improved product or process, a new marketing method,or a new organizational method in business practices, workplace organization or external relations. Avlonitis and Salavou (2007) see innovation as a company's ability to introduce new products, which are also successful. McCormick and Maalu (2011) defines innovation to comprise product or process, continuous or discontinuous, radical or incremental innovations leading to improved or new products. For the purpose of this study, the definition given by McCormick and Maalu (2011) is adopted because the definition is given in the context of product innovation which is one branch of innovation and it refers to the development of new products, improvements to existing products, or the addition of new features or improvements to existing products.

2.1.2 Innovation management theories and frameworks

Innovation management theories and frameworks provide concepts, approaches, and models that guide the management of innovation within organizations. The process of

managing a company's innovation which starts from ideation to the successful implementation, that includes the decisions, activities, and practices associated with creating and carrying out an innovation strategy is referred to as innovation management. Kadar 2014 Define Management of innovation as a systematically achieving change of process using strategic and operational approaches. Innovation management involves structured procedures that organizations body to follow, develop, and enhance novel products, services, and business methodologies. Preez 2008 emphasized the significance of an integrated design process, effective knowledge management, and strategic planning in managing innovation.

The innovation management process begins with idea generation and progresses through team work and developing a set of ideas. These ideas are then implemented using project management best practices. Storey (2004) offers a collection of analyses on innovation management, including the role of managers, knowledge, and alliances. Bals (2008) compares theoretical and practical approaches to innovation management, emphasizing the importance of efficient and effective processes. These works collectively emphasize the importance of innovation management for organizational growth and competitiveness. The innovation management framework of a company may vary depending on the type of innovation it targets. If executed carefully , developing this strategy can yield substantial long-term advantages.

Innovation management theories help to understand, guide, and optimize the process of innovation within organizations and insights into various aspects of innovation, including its drivers, processes, challenges, and outcomes. Success can result from implementing and maintaining a management system that is designed to continuously improve performance.

The effectiveness of an Innovation Management System hinges on its framework. The framework must be easy to understand and should contain a set of processes. Most organizations will adopt an innovation methodology without having a management framework; this can only lead to an accidental innovation.(Maier et ai., 2012) This framework must oversee a systematic innovation process, necessitating specialized tools, and above all, it should maintain simplicity and accessibility. The framework must contain a number of steps that the company should take in order to succeed in innovation, considering all the important aspects of a business system that can help identify the performance in the organizational unit. Having an Efficient and sustainable innovation framework will minimize frustrations, risks, cost overruns and system failures associated with innovation activities. (Maier et ai., 2012) The first step in managing innovation is to understand how the innovation process can be successfully influenced.

2.1.3 New product development and Challenges

New product development is the development of original products, product improvements, product modifications, and new brands through the firm's own research and development efforts (Kotler 2006:274). The introduction of new products has increased significantly as the industry highly recognizes their critical role in business success. However, managing the New Product Development (NPD) process has become a formidable challenge for firms, demanding substantial financial and human resources and being highly time-sensitive.

Challenges in product development refer to obstacles and complexities encountered throughout the lifecycle of a product, from conceptualization to market introduction.

These challenges can manifest in various forms, including technical constraints, market uncertainties, resource limitations, and regulatory requirements. Hassanien, divided barrieres of NPD as “organizational-related barriers such as lack of resources, knowledge or capabilities and the power and interest of stakeholders; external and market-related barriers (e.g. customer/competition-related barriers, political, economic, social, technological, environmental and legal factors); and . NPD process-related barriers such as the risk associated with NPD and the time constraints” (Hassanien and Dale 2012).

2.1.4 Innovation Management and its Success Factor

The study reviewed different literature's that identifies the organizational factors that influence the ability to manage innovation at the firm level. Researchers have been asking key questions like: What are the critical factors that contribute to a new product's success? And how can the development process be improved to increase success rates? Answering these questions will help to understand what factors can be manipulated by organizations to increase their ability to manage innovation. A range of success factors have been identified in the field of innovation management.

Understanding key success factors throughout the stages of the New Product Development (NPD) process is crucial from a managerial perspective. Rese (2011) underscores the importance of this understanding, noting that managers play a critical role in navigating these stages effectively. Similarly, Smith (2008) provides a comprehensive framework identifying nine critical factors influencing innovation management: management style and leadership, resources, organizational structure,

corporate strategy, technology, knowledge management, employees, and the innovation process (Smith et al., 2008).

Building on this framework, Durst (2013) expands the discussion by highlighting the success factors of innovation ecosystems. Durst's research emphasizes the importance of resources, governance, strategy and leadership, organizational culture, human resources management, people, partners, technology, and clustering. This holistic view suggests that innovation management extends beyond internal organizational factors to include external partnerships and ecosystem dynamics.

In their work, Leesatapornwongsa et al., (2013) highlights the significance of formalizing the NPD process and the role that particular product strategies and portfolio management tools play in differentiating successful NPD practices. These components, they claims, provide strategic direction and unambiguous guidance throughout the development process. Millson (2012) further emphasizes the need for cross-functional integration, particularly between R&D/manufacturing and marketing. This integration is essential during the NPD process to ensure that all relevant perspectives are considered, facilitating smoother transitions from concept to market. These studies collectively underscore the multifaceted nature of innovation management, with a need for summarized approaches.

Gaubinger et al. (2015) and Cooper and Kleinschmidt (2011) condense these success factors into four main categories, Innovation strategy, organization and innovation culture, Innovation resources and Innovation NPD process. For the purpose of this study these approach of success factors have been used. By integrating these four

categories, organizations can create a comprehensive framework for innovation management that addresses all critical aspects of the innovation management.

2.1.4.1 Innovation strategy

A clear and transparent innovation strategy is fundamental to effective innovation management. This defined strategy serves as both the guiding inspiration and the limiting framework for the operational activities of product management. To ensure alignment with the overall business objectives, specific fields compatible with the strategy must be identified as starting points for product innovation activities. The strategy process should include a thorough evaluation and control phase, which allows for the measurement of the performance and effectiveness of the innovation strategy. This ongoing assessment ensures that the innovation efforts remain aligned with strategic goals and facilitates necessary adjustments to optimize outcomes. (Gaubinger et al. 2015). A company's innovation strategy should clearly outline how various types of innovation align with the overall business strategy, specify the resources to be allocated to each type, evaluate top management support and develop the innovation strategy and its implementation. Anderson et al. (2014) argues that for an innovation strategy to be effective in an organization, it needs to meet the ever-changing needs, preferences and wants of customers.

2.1.4.2 Innovation organization and innovation culture

Innovation organization refers to the structure and processes an organization sets up to foster innovation and provides the framework and tools for innovation. Innovation culture embodies the shared values, beliefs, and behaviors within an organization that foster creativity, risk-taking, and experimentation. It evaluates the extent to which an innovation culture is integrated within the company's organizational framework and promotes openness to idea generation, collaboration across departments, and a

tolerance for failure as a pathway to learning. Recognition and rewards are provided for innovative thinking and behavior. Evanschitzky (2012) emphasizes culture emerges as an important moderating factor of new product success. (Evanschitzky et al. 2012).

2.1.4.3 Resources and Innovation

For an innovation project to be successful team members have to have sufficient resources for their tasks. Financial resources are naturally crucial. Cooper and Kleinschmidt emphasize the role of top management includes viewing innovation as an investment rather than a cost. This mindset is essential for allocating dedicated innovation budgets in a way that aligns with project goals. (Cooper and Kleinschmidt 2007). Innovation resource evaluates the extent to which the company utilizes "supporting factors" in the implementation of its innovations such as Space for employees to use time at their discretion, Integration of all employees into the innovation process and Creating open innovation culture. (Gaubinger et al. 2015)

2.1.4.4 The Innovation process

The NPD process consists of the activities carried out by firms when developing and launching new products (Bhuiyan, 2011). The process of new product development since 1960 passes through different stages of maturation. Some of the different frameworks adopted by organizations for new product development are the New product development (NPD) process, the IDEO process, the Scorecard-Markov model, the Booz, Allen, and Hamilton (BAH) model. The Booz, Allen and Hamilton (1982) model is the best known model of NPD process and they discovered that companies which successfully launch new products typically have a formal NPD process in place,

and they generally go through all the necessary development stages. (Bhuiyan and Nadia 2011)

Stages of (BAH) model

- New Product Strategy: Connects the NPD process to the company's goals, focusing on generating and screening ideas.
- Idea Generation: Seeks new product ideas that align with company goals.
- Screening: Conducts initial evaluations to identify promising ideas worth further exploration.
- Business Analysis: Examines ideas in detail using quantitative measures such as profits, return on investment (ROI), and sales projections.
- Development: Transforms a paper concept into a working, producible product.
- Testing: Carries out commercial experiments to validate earlier business assessments.
- Commercialization: Introduces the new product to the market.

2.1.4.4.1 Innovation and new product development process model

Before 1960, innovation models primarily focused on technology ("technology push") without considering marketing aspects. As customer needs grew, there was a shift towards a market-driven approach to innovation, leading to the integration of marketing considerations into the innovation process.(Gaubinger et al. 2015). Studies on success factors in new product development found that integrating "technology-push" and "market pull" approaches positively impacted company success. Rothwell's "push-pull model" is a seminal example, integrating impulses from both the supply and market sides (Rothwell 1994). Various scholars have proposed different

innovation process models over the years, with some of the most common ones including:

The stage-gate model

Cooper introduced a product management model based on success factor studies he conducted and separated the innovation process into five stages called the stage- gate model (Cooper, R. G. 1994). The Stage-Gate model breaks down the innovation process into five steps. Each step has a checkpoint called a "gate" where we decide whether to keep going with the project or stop. The five stages are: finding and evaluating ideas, developing product concepts, testing and validating, and introducing the product to the market. Coopers stated that no single department is in charge of any stage alone. Instead, different departments like R&D, marketing, and production work together at each stage. They decide together whether to keep the project going or stop it, based on criteria set earlier. The stage gate process has a fundamentally sequential character in which a new stage is started only after all the tasks from the previous stage have been finished successfully and a "go" decision has been made at the gate between the two stages. (Cooper, R. G. 1994) (Cooper, R. G. 2011). Cooper has introduced multiple generations of the Stage-Gate model, each representing an advancement in scalability and flexibility. it has evolved a lot over time. Cooper stated that, “The point is that Stage-Gate is not a static tool but is rather a comprehensive, integrated, changing, and evergreen system that builds in many best practices and methods. And it is always transforming” The latest generation reflects an evolutionary stage in innovation process management systems, featuring openness akin to the principles of open innovation (Cooper 2008).

Cooper's Stage gate model has passed through the first generation of original stage-gate process to the fifth generation agile-stage-gate hybrid evolutionary stages. The evolution reflects the changing needs of innovation management and product development. From the first generation , it has grown into a flexible, customer-focused, and collaborative framework that integrates modern practices such as agile methodologies and open innovation. This progression has enabled companies to better manage risks, respond to market changes, and deliver successful new products.

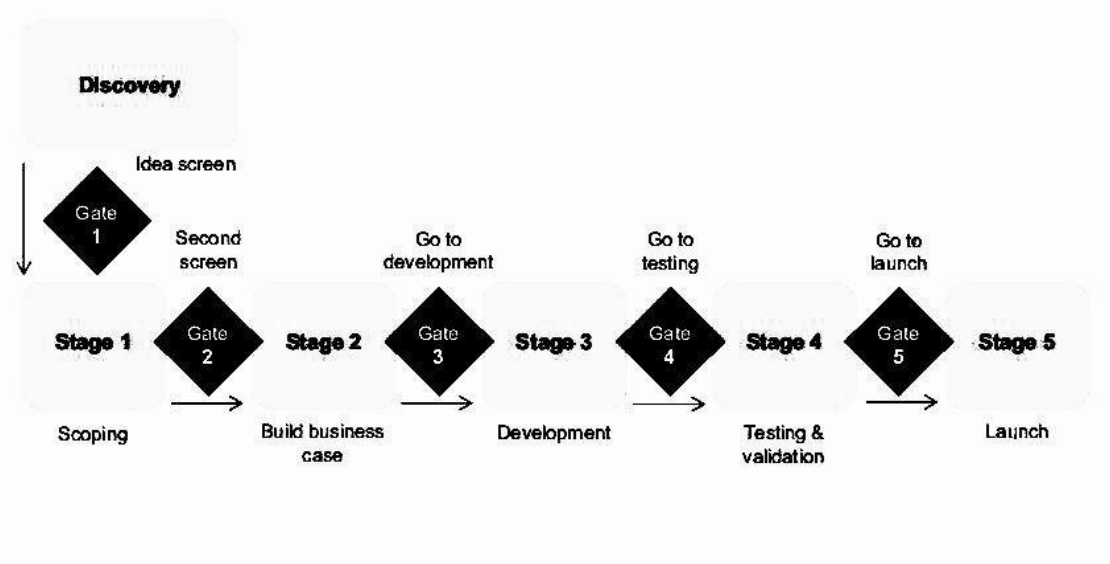

Figure 1: Overview of a typical Stage-Gate Model

Open innovation model

To grasp open innovation, let's begin by examining the closed innovation model. In a closed innovation model, both the development and marketing of new products happen exclusively within the firm's boundaries (Grönlund et al. 2010). Open innovation theory states the idea of companies to look for external support to work collaboratively with external investors, government, other organizations and universities in their innovation journey. It leverages external sources of knowledge and expertise to complement their internal R&D efforts and accelerate the pace of

innovation (Chesbrough 2006) (West and Bogers 2013). The basic premise of open innovation is opening up the innovation process (Huizingh 2011). Neglecting to involve customers at all may pose greater risks to firms than the risks associated with customer integration in open innovation. (Grönlund et al. 2010)

(Awny 2005) and (Tipu, A 2012) stated in their research that countries often receive technological innovations due to their limited indigenous technological capabilities. This underscores the importance of adopting an open Stage-Gate model, which facilitates external collaboration and the incorporation of external innovations to bolster local technological development. (Lee et al. 2010) observe that open innovation practices at smaller companies are more common in the latter innovation phases, especially the commercialization phase.

Agile innovation model

Agile innovation borrows principles from Agile software development, emphasizing flexibility, customer collaboration, and rapid iterations. It allows teams to respond quickly to changes and integrate continuous feedback into the development process. Originally designed for software product development, Agile methodologies have since been adapted for various sectors, including manufacturing (Cooper and Sommer 2016). Agile NPD diverges from traditional project management by questioning the necessity of extensive documentation and rigid methodologies, prioritizing customer-centricity even amid changing requirements. The Agile management approach prioritizes learning over planning. It emphasizes early user involvement by frequently testing product concepts to gather valuable feedback, which guides their evolution in subsequent cycles. (Bianchi et al. 2018).

Each of the above models have their own limitations. To overcome the limitation, different authors came with the new combined models to overcome each of the above model limitations and to increase the success rate of NPD. The stage gate model alone has several limitations, such as it is time-consuming, resulting in time wasting activities. Other downsides include bureaucratic procedures, no provision for focus, and restriction of learning opportunities (Grönlund et al. 2010). The Agile Stage-Gate model integrates principles from both Agile methodologies and the Stage-Gate model, combining their strengths to create a hybrid approach to innovation management. Similarly, the Open Stage-Gate model incorporates elements of the Stage-Gate model with principles of open innovation, fostering collaboration and knowledge exchange with external partners throughout the innovation process.

Both hybrid frameworks aim to address limitations of traditional innovation models by enabling organizations to accelerate innovation cycles and improve product success rates. The Agile Stage-Gate model places greater emphasis on rapid iteration, adaptive planning, and self-organizing teams, drawing from Agile principles such as Scrum and Kanban. It promotes collaboration, transparency, and continuous improvement, enabling organizations to quickly respond to market feedback and deliver value to customers (Cooper and Sommer 2016) (Bianchi et al. 2018). On the other hand, the Open Stage-Gate model emphasizes collaboration and knowledge sharing with external partners, including customers, suppliers, and research institutions. Both the Agile Stage-Gate model and the Open Stage-Gate model offer innovative approaches to managing the innovation process. While the Agile Stage-Gate model focuses on internal agility and iterative development, the Open Stage-Gate model emphasizes external collaboration and open innovation. Organizations

may choose to adopt one or both of these hybrid frameworks based on their specific needs, objectives, and organizational culture. (Grönlund et al. 2010).

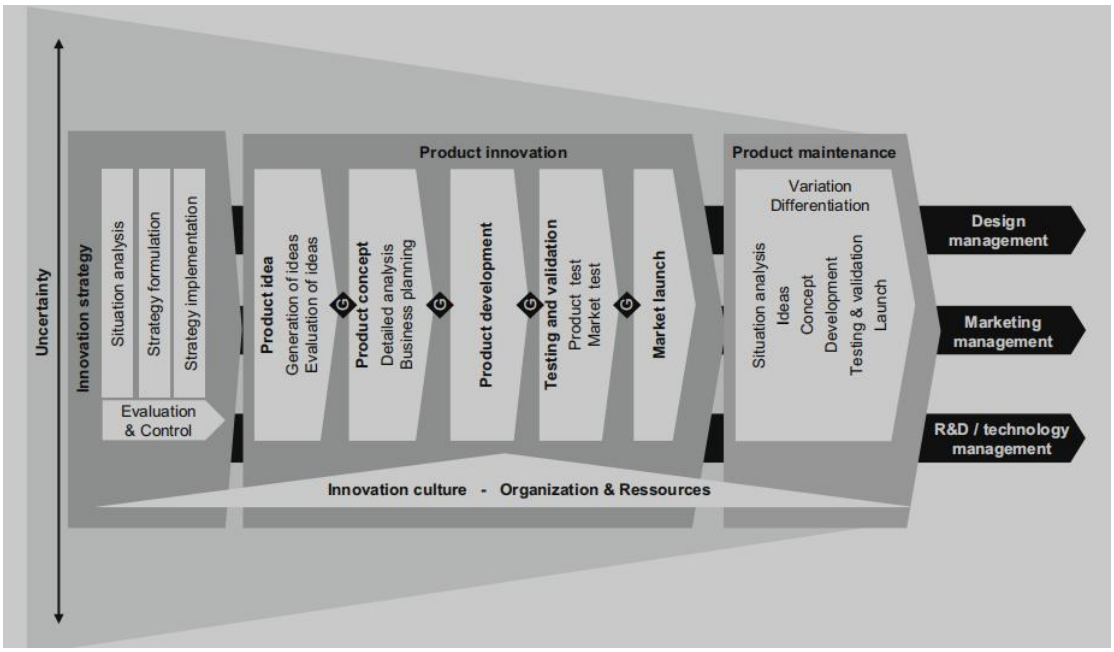

Figure 2: Process model of integrated innovation and product management of Gaubinger et al. (2015)

The new Process model of integrated innovation and product management developed from Cooper's second-generation model, (Gaubinger et al. 2015) and Rahul Dadgale, PMP® 2016 for Electro-Mechanical products. Typical New Product Development Process of Electro-Mechanical product comprises the following 6 important phases of strategy and stage-gate process

1. Product Strategy Concept Design / Scoping: encompasses various stages, including the creation of industrial design sketches, conducting product functional analysis, generating ideas, studying development costs, and reviewing the concept design.
2. Feasibility / Build business case: The feasibility stage involves creating an A-Surface CAD model, developing parts and a bill of materials, conducting

design for manufacturability and assembly and design failure mode and effects analysis, performing virtual verification through finite element analysis and computational fluid dynamics, ensuring compliance with regulatory requirements, deciding on make versus buy options, and reviewing the design readiness of the prototype.

3. Development: The development stage involves building the prototype, conducting design verification plan testing, analyzing test results, reviewing build issues, implementing corrective actions, and evaluating the design readiness for the next prototype.
4. Test and Validation: The validation stage includes building the next prototype, performing design verification plan tests, obtaining and analyzing field test results, reviewing build and field issues, implementing corrective actions, conducting process failure mode and effects analysis, and assessing the design readiness for production.
5. Product Launch: involves releasing drawings, parts manuals, operator and service manuals, and standard operating procedures, as well as addressing and implementing corrective actions for issues identified during pilot production.

2.2 Empirical Literature Review

Innovation management and new product development (NPD) are critical processes for maintaining competitive advantage and achieving long-term growth in engineering and manufacturing industries. Despite significant investments in these areas, many firms struggle with low success rates in NPD, leading to financial losses and competitive disadvantages. Several empirical studies have investigated the key factors influencing NPD success. For instance, Kahn et al. (2012) conducted a meta-analysis

of NPD success factors and identified that market orientation, cross-functional teams, and a clear NPD process are consistently associated with higher success rates. Similarly, Calantone et al. (2002) found that organizational learning and market knowledge significantly contribute to NPD performance. These findings are corroborated by the work of Troy, Hirunyawipada, and Paswan (2008), who highlight the importance of strategic alignment, resource commitment, and process formalization in achieving NPD success.

Improvement may be hampered by unclear performance measures and a lack of review at every stage of the NPD process (Carmeli & Halevi, 2005 [9]). Businesses could find it difficult to monitor their innovation initiatives, pinpoint areas for development, or gauge their success (Jiao et al., 2010 [10]).

The other is limited financial resources can restrict the ability to invest in research and development (R&D), hire skilled personnel, or acquire necessary technologies (Souder & Moorman, 2008 [7]). Additionally, Access to cutting-edge technologies can be essential for developing innovation product. Businesses with little access to technology may be at a competitive disadvantage. (Jansen et al., 2009 [8]).

A culture that doesn't support innovation, such as a risk-averse environment, can stifle creativity and hinder new product development (Chen et al., 2012 [3]). Organizational culture, according to Smith et al. (2008), is crucial to the management of innovation. It is a factor that influences every other factor and is influenced by modifications to the other factors.

The Stage-Gate model, introduced by Cooper, remains a dominant framework in NPD, particularly in complex industries like electromechanical manufacturing. A study by

Wuest et al. (2014) examined manufacturing and assembly processes, while Leithold et al. (2015) assessed NPD processes in 49 German manufacturing firms. Additionally, Edwards et al. (2019) studied the hybrid Agile-Stage-Gate model in three manufacturing SMEs. All research emphasized the Stage-Gate model's ability to reduce time-to-market and enhance product quality through rigorous evaluation at each stage. However, success depends heavily on proper adaptation to specific requirements, limitations, and boundaries. Similarly, Robert G. Cooper and Anita Friis Sommer presented six case studies from major firms experimenting with Agile–Stage-Gate hybrids, with results echoing the previous findings.

Millison (2012) on his study analyzes 131 new product projects across three industries: medical devices, electrical equipment, and heavy construction equipment. His findings suggest that R&D/manufacturing and marketing have the strongest influence on new product success at different stages of the NPD process. This underlines the importance of cross-functional integration between these departments for successful new product development.

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1. Description of the Study Area

The study thoroughly investigates the innovation management and new product development (NPD) practices at Yasart Engineering PLC, a private company engaged in the electromechanical and manufacturing sectors. Yasart Engineering was selected for this case study due to the researcher's familiarity with its projects and the observed gap in NPD and import substitution. The choice is particularly relevant because Ethiopia faces a shortage of companies focused on developing new products, with a prevailing tendency to import rather than innovate domestically. This research aims to highlight the challenges and opportunities within the context of Ethiopian industries, specifically addressing how local firms like Yasart Engineering can enhance their NPD practices to reduce dependency on imports and foster local innovation.

3.2 Research Design

The research design that is followed on this research is descriptive research. Descriptive research is a method used to describe the characteristics of a population or phenomenon being studied. This type of research aims to provide a comprehensive overview of the subject by gathering quantifiable information that can be used to statistically analyze patterns, trends, and relationships. It involves both numerical data (e.g., surveys, statistics) and qualitative data (e.g., interviews, case studies).

Using descriptive research, The study has tried to give answers to systematically document current innovation management and NPD practices, identifying specific

processes, tools, and strategies employed by Yasart. This approach allows for a comprehensive understanding of where the company stands and what can be enhanced.

3.3 Research Approach

For this research study on the management of innovation and new product development (NPD) practices at Yasart Engineering Plc, a descriptive research of mixed methods approach, which combines both qualitative and quantitative research techniques is used. It is ideal for a comprehensive understanding of innovation management and NPD practices. This approach allows us to capture the breadth of numerical data and the depth of contextual insights. Using the quantitative technique surveying of employees at various levels (e.g., R&D, management) to gather numerical data will be conducted on innovation practices, framework overview, and perceived challenges . And as Qualitative technique interviews with key stakeholders, including managers, engineers, and senior management, to gain insights into the process of innovation management.

3.4 Target population and Sampling methods

In this study the researcher used the purposive sampling technique of total population sampling (TPS) where every member of the population engaged in the innovation and new product development project included. This approach is used since the population size of Yasart is relatively small, and all individuals have significant relevance to the research objectives. The target population for this study is 33 and comprises employees from specific departments within Yasart Engineering PLC who are directly involved in the company's innovation management and new product development

(NPD) processes. This includes individuals from the Research and Development (R&D), Management, and Marketing departments. Each of these departments plays a critical role in driving innovation and bringing new products to market.

The study population can be seen as small. The decision to survey only 33 respondents at Yasart Engineering is a result of the company's limited staff size, which inherently restricts the potential respondent pool. This approach is supported by previous similar studies where the entire workforce is surveyed to ensure comprehensive and representative insights. Additionally, the inclusion of all employees provides a depth of understanding that larger sample sizes might not achieve in small organizational contexts. Considering the emerging engineering and manufacturing firms in Ethiopia, many of which will have similar manpower ranges, this research is well-suited to provide valuable insights applicable to such organizations.

The management is responsible for strategic decision-making, overall oversight of the company's innovation initiatives and strategic alignment of NPD with company goals, resource allocation, and high-level challenges in the innovation process. The total sample taken from the management contains three employees.

The largest group in the study, consisting of 18 employees, are the R&D personnel who are directly engaged in the technical aspects of new product development. They are responsible for generating ideas, developing prototypes, conducting experiments, and refining products. The R&D team's technical knowledge and experience are crucial for identifying the practical challenges in product development. The other group is the manufacturing team. While they are sometimes integrated into the R&D

department, at Yasart, they operate separately in their own two workshops, which are equipped with the necessary personnel. The manufacturing team ensures that new product designs are manufacturable using existing processes or with minimal modifications. They provide input on design specifications to ensure ease of production, cost efficiency, and high-quality output. Their feedback on the stages of idea generation, prototyping, and testing helps in understanding the intricacies of the innovation process, methodologies, and tools used in innovation management. The manufacturing team collaborates closely with the research and development (R&D) team to ensure that innovative ideas are practical and scalable. They provide feedback on the feasibility of new concepts and technologies. The total sample size of the manufacturing is seven individuals.

The marketing team is responsible for market research, understanding customer needs, and positioning new products in the market. They play a critical role in ensuring that the developed products meet market demands and are commercially viable. They focus on customer feedback, market trends, and the effectiveness of commercialization strategies. The sample taken from the marketing team contains five employees.

3.5 Data sources and Types

As a primary data survey questionnaire was collected from all the project team, interviews were made with the management and focus group discussion was made with each department. The questionnaire was administered and collected online using Google Forms. As a secondary data different journals and publications related to the subject matter were input to the research.

3.6 Data Analysis Method

After conducting the literature review from various sources, the researcher evaluates the current practices at Yasart Engineering PLC. The analysis involves examining the existing product development system, frameworks, models and other relevant documents, and comparing these with the recommendations found in the literature. For better understanding of the innovation and product development processes, both quantitative and qualitative research methods are employed. This involves collecting data through surveys and interviews with employees from the R&D, Management, and Marketing teams. These insights help in assessing the effectiveness of current practices and identifying areas for improvement.

3.7 Validity

To confirm validity the researcher adopted previously validated questionnaires with modifications to fit the specific context of the study. The researcher also consulted with experts in the field of innovation and new product development to review the questionnaire and welcomed their feedback.

3.8 Reliability

Reliability is defined as the extent to which a measure is free from random measurement error. The reliability of the questionnaire was calculated using Cronbach's alpha coefficient, which is widely regarded as the most commonly used reliability coefficient in social science research. Cronbach's alpha value of 0.7 or higher is generally accepted as indicating a consistent and reliable scale. In this study, A questionnaire consisting of 33 questions with a five-point Likert scale (1 = Strongly Disagree, 2 Disagree =, 3 = Neutral, 4 = Agree, 5 = Strongly Agree) was employed as

the primary data collection tool. A pre-test was conducted with 8 respondents prior to the full-scale test. The importance of pre-testing includes identifying content difficulties caused by ambiguous questions or wording, estimating response rates, checking the flow of questions, and improving the overall quality of the instrument.

No	Variable	Cronbach's Alpha	No. of Items
1	Innovation strategy	0.751	4
2	Organization innovation culture	0.710	6
3	NPD process model	0.714	19
4	Innovation resources	0.833	4
5	Overall	0.793	33

Table 1 : Cronbach's alpha output

As seen on the table the reliability coefficients for all variables exceeded the benchmark of 0.7 and The overall Cronbach's Alpha is 0.793 with 33 measurement items demonstrating that the questionnaire items were reliably measuring the intended constructs and providing confidence in the consistency of the responses.

3.9 Ethical Consideration

Ethical issues were considered and addressed throughout this study. The research relied on data provided by respondents, including qualitative data from interviews and document reviews, ensuring that the process was realistic and unbiased. The purpose of the research was clearly communicated to the case organization and the sample population. Questionnaires were distributed to willing participants only, and the same ethical considerations were applied to the interviews.

CHAPTER FOUR

4. DATA ANALYSIS AND DISCUSSION OF FINDINGS

This chapter presents data analysis and discussion of findings on “the management of innovation, technology and new product development”. The results of the study by presenting a comprehensive analysis of the data collected through both quantitative and qualitative methods. Key findings will be uncovered in several key sections. First Starting with presenting the characteristics and profiles of the respondents who participated in the study, along with a detailed look at the organization itself. Then, the results of the basic research questions and inferential statistical analyses conducted, which will provide deeper insights into the management of innovation and new product development at Yasart.

4.1 Demographic mix of the respondent

Age Distribution

Table 2: Respondents by Age

Age Range	Frequency	Percent
20-29	18	54.5
30-39	13	39.4
40-49	2	6.1
>50		
Total	33	100

Source: Survey Result

The age distribution of the respondents in the above table shows the largest group 54.5%, or 18 respondents fall within the 20-29 age range indicating a younger demographic. The 30-39 age group comprises 39.4% of respondents suggesting a presence of more established professionals, while the 41-50 age group represents a smaller portion 6.1%.

Gender Distribution

Table 3: Respondents by Sex

Sex	Frequency	Percent
M	31	90
F	2	10
Total	33	100

Source: Survey Result

The gender distribution of the respondents in the above table shows 90% of the respondents are male, and 10% are female.

Work experience distribution

Table 4: Respondents by Experience

Work Experience	Frequency	Percent
Junior (0-2) years	12	36.3
Intermediate (3-5 years)	8	24.2
Senior (6-8 years)	11	33.3
Managerial (9-11)	1	3.1
Executive (>11 years)	1	3.1
Total	33	100

Source: Survey Result

The above table shows the work experience distribution of the respondent. As shown in the table a significant portion (36.3%) has Junior (0-2 years) of experience, indicating a potentially younger workforce. The high number of junior employees shows the need for training and development programs. The next significant portion is held by the senior (33.3%) and Intermediate (24.2%) levels. This close percentage shows the presence of a good balance between Senior and Intermediate experience levels suggests a stable mid-career group. The low percentage (3.1% each) in Managerial and Executive positions suggests a limited number of senior-level decision-makers.

Distribution in academic level

Table 5 Respondents by Academic Status

Academic level	Frequency	Percent
Diploma/TVET		
Bachelor's Degree	23	69.2
Master’s Degree	10	30.8
Other		
Total	33	100

Source: Survey Result

All the respondents had either a bachelor's degree or a master's degree. The majority (69.2%) held a bachelor's degree, while the remaining 30.8% had a master's degree.

Qualification distribution

Table 6: Respondents by qualification

Work area	Frequency	Percent
Electrical E	4	12.1
Software E		
Mechanical E	7	21.2
Electro-Mechanical	17	51.2
other	5	15.1
Total	33	100

Source: Survey Result

The majority of respondents (51.2% or 17 people) work in Electro-Mechanical engineering, indicating it as the most common work area. Electrical and Mechanical Engineering covers (12.1%) and (21.2%) of respondents respectively. The remaining (15.1%) come from other backgrounds.

4.2 Results of the questionnaires and interview

The interview with an employee at Yasart Engineering elaborates the management of innovation technology and NPD process . All the employees during the interview believe the success rate of new product development (NPD) is very low, “products are developed but not here and there but they are not functional and effective at solving problems and reaching the market. The low success rate is seen across various NPD stages, such as idea generation, screening, prototype development, and market launch. The interviewee confirms that most products don’t reach the market, attributing this to poor execution, cheaper, high-performance competition and poor marketing targeting the wrong customer segments.

The employee mentions that most or almost all products only reach the fabrication/development and testing stage. The employee expresses clear dissatisfaction with the current NPD process. Expressed the current NPD as “one person takes the lead to manufacture a product for ease of process and to have specialized personnel on that specific product but this promotes working alone or not as team work. The employee also highlights a lack of a structured NPD process model (e.g., Stage-Gate, Agile) and low awareness among employees, with the current process often bypassing feasibility stages and involving low cooperation from R&D and marketing teams.

The interviewees were asked about the challenges they face in NPD, they responded with an uncleared process of development or lack of proper planning, lack of teamwork, lack of task provision, raw material scarcity, lack of technological and financial resources, lack of past experience sharing, technical complexity, volatile/changing market conditions, not setting priority and developing many product at the same time, starting new product development before realizing the previous one, and inefficient employees.

The interviewees were also asked for their suggestions on the process of NPD. Most of them emphasize on implementing a clear NPD process model with proper training, taking time on the designing stage and making successive design reviews, establishing dedicated NPD teams with defined roles, to focus on market based projects, to focus on developing one product at a time, and enhancing R&D and marketing engagement. The interview findings emphasize the need for structured processes, adequate resource allocation, and enhanced collaboration to improve the success rate of new product developments at Yasart Engineering.

The interview with Yasart Engineering's top management reveals critical insights and challenges impacting the company's innovation and new product development (NPD) processes. The management acknowledges the need for a revision of the current innovation strategy to better align with market demands and organizational capabilities. They identify significant gaps in the management system, financial scarcity. To overcome the financial scarcity the company is currently seeking loans to support its NPD efforts. Additionally, there is insufficient governmental support, particularly in facilitating loans and the importation of raw materials. The lack of interconnected or network of interconnected part manufacturing companies further complicates the development and finishing stages of new products, highlighting a fragmented supply chain. Moreover, the management recognizes the need for proper market analysis and product standardization to identify the most marketable product and product sizes and types. Also they believe in parallelly establishing, identifying and securing reliable end-users, distributors and agents for their products.

The top management also recognizes the need to shift from a versatile to a more focused product development approach. Refinement of the current setup is crucial. There is also a significant emphasis on developing the workforce and creating incentive methods to boost productivity and innovation. To address this, the management is establishing sister companies in which employees are shareholders of the company, this helps to foster a sense of ownership and dedication among employees towards specific product developments.

Finally, the top management believes raw material availability and timing pose substantial hurdles, as delays in importing part materials can disrupt the entire NPD process. Additionally, the top management acknowledges that product development has not been given the necessary attention within the company. They are committed to rectifying this by making it a core focus and ensuring it receives the resources and

support it deserves. By addressing these critical areas, Yasart Engineering hopes to create a more robust and sustainable innovation ecosystem.

This section deals with the main results of the data gathered through questionnaires. The study investigated how Yasart Engineering manages innovation technology and new product development processes. The aim is to understand how the approach to innovation and new product development (considered the independent variable) impacts their success rate (the dependent variable). The independent variable is measured by four variables namely innovation strategy, innovation resources, organization innovation culture, and the overall innovation process.

The survey result is analyzed using the "mean" (average) data. This analysis provides a general overview of new product development at Yasart Engineering, focusing on four key areas: innovation strategy, innovation resources, organization innovation culture, and the overall innovation process. Respondents answered questions about these areas using a 5-point Likert scale, ranging from strongly disagree to strongly agree. The result of the SPSS analysis is shown in the following table.

4.2.1 Innovation Strategy

Effective innovation management hinges on a clearly defined and transparent innovation strategy. This strategy serves as both the guiding light and the framework for product management's day-to-day activities. The following table presents the results of a questionnaire to assess this critical aspect.

Table 7: Innovation Strategy

	Agreement Level										
Questions	SD	%	D	%	N	%	A	%	SA	%	M

											ean
The company have a clear and transparent innovation strategy	0	0.0	5	15.2	12	36.4	16	48.5	0	0.0	3.3
The top management actively supports the innovation strategy.	2	6.1	2	6.1	5	15.2	9	27.3	15	45.5	4
Key performance indicators (KPIs) and milestones are used to measure the success of the innovation strategy.	0	0.0	9	27.3	16	48.5	6	18.2	2	6.1	3.0
The innovation strategy allows cross-functional teams (Top management, R&D, Marketing) work together effectively on innovation projects.	5	15.2	8	24.2	10	30.3	7	21.2	3	9.1	2.8

Frequency of (SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) %: Percent of the frequency

Source: Survey result

A substantial majority of respondents (60.6%, combining those who selected Agree and Strongly Agree) believe that the company's innovation strategy effectively facilitates cross-functional teamwork supported by a mean score of 3.7 showing a positive perception of the strategy's impact on collaboration between different departments. The strategy promotes collaboration among different departments, such as top management, R&D, and marketing. Furthermore, an even larger proportion of respondents (72.8%, combining Agree and Strongly Agree) feel that top management actively supports the innovation strategy. This strong support from leadership likely plays a crucial role in fostering effective teamwork, as top management's endorsement can provide the necessary resources, guidance, and motivation for cross-functional

projects. The relationship between these two aspects suggests that active support from top management enhances the implementation of the innovation strategy, thereby enabling better collaboration across various teams within the organization. However, a significant proportion (33.3%) remains neutral, and a small number (6.1%) disagree. This indicates that while the majority sees the strategy as effective for collaboration, some respondents are either indifferent or perceive some issues. This neutrality could stem from a lack of awareness or understanding of the strategy, insufficient information to form an opinion, or a perception that the strategy is somewhat clear but not entirely transparent. The mean score of 3 for the statement regarding the use of Key Performance Indicators (KPIs) and milestones to measure the success of the innovation strategy indicates a neutral overall sentiment among respondents. This neutrality indicates an area for improvement within the innovation strategy

4.2.2. Organization innovation culture

An organization's innovation culture reflects its shared mindsets and behaviors that drive creative ideas, calculated risks, and exploration. The following table explores how well this culture is integrated within Yasart Engineering.

Table 8: Organization innovation culture

	Agreement Level										
Questions	SD	%	D	%	N	%	A	%	SA	%	Mean
The Innovation culture is well integrated into the organizational structure of Yasart Engineering.	0	0.0	3	9.1	9	27.3	16	48.5	5	15.2	3.7
The organizational structures allow for fair competition	0	0.0	5	15.2	7	21.2	13	39.4	8	24.2	3.7

and recognize the effort of individuals and team performance											
Do you agree that the top management has the knowledge or capabilities of solving organizational-related barriers.	0	0.0	3	9.1	11	33.3	7	21.2	12	36.4	3.8
There is a proper mechanism for team formation, project manager and the establishment of members' roles that enhance performance and collaboration in new product development projects at Yasart Engineering.	4	12.1	15	45.5	6	18.2	8	24.2	0	0.0	2.5
Employees at Yasart Engineering are given the autonomy to pursue innovative ideas and empowered to make decisions regarding innovation projects ?	0	0.0	0	0.0	9	27.3	8	24.2	16	48.5	4.2
Different departments and teams effectively collaborate on innovation projects at Yasart Engineering?	5	15.2	11	33.3	0	0.0	14	42.4	3	9.1	3.0

Frequency of (SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) %: Percent of the frequency

Source: Survey result

The survey results at Yasart Engineering indicate a developing innovation culture with several positive aspects, including well-integrated innovation strategies and high employee autonomy. A significant majority believe the innovation culture is integrated into the organizational structure (63.7%, combining Agree and Strongly

Agree) which suggests a positive step towards fostering innovation, and majority (72.7%) employees feel empowered to pursue innovative ideas which empowers employees and fosters a culture of ownership. A significant portion (27.3%) remains neutral, which might suggest some employees are not fully aware of their autonomy or do not feel empowered or require better communication of empowerment practices.

However, there are notable areas needing improvement, such as mechanisms for team formation, project management, project manager selection, and establishing clear member roles.and role establishment (57.6% believe these are lacking) and interdepartmental collaboration (only 51.5% perceive it as effective). Additionally, there are concerns about top management's capability to address innovation barriers, with 42.4% expressing doubts. Addressing these issues through better communication, targeted interventions, and clear processes can enhance Yasart Engineering's innovation culture. A notable portion (27.3%) is neutral, suggesting some respondents are unsure about the integration of innovation culture.

4.2.3. Resources and Innovation

The success of innovation projects hinges on well-equipped teams. This "Innovation Resource" section evaluates how effectively Yasart Engineering utilizes supporting factors to fuel its innovations. The following table presents the questionnaire results.

Table 9: Resource and innovation

	Agreement Level										
Questions	SD	%	D	%	N	%	A	%	SA	%	Mean
There are adequate financial resources available to	0	0.0	0	0.0	15	45.5	11	33.3	7	21.2	3.3

support innovation.											
There is adequate human resources available to support innovation.	0	0.0	4	12.1	3	9.1	21	63.6	5	15.2	4
There are adequate technological resources available to support innovation.	0	0.0	0	0.0	10	30.3	16	48.5	7	21.2	3.0
There are continuous training and development programs offered to enhance innovation skills	5	15.2	4	12.1	18	54.5	3	9.1	3	9.1	3.7

Frequency of (SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) %: Percent of the frequency

Source: Survey result

The analysis shows that Yasart Engineering has generally favorable views on the adequacy of resources to support innovation, especially in terms of human and technological resources. A majority (78.8%, Agree + Strongly Agree) believes there are adequate human resources to support innovation. Indicating sufficient personnel with the necessary skills and expertise. However, No respondents (0%) strongly or somewhat agreed that adequate financial resources are available. A significant portion (45.5%) remained neutral, suggesting uncertainty. This raises concerns about the financial backing for innovation initiatives. As for the technological resource nearly half (48.5%) agreed on the adequacy, a significant portion (30.3%) remained neutral. This suggests potential gaps in some technological areas that could hinder innovation efforts. Finally a majority (54.5% Neutral, and 27.3% Disagree + Strongly Disagree) acknowledged the lack of training and development programs for innovation skills. Overall, the analysis reveals a mixed picture regarding resource availability for

innovation at Yasart Engineering. While there's a positive view of human resources concerns remain about financial resources, technological gaps, the effectiveness of training initiatives and some training programs.

4.2.4 The Innovation process

Innovation thrives on a well-defined process. This section examines existing process models focusing on how effectively they capture, develop, and ultimately launch innovative products. The following table presents the survey results.

Table 10: The Innovation process

	Agreement Level										
Questions	SD	%	D	%	N	%	A	%	SA	%	Mean
Do all employees are familiar with the current New Product Development process model used at Yasart Engineering?	0	0.0	17	51.5	10	30.3	6	18.2	0	0.0	2.7
is the current innovation processes effective in developing new products.	0	0.0	15	45.5	13	39.4	3	9.1	2	6.1	2.8
The NPD process model effectively facilitates collaboration between different departments (R&D, Marketing, Management).	2	6.1	12	36.4	13	39.4	3	9.1	3	9.1	2.8
The stages involved in the NPD process at Yasart are well-defined and followed.	0	0.0	13	39.4	17	51.5	3	9.1	0	0.0	2.7
Yasart Engineering uses a Stage-Gate model or a similar structured framework for NPD.	2	6.1	12	36.4	16	48.5	3	9.1	0	0.0	2.6

New product ideas are generated effectively within the company.	0	0.0	5	15.2	6	18.2	15	45.5	7	21.2	3.7
The criteria used to screen and evaluate new product ideas are clear and appropriate. (or it includes creating a CAD model, developing parts, bill of materials, conducting design for manufacturability and assembly and design failure mode and effects analysis, ensuring compliance with regulatory requirements, deciding on make versus buy options, and reviewing the design readiness of the prototype.)	2	6.1	5	15.2	10	30.3	8	24.2	8	24.2	3.5
There is a mechanisms in place to capture and evaluate ideas from employees, customers, and other stakeholders.	2	6.1	10	30.3	7	21.2	14	42.4	0	0.0	3.0
Do you agree that the company approaches concept development for new products effectively? (building the prototype, conducting design verification plan testing, analyzing test results)	4	12.1	6	18.2	2	6.1	18	54.5	3	9.1	3.3
The criteria and decision-making processes used to screen and select promising ideas participate all and are effective	0	0.0	8	24.2	14	42.4	3	9.1	8	24.2	3.3
There are metrics and feedback mechanisms which are used to evaluate the success of test marketing	4	12.1	13	39.4	13	39.4	3	9.1	0	0.0	2.5

Yasart Engineering develops and refines product concepts into viable prototypes efficiently. (performing design verification plan tests, obtaining and analyzing field test results, reviewing build and field issues, implementing corrective actions, conducting process failure mode and effects analysis, and assessing the design readiness for production.)	2	6.1	9	27.3	15	45.5	7	21.2	0	0.0	2.8
Yasart Engineering manages the product development process effectively to bring new products from concept to market launch. (involves releasing drawings, parts manuals, operator and service manuals, and standard operating procedures, as well as addressing and implementing corrective actions for issues identified during pilot production.)	5	15.2	8	24.2	10	30.3	7	21.2	3	9.1	2.8
Do you agree the strategies and methodologies employed by Yasart Engineering ensure efficient and timely product development and launch.	2	6.1	14	42.4	12	36.4	5	15.2	0	0.0	2.6
The company gathers and utilizes feedback effectively during the NPD process	0	0.0	9	27.3	13	39.4	11	33.3	0	0.0	3.1
Mechanisms are in place to ensure continuous improvement in innovation and NPD	2	6.1	3	9.1	17	51.5	8	24.2	3	9.1	3.2

Feedback from previous projects is used effectively to improve the NPD process model.	2	6.1	5	15.2	7	21.2	13	39.4	6	18.2	3.5
Do you agree customer involvement is important in the success of new product development at Yasart?	3	9.1	3	9.1	4	12.1	8	24.2	15	45.5	3.9
Yasart works collaboratively with external investors, government, other organizations and universities in their innovation journey.	0	0.0	10	30.3	20	60.6	3	9.1	0	0.0	2.8

Frequency of (SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree) %: Percent of the frequency

Source: Survey result

The general dissatisfaction with the effectiveness of the current innovation processes or low success rate of product development (NPD) at Yasart Engineering is highlighted by the fact that 84.8% of respondents either disagree (45.5%) or are neutral (39.4%) about the effectiveness of these processes. One of the reasons for low success rate of product development is lack of Familiarity with NPD Process With 51.5% of employees not being familiar with the NPD process model and a mean score of 2.7, it's clear that a significant portion of the workforce does not fully understand the procedures involved. This lack of knowledge can lead to ineffective execution and poor outcomes. The other is the absence of Structured Frameworks. The data indicates that 42.5% of respondents disagree that a Stage-Gate model or a similar structured framework is used, and 48.5% are neutral. Structured frameworks like the Stage-Gate model are critical for guiding NPD through various stages from concept to launch. Their absence could contribute to inefficiencies and a lack of clear direction. Unclear

or Inconsistent Processes is a reason. With 39.4% of respondents believing that the stages involved in the NPD process are not well-defined and followed, and 51.5% being neutral, there is a clear indication that the NPD processes at Yasart are either unclear or inconsistently applied. This lack of clarity can result in misalignment and confusion, further hampering innovation efforts. Effective collaboration between departments is important for product development but 42.5% of respondents (combining Strongly Disagree and Disagree) feel the NPD process does not facilitate effective collaboration between departments. 39.4% are neutral this suggests significant room for improvement in fostering cross-departmental collaboration during the NPD process.

The analysis of the new product development (NPD) processes at Yasart Engineering reveals both strengths and areas for improvement. A notable strength is the idea generation process, which boasts a high mean score of 3.7, indicating a significant level of confidence among employees, with 66.7% agreeing that new product ideas are generated effectively. Similarly, concept development enjoys a relatively high mean score of 3.3, with 63.6% of respondents expressing overall satisfaction with how product concepts are developed.

However, there are several areas where improvement is needed. The clarity of the criteria used for screening and evaluating new product ideas, despite a positive mean score of 3.5, has a notable portion of respondents (30.3%) remaining neutral, suggesting a need for clearer communication regarding these criteria. The mechanisms for capturing and evaluating ideas present a mixed perception, with a mean score of 3.0; 42.4% of respondents agree that the mechanisms are effective,

while 36.4% disagree, indicating the need for a more robust system to improve idea capture and evaluation.

The screening and selection processes also show a significant level of neutrality (42.4%) with a mean score of 3.3, suggesting that many employees lack clarity or confidence in these processes. The metrics and feedback mechanisms used during test marketing receive a particularly low mean score of 2.5, with 51.5% expressing dissatisfaction, highlighting the need to enhance how feedback is gathered and utilized. The efficiency in developing viable prototypes is another concern, with a mean score of 2.8 and a high level of neutrality (45.5%), indicating that improvements are needed to make this process more efficient. Efficiency and timeliness in product development and launch are also critical areas for improvement, with a mean score of 2.6 and significant disagreement (48.5%), coupled with high neutrality (36.4%). This indicates a pressing need to streamline these processes to ensure timely and efficient product development and launch. Lastly, the utilization of feedback during the NPD process has a mixed perception, with a mean score of 3.1, suggesting that while some feedback mechanisms are in place, their effectiveness could be improved to better guide the development process.

The data of employee perceptions regarding feedback utilization within Yasart Engineering's NPD process reveals that a significant portion of employees (39.4%) remains neutral about the effectiveness of current feedback mechanisms, resulting in a mean score of 3.1. This neutrality suggests uncertainty or mixed feelings about how well feedback is integrated during the ongoing NPD process. Conversely, there is a higher level of agreement (57.6%) that feedback from previous projects is effectively utilized, as reflected in a mean score of 3.5. This indicates that while the company has

a good track record of using past feedback, there may be gaps or inconsistencies in how current feedback is collected and applied. Furthermore, the data shows that only 33.3% of respondents agree that mechanisms for continuous improvement are in place, while a majority (51.5%) remains neutral, resulting in a mean score of 3.2. This suggests that employees recognize the potential for continuous improvement practices but are uncertain about their existence or effectiveness.

Despite a strong agreement among employees (69.7%) on the importance of customer involvement in new product development (NPD), reflected in a high mean score of 3.9, Yasart Engineering appears to be under utilizing this valuable resource. This discrepancy is further highlighted by the high level of neutrality (60.6%) and low agreement (9.1%) regarding the company's collaboration with external partners, including customers and other stakeholders. This suggests a significant gap in actively incorporating external feedback into the NPD process.

Employees clearly recognize the importance of customer input, yet the data indicates that this recognition is not translating into actionable collaboration strategies. The disconnect between understanding the value of customer involvement and the actual practices of engaging with customers and other external partners presents a critical area for improvement. Enhancing mechanisms for capturing and integrating customer feedback, as well as establishing more robust partnerships with external stakeholders, could bridge this gap and significantly boost the effectiveness of Yasart Engineering's NPD efforts. This alignment would not only optimize the use of external insights but also foster a more innovative and responsive product development environment.

4.3 Summary of findings

The employee confirms the low success rate of new product development, mirroring the concerns raised in the survey. Products often stall during the process and fail to reach the market. The data suggests a significant lack of a clearly defined and communicated innovation strategy. This gap leaves employees unsure about the company's overall innovation goals and priorities. Similar to the survey findings, the interview highlights poor execution as a major factor hindering success. This is due to a lack of clear processes, inadequate resources, or inefficiencies in project management.

The data also shows employees understand the importance of customer feedback, but it is not effectively integrated into the innovation process. Additionally, the low agreement on the existence of "continuous improvement mechanisms" suggests a culture that may not actively seek or utilize feedback for ongoing improvement. This lack of active feedback mechanisms could hold back innovation and hinder the development of successful new products.

Employees report a significant lack of awareness of the NPD process model and its stages. The employee criticizes the current NPD process as lacking structure and teamwork. This aligns with the survey's findings regarding the absence of a defined framework and potential weaknesses in collaboration across departments. The current process appears with unclear steps, responsibilities and unstructured and inconsistent leading to confusion and inefficiencies. The interview suggests a lack of training or awareness regarding the NPD process among employees. Additionally, the complexity of the process itself might be overwhelming without proper structure and planning. Low scores on familiarity with structured frameworks like Stage-Gate highlight the need for a more defined approach.

The interview confirms that most products only reach the fabrication/development and testing stage, further supporting the survey's suggestion of bottlenecks within the prototyping and development phases. Poor feedback utilization during the development process further complicates efforts. Delays in product development and launch are also significant concerns, with high disagreement on the timeliness of these processes.

The employee mentions competition and poor market targeting as reasons for product failure. This aligns with the possibility that Yasart Engineering might not be effectively evaluating market needs during the NPD process of the low agreement scores on the effectiveness of concept development and metrics and feedback mechanisms, suggesting products may not align well with market needs.

CHAPTER FIVE

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

The study's investigation into Yasart Engineering's innovation and NPD processes uncovers several factors that may contribute to the low success rate of new products. The survey indicates a gap in the clarity and communication of the overall innovation strategy. The absence of clear KPIs and milestones for measuring success hinders the ability to assess progress and identify areas needing improvement. Additionally, the findings reveal a disconnect between the desired innovation culture and the current organizational structure, particularly in terms of team formation, role establishment, and cross-departmental collaboration. Moreover, the study identifies limitations in financial and technological resources and underscores the need for ongoing training and development programs, especially given the relatively young workforce.

The findings highlight significant issues in Yasart Engineering's current NPD process, pointing to a lack of clarity, ineffectiveness and a closed innovation process. The absence of a structured framework and clear criteria for idea evaluation, along with gaps in collaboration, likely hinder successful new product development. Survey results reveal weaknesses across several stages of Yasart Engineering's NPD process, contributing to the low success rate. Although there is a mechanism for capturing ideas, its effectiveness is uncertain. Inefficiencies in prototype development and overall process management further exacerbate these challenges. An employee interview corroborates these findings, indicating that most products only reach the development and testing stage without a proper feasibility analysis, aligning with survey suggestions of issues during prototyping and development. These problems are

compounded by the absence of a structured NPD framework, leading to poor collaboration and undefined stages.

The potential lack of mechanisms for continuous improvement suggests missed opportunities to learn from past projects and refine the NPD process for future success. These factors can lead to inefficiencies and hinder the effectiveness of NPD efforts. The limited use of metrics and feedback mechanisms, particularly during test marketing, makes it difficult to measure success or identify areas for improvement.

5.2 Recommendations

- ✓ Revise the innovation strategy align the strategy with current market demands and the company's capabilities to ensure a focus on developing products that have a strong market fit.
- ✓ Adopt Formal NPD Models, introduce structured NPD models such as Stage-Gate or Agile to streamline the product development process. Provide training to employees on these models to ensure proper implementation.
- ✓ Regularly review and refine the NPD process to incorporate best practices and lessons learned from previous projects.
- ✓ Embrace an open innovation model to foster a more open and collaborative innovation culture and collaborate with external partners (e.g., universities, startups) to leverage their expertise and access new technologies and resources.
- ✓ Implement a feedback mechanisms throughout the NPD process (including test marketing) to measure success. Regularly analyze past project data and incorporate lessons learned to continuously refine the NPD process.

- ✓ Secure sufficient financial resources to support innovation activities. Explore alternative funding options, such as loans, grants, and partnerships, to mitigate financial constraints.
- ✓ Explore establishing companies where employees are shareholders. This can foster a sense of ownership and dedication among employees towards specific product developments.
- ✓ Focus on securing reliable suppliers to overcome limitations and delays in obtaining raw materials.
- ✓ Investigate alternative sourcing options or potentially collaborate with local manufacturers to strengthen the supply chain.
- ✓ Establish clear criteria for idea evaluation to ensures promising concepts with market potential are pursued and resources are not wasted on ideas with limited viability.
- ✓ Invest in workforce development, provide training programs and create incentive programs to boost employee skills and innovation within the NPD process.
- ✓ Prioritize project completion by focusing on completing ongoing projects before initiating new ones. This reduces resource dilution and allows for focused development efforts.
- ✓ Give employees autonomy to pursue innovative ideas and make decisions regarding innovation projects. Provide platforms for idea sharing and ensure management support for employee initiatives.
- ✓ Implement pilot testing phases to validate product concepts before full-scale development. Use feedback from pilot tests to make necessary adjustments and improve product viability.

- ✓ Seek governmental support to facilitate loans and streamline the importation of raw materials. Advocate for policies that support innovation and manufacturing industries.

5.3 Direction for Future Research

Building on the findings and conclusions of this study, future research should focus on several critical areas to further enhance the innovation capabilities and New Product Development (NPD) processes of Yasart Engineering and similar firms. To practically explore the adoption and adaptation of structured NPD models such as Stage-Gate, Agile, or open innovation to the specific needs and constraints of small to medium-sized engineering firms in Ethiopia.

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APPENDICES

My name is Daniel Asefa, and I am a postgraduate student in the Department of Project Management, MBA program at Addis Ababa University. I am currently conducting a research project entitled “the management of innovation, technology and new product development: The Case of Yasart Engineering.” For the success of this study, I kindly request your commitment to provide genuine information for the following questions.

Thank you very much for your time

Regards;

Daniel Asefa

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Appendix A: Survey questionnaire

Questionnaire on “The management of innovation, technology and new product development : the case of Yasart Engineering Plc”

Scale your agreement level through the following 5 scale measurement from strongly disagree to

strongly agree

1= Strongly Disagree

2 = Disagree

3= Neutral

4=Agree

5= Strongly Agree

Section 1 of 5

Innovation Strategy

The company have an innovation strategy

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

The top management actively supports the innovation strategy.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Key performance indicators (KPIs) and milestones are used to measure the success of the innovation strategy.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

The innovation strategy allows cross-functional teams (Top management, R&D, Marketing) work together effectively on innovation projects.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Section 2 of 5

Organization innovation culture

The Innovation culture is well integrated into the organizational structure of Yasart Engineering.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

The organizational structures allow for fair competition and recognize the effort of individuals and team performance

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Do you agree that the top management has the knowledge or capabilities of solving organizational-related barriers.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

There is a proper mechanism for team formation, project manager and the establishment of members' roles that enhance performance and collaboration in new product development projects at Yasart Engineering.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Employees at Yasart Engineering are given the autonomy to pursue innovative ideas and empowered to make decisions regarding innovation projects ?

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Different departments and teams effectively collaborate on innovation projects at Yasart Engineering?

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Section 3 of 5

Innovation Resource

There are adequate financial resources available to support innovation.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

There is adequate human resources available to support innovation.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

There are adequate technological resources available to support innovation.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

There are continuous training and development programs offered to enhance innovation skills

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Section 4 of 5

NPD process model

Do all employees are familiar with the current NPD process model used at Yasart Engineering?

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

The current innovation processes are effective in developing new products.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

The NPD process model effectively facilitates collaboration between different departments (R&D, Marketing, Management).

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

The stages involved in the NPD process at Yasart are well-defined and followed.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Yasart Engineering uses a Stage-Gate model or a similar structured framework for NPD.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

New product ideas are generated effectively within the company.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

The criteria used to screen and evaluate new product ideas are clear and appropriate. (or it includes creating a CAD model, developing parts, bill of materials, conducting design for manufacturability and assembly and design failure mode and effects analysis, ensuring compliance with regulatory requirements, deciding on make versus buy options, and reviewing the design readiness of the prototype.)

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

There are mechanisms in place to capture and evaluate ideas from employees, customers, and other stakeholders.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Do you agree that the company approaches concept development for new products effectively? (building the prototype, conducting design verification plan testing, analyzing test results)

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

The criteria and decision-making processes used to screen and select promising ideas participate all and are effective

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

There are metrics and feedback mechanisms which are used to evaluate the success of test marketing

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Yasart Engineering develops and refines product concepts into viable prototypes efficiently. (performing design verification plan tests, obtaining and analyzing field test results, reviewing build and field issues, implementing corrective actions, conducting process failure mode and effects analysis, and assessing the design readiness for production.)

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Yasart Engineering manages the product development process effectively to bring new products from concept to market launch. (involves releasing drawings, parts manuals, operator and service manuals, and standard operating procedures, as well as addressing and implementing corrective actions for issues identified during pilot production.)

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Do you agree the strategies and methodologies employed by Yasart Engineering ensure efficient and timely product development and launch.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

The company gathers and utilizes feedback effectively during the NPD process

Strongly Agree				Strongly Disagree
1	2	3	4	5

O	O	O	O	O

Mechanisms are in place to ensure continuous improvement in innovation and NPD.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Feedback from previous projects is used effectively to improve the NPD process model.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Do you agree customer involvement is important in the success of new product development at Yasart?

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Yasart works collaboratively with external investors, government, other organizations and universities in their innovation journey.

Strongly Agree				Strongly Disagree
1	2	3	4	5
O	O	O	O	O

Section 5 of 5

Appendix B: Interview Questions

1. In your opinion, how is the success rate of new product development ?
2. Does the all new product reach the Market /if yes how is their performance / if no why it is not reaching the market
3. What stage of development reach most of the product / innovation
4. Explain about the current NPD process model and Are you satisfied with the current product development process ?
5. What improvements would you suggest for enhancing the innovation and NPD processes?
6. What are the biggest challenges faced during the NPD process?
7. Do you think your company has enough competitors in the industry introducing new products?