

COMPILATION OF THE EXPERIENCES IN TÜRKİYE FROM THE PRODUCT MANAGEMENT PERSPECTIVE

2022



TECHNOLOGY DEVELOPMENT FOUNDATION OF TÜRKİYE

#TechnologyProducingTürkiye

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ABBREVIATIONS

AOTS: Association for Overseas Technical Scholarship

API: Application Programming Interface

AR: Augmented Reality

ASHRAE: American Society of Heating, Refrigerating and Air-Conditioning

AUP: Active User Percentage

AWS: Amazon Web Services

B2B: Business-to-Business

B2C: Business-to-Consumer

BCG: Boston Consulting Group

BIF: Bosch Innovation Framework

BIM: Building Information Modeling
BNPL: Buy Now Pay Later
BTO: Building Technologies Office
CAC: Customer Acquisition Cost
CAD: Computer Aided Design
CEO: Chief Executive Officer
CIBSE: Chartered Institution of Building Services Engineers
CLTV: Customer Lifetime Value
CRITIC: Criteria Importance Through Intercriteria Correlation
CRM: Customer Relationship Management
CRR: Customer Retention Rate
DC: Direct Current
DeFi: Decentralized Finance
DO: Digital Onboarding
DoD: Ministry of Defense, US
DOE: Ministry of Energy, US
ECTS: European Credit Transfer and Accumulation System
ECV: Expected Commercial Value
EMRA: Energy Market Regulatory Authority
ERMA: Electronic Recoding Method of Accounting
ERP: Enterprise Resource Planning
EU: European Union
FAA: Federal Aviation Administration
FCA: Financial Conduct Authority, UK
FDD: Feature Driven Development
fsQCA: Fuzzy-set/Qualitative Comparative Analysis
GAO: General Accounting Office, US
GDPR: General Data Protection Regulation
GWP: Global Warming Potential
HFC: Hydro-fluoro-carbon
HVDC: High Voltage Direct Current
IEA: International Energy Agency
ISIB: Turkish HVAC&R Exporters Association

ITUSEM: Istanbul Technical University Continuing Education Center
JCCME: International Joint Conference on Civil and Marine Engineering
KOSGEB: Small and Medium Enterprises Development Organization of Türkiye
KPI: Key Performance Indicators
LeSS: Large-Scale Scrum
LPPD: Law on the Protection of Personal Data, Türkiye
MAC: Mobile Air-conditioning Systems
MCDM: Multi-Criteria Decision Making Methods
MCR: Magnetic Control Reactor
MVP: Minimum Viable Product
NASA: National Aeronautics and Space Administration, US
NFT: Non-fungible Token
NPD: New Product Development
NPDP: New Product Development Profession(al)
NPS: Net Promoter Score
NPV: Net Present Value
ODP: Ozone Depletion Potential
OECD: Organization for Economic Co-operation and Development
OSS: Open Source Software
PD: Product Development
PDMA: Product Development and Management Association
PI: Productivity Index
REHVA: Federation of European Heating, Ventilation, and Air Conditioning Associations
R&D: Research and Development
ROI: Return on Investment
RPA: Robotic Process Automation
RR: Regular Revenue
SAFe: Scaled Agile Framework
SVC: Static VAR Compensator
SWOT Analysis: Strengths, Weaknesses, Opportunities, and Threats Analysis
SME: Small and Medium-sized Enterprise(s)
TEGV: Educational Volunteers Foundation of Türkiye
TEYDEB: Technology and Innovation Funding Programmes Directorate

TOBB: Union of Chambers and Commodity Exchanges of Türkiye

TRL: Technology Readiness Levels

TTGV: Technology Development Foundation of Türkiye

TTO: Technology Transfer Offices

TUBITAK: Scientific and Technological Research Council of Türkiye

TUIK: Turkish Statistics Institution

UX: User Experience

VPP: Virtual Power Plant

WPP: Wind Power Plant

XaaS: Everything as a Service

YOK: Council of Higher Education

COMPILED BY



Esra Kaya completed her undergraduate education at the Department of International Relations, Faculty of Political Sciences, Ankara University. After that, Kaya completed Hacettepe University's MBA program and worked on Change Management. In 2020, she embarked on her professional career at the TTGV Ecosystem Development Coordinatorship, and she worked for the Product Management Türkiye Platform. Then, she moved on to her current position at TTGV Hit Thematic Venture Development Program. She works on entrepreneurship and innovation ecosystem, community building and maintaining as well as publications on product management and the technological innovation ecosystem.



PREFACE

The Technology Development Foundation of Türkiye (TTGV) was established in 1991 to strengthen the competitiveness of the private sector in global markets by supporting R&D and technology activities. As the first and only foundation established with public-private partnership and under the law, TTGV aims to be an impartial, agile trust platform that follows developments, inspires, provides vision, develops by learning together, teaches and implements, and shares its intellectual capital. To this end, it has been constantly updating its mission to enrich the ecosystem since its foundation in 1991.

TTGV's goal is to identify Türkiye's areas of need, develop relevant communities, and accelerate the dissemination of original methodologies to support our technological innovation ecosystem in a globally competitive environment.

In the current era of science-based technological innovation, "Product Management and New Product Development", which is among the most important fields of knowledge in the transformation of scientific knowledge into economic and social benefits, has almost become a profession in itself.

We sincerely believe that "Compilation of Experiences in Türkiye from the Product Management Perspective", which was created with contributions by experts, will contribute to our country's technological innovation ecosystem and we hope that it will be helpful to everyone in Türkiye who is interested in this field or has chosen to pursue it as a career.



#TechnologyProducingTürkiye



CHAPTER

1

PRODUCT (MANAGEMENT) AND PROJECT (MANAGEMENT)



E. SERDAR GÖKPINAR

E. Serdar GÖKPINAR, Ph.D., holds a bachelor's degree in Mechanical Engineering, and an MBA and Ph.D. in Technology Management. Between 1996 and 2011, he worked as a researcher, R&D project coordinator, and group coordinator for TUBITAK-SAGE. Between 2012-2018, he served as the Director of Technology Management and Fighter Aircraft Director at TAI. Currently working at TTGV, Gökpınar is also a researcher in the fields of engineering management, R&D technology, and innovation management and pursues his academic studies as a lecturer at METU.

1.

INTRODUCTION

Evolving competition, continuous scientific and technological progress, changing market and customer needs, and increasing pressures related to climate and sustainability, as well as organizations' need for efficiency (and hence digital transformation), create a multidimensional complexity that needs to be managed.

Modern business life has also necessitated the development of various management approaches and related cultures and teachings to sustain daily activities, manage change and complexity, and quickly respond to market demands. Project management and product management, on the other hand, are two “professionalized” management approaches that are critical for organizations to create value.

Projects and products both have different places and functions within organizations. In the relationship between product and project, one is the output or result of the other. To put it simply, as the output of a new product development project, a “product” is developed and offered to the market. Although it may seem inappropriate or meaningless to compare a management methodology, way of doing business or process to an output or result, it is important to understand the differences in project or product perspectives, approaches, and mindsets in addressing problems and opportunities. Leaving theory aside, in reality, these perspectives pervade corporate culture and have an impact on organizations' productivity, profitability, and success. This study will discuss the differences in approach and perspective between the “traditional” project (management) and product (management).

2.

PROJECT AND PROJECT MANAGEMENT

Organizations perform two types of work that generally covers operations or projects. The difference between these two is that operations are ongoing and repetitive, whereas projects are temporary and unique. A project is a way of doing work that consists of teams coming together for a specific task and disbanding when the task is completed.

“A project is a temporary endeavor undertaken to create a unique product, service, or result.”

PMI

Here, the term “temporary” means that every project has a predefined end, while “unique (or original)” means that the product, service, or outcome to be created at the end of the project has such characteristics that can be distinguished from existing or equivalent products, services, or outcomes. Despite the fact that the history of project-type work is almost as old as the known history of humanity (can be dated back to the construction of Göbeklitepe), it has only been 60-70 years since it was considered as a separate branch of management and profession.

Projects are undertaken to achieve objectives by producing outputs or deliverables. An objective, on the other hand, can be an outcome towards which the work is directed, a strategic position to be

reached, a goal to be attained, a product to be produced, or a service to be performed. An output (or more appropriately a deliverable, which can be either tangible or intangible) is defined as any unique and verifiable product, result, or the ability to perform a service that must be produced to complete a process, stage, or project.

On the other hand, project management is the application of knowledge, skills, tools, and techniques to project activities in order to meet project requirements. The “uniqueness” and “temporariness” mentioned in the definition of the project also imply the fact that different management and organizational procedures than operations will be needed.

Managing a project typically includes (but is not limited to) the following: identifying project requirements; addressing the various needs, concerns, and expectations of project stakeholders; establishing and maintaining active communication with stakeholders; managing resources; and balancing competing project constraints such as scope, schedule, cost, quality, resources, risks, etc.

Project management is a set of working methodologies that enable organizations to organize their work in an efficient, timely, and financially conscious fashion. Projects have clearly defined goals as well as comprehensive definitions of time limits, tools, teams, and all other required resources. It is essential that project managers have meticulous planning and that they strictly control expenses.

“Project management is like juggling three balls: time, cost, and quality.”

G. Reiss

3.

PRODUCT AND PRODUCT MANAGEMENT

Product¹ is an organization’s tool for offering and acquiring value. Companies or organizations generate revenue by selling their products.

“A product is any good, service, or information that is sold.”

PDMA

This is the “simplest definition”, but a product is something that meets the demands of a particular market, provides enough value to justify its continued existence, and is characterized by its benefits, features, functions, and uses to meet the needs of the consumer.

Product management, on the other hand, is an organizational function that guides every step of a product’s lifecycle, from development to positioning and pricing, by focusing first and foremost on the product and its customers.

1. Although there is a common tendency to perceive products only as physical goods, products should be considered as goods (hardware or software), services, information, knowledge, data, experience, etc., or in many cases a combination of these. There are even occasions when the product is a “project”.

“Product management is the process of ensuring that a product or service meets customers’ needs over time by continuously monitoring and changing elements of the marketing mix, including the product and its features, communication strategy, distribution channels, and price”.

PDMA

While different industries have different products, regardless of the industry, managing products typically includes (but is not limited to) the following:

- Analyzing and understanding the market (and competitors), the customer, and the user²
- Identifying and prioritizing customer needs
- Linking the organization’s strategy, business needs, user, technology, and design knowledge
- Defining the right product for accessing the market
- Revealing the product’s justification through business case analysis
- Creating the business model and monetization
- Monitoring and reporting product performance
- Considering the entire product lifecycle from cradle to grave (from concept to development, pricing to delivery, launch to after-sales)

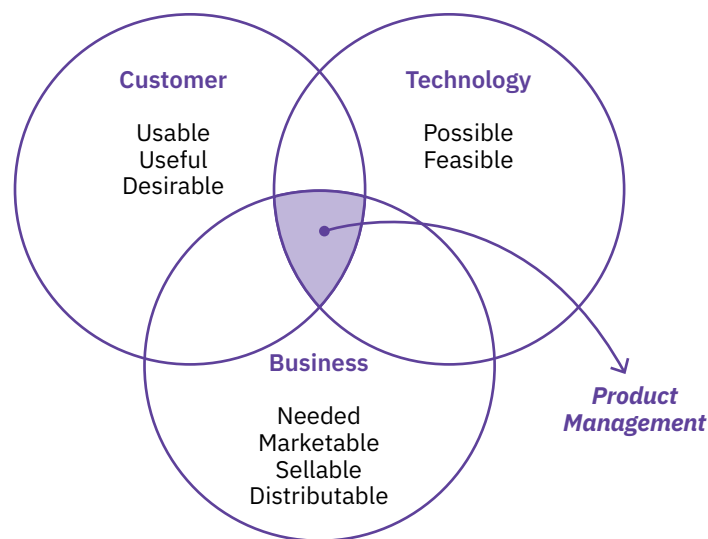


Figure 1: Scope of Product Management

The scope of product management is given in Figure 1 in its simplest form. The critical point here is as follows: In order to create the best possible product, product management is the customer/user advocate within the organization, ensuring that the voice of the market is heard and taken into consideration.

². The customer and the user may not always be the same person.

It would not be wrong to say that we live in the product innovation age. As a result of digitalization, the “exponential” growth of digital (and data-driven) products, and the shortening of product lifecycles, product management has become a much more evident and critical function for organizations. Until recently, products were typically discrete items designed for a specific purpose. They didn’t exchange much data with each other. For example, your car did not “talk” to your phone. However, almost no moment of our lives now goes by without using some kind of product that collects and transmits enormous amounts of data. We interact with an increasing number of connected products every day without even noticing. Digital products are everywhere; they are used in both our personal and professional lives. Digitalization has created a “product economy” on a global scale. This has been made possible by software’s quick development, scalability, and relatively inexpensive capital investment requirements. Expecting this significant global impact of digitalization to increase would not be wrong. This transformation is anticipated to multiply along with the needs of and advancements in climate and sustainability, in addition to digitalization. Due to this, organizations will need the right product management systems and good product managers.

“The job of a product manager is to discover a product that is valuable, usable, and feasible.”

Marty Cagan

4.

GENERAL COMPARISON OF PRODUCT AND PROJECT APPROACHES

It is common for the differences between project management and product management approaches and practices—both of which are essential for an organization’s success—to be misunderstood and even used interchangeably.

A project is a process that results in a finished product, and project management focuses on producing deliverables on time and within budget. Project management is largely focused on the outputs or deliverables. The project manager (or management team for large projects) understands the deliverables at the beginning of the project and manages them through project completion. His/her main responsibility is to complete interlinked group of actions (project) within a defined budget, time/schedule, and quality.

A product is something that solves a consumer’s problem and meets market demands, and product management focuses more on the outcome than the output: customer satisfaction, market share, and profitability. Understanding user/customer needs, translating them (getting them translated) into a design, leading a team (the development team) to build the product to meet those needs, and then continuing to monitor and improve the product are all responsibilities of product management.

The two management strategies have different success criteria. To give a broad example of the fundamental contrasts between the approaches, think of a situation where a product development project inside the organization has been completed on schedule, within the allotted budget, and within the set specifications, but no one wants to buy the product. Although there are variations between sectors, the situation in the example is quite common. In such a case, it would not be wrong to say that project management is successful while product management has failed.



“...More than 60% of all efforts put into developing new products are lost before they reach the market, and of the 40 percent that does emerge, 40 percent are unprofitable and are withdrawn from the market. Three quarters of money spent on product development investments results in commercially unsuccessful products....”

Clayton Christensen et al., 2003

It is advised that the product perspective should not be limited to the organization's external customers and the products offered to them. Within the framework of the “internal customer” concept, the organization should be activated in relation to almost every process innovation, operation, and project. For example, let's imagine that an internal project is being carried out to establish a new application within the organization, for example, a new training platform or a learning management system. The project team defines the system, conducts the bidding and evaluation processes, procures (buys or develops), integrates, and finally launches on time and within budget. But what happens if the new system is not used by employees? The project might have been well-managed, but product management might have been insufficient. This may be experienced by almost all divisions within the organization.

Although there is a wide variety of practices as every organization is different, the following are briefly the main differences in approach between the two functions:

- Fixing scope, time, and resources is a requirement for project management. By doing this, it is possible to first assess how well projects delivered on their agreed-upon scope within their allotted time. Product management, on the other hand, focuses on the outcomes desired to be obtained. The desired outcomes can be attained by continuous improvement as well as iterative experimentation, learning, and adaptation.
- Project management is finite in time and its focus is limited to the duration of the project. Projects have specific start and end dates. Product management is an ongoing endeavor to get the best value from the product. Therefore, it may not have a clearly defined end in many cases. Once a product has been created, it continues to be managed, maintained, and improved, and in that sense, it is continuous.
 - In an ideal organization, the product manager should not deal with time pressure and the “efficient” use of corporate resources. Product manager looks strategically, aims to be effective, and aims to get the right product above all. On the other hand, the right timing for product launch, required efforts to shorten the time-to-market and time-to-profit (product definition and release planning, etc.), the creation of a setup that enables fast learning, etc. are timing-related issues that directly affect product management and, at times, product-related project management.
- The project team is in place for the duration of the project and breaks up after it is completed. Product management, on the other hand, is related to defining, developing, and maintaining a product. It focuses on the entire life cycle of the product from “cradle to grave”. Product management exists and continues before and after the product development project. Despite the fact that different teams may be involved in product management activities at different stages of the lifecycle, the product management function is permanent.
- In the conventional project process, usually, an idea is created, followed by the gathering of requirements, and implementation starts with outlining what has to be done to achieve it. While creating the idea, several assumptions are made about the needs and behaviors of the

customer. In the product approach, the assumptions are first verified before moving forward with the product development rather than assuming that the organization is aware of what customers need. This is accomplished through a variety of hypothesis testing, data gathering methods (such as consumer interviews, focus groups, joint workshops, experiments, etc.), and data analysis.

- Project management reports on progress against predefined success criteria. Product management, on the other hand, sets the criteria for products and defines and measures the experiments to be made.
- Product management sets the vision for the product, collects requirements, prioritizes them, and focuses on the user/customer and hence, on the sustainable success of the product. Project management's focus is rather internal (project team, senior management, project sponsor, etc.), and it ensures that activities are carried out on time and within budget limits by acting in line with the defined vision.
- The primary stakeholder of product management is the user/customer of the product. For product management, it is critical to be on the site, to understand the market and the user, and to deal with the problem rather than the solution. The primary stakeholder for project management varies depending on the needs of the project, but in most cases, senior management or the sponsor of the project is one step ahead as a stakeholder.
- While it works better for project managers to have an industry background (although this is not mandatory), it is not necessary for product managers.
- While product management has higher autonomy, autonomy is much more limited in project management.

Product management and project management also have several common aspects. In short, both product and project management adopt a “scientific” and systematic way of working. Both prioritize the good use of time (although there are differences in approach). The difference in approach to time is that project management has schedule limits, which makes it imperative to prioritize efficiency. On the other hand, in product management, efficient use of time is more important, and the timing of a product launch or offering to the market is an exception, although, for the product manager, the schedule may not be as much of a source of concern as it is for the project manager. Another common aspect, which is perhaps the most critical, is that they both work with people and know (or are expected to know) that qualified human resources, human resource diversity, and the right team organization are critical for success.

5.

ASSOCIATING PRODUCT AND PROJECT FUNCTIONS

The comparison of approaches and points of view should not create the perception that project management and product management are alternatives or substitutes for each other. Project management and product management are two separate but frequently complementary functions within an organization and can go hand in hand, while many organizations develop their products through projects (new product development projects). Project management is a means of attaining a specific goal within a limited time frame and a specific budget. The creation of the product concept and specifications, the development of the product, the development of product-related technologies, the launch of a new product, the addition of new features to the product, or the decommissioning of the product can be the subject of a project.

Different businesses have different problems, solutions, and goals, as well as different customers with different needs and expectations. Every business offers customers products that set them apart from competing companies operating in the same market segment or industry. For the organization and the product to succeed, both functions are important and required. The quality (and quantity) of the product, the market, the customers, the organization's strategic processes, its corporate culture and process management maturity, and the resources and intellectual ability that the organization can mobilize will determine how they are to be synchronized and linked.

Based on the above factors, the association between product management and project management can be constructed quite differently. To give an example of how these two critical functions are organized, Microsoft uses program managers to create operating systems, office suites, and XBoxes, while Google employs product managers for product discovery and program managers for assistance with delivery.

There are also organizations where the same person is expected to perform both project and product management functions for various reasons. Project management and product management are two different functions that necessitate different skills and interests to be successful. Furthermore, even if organizations have people to succeed in both functions, project management requirements are often prioritized due to "time pressure". Because of its strategic nature, the products often lack "urgency" and can be pushed to the background to make room for pressing urgent tactical issues, such as timely delivery. Critical to organizations, product management, and project management functions require both unique skills and 100% of time to be allocated and dedicated to the function. Even if both functions are to be expected from the same person as a result of the organizational choice made, it is of critical importance to be aware that the two functions have different duties, responsibilities, and success criteria.

6. CONCLUSION

The responsibility of product management is to ensure that the company's solution set (and its communication) is in line with the company's strategy and market needs. It provides guidance on how to utilize the organization's limited resources to offer competitive products that meet market needs and works with other teams to help the company achieve its business objectives. It would not be wrong to say that there has been a shift from a project perspective to a product perspective, approach, or mindset in addressing today's problems and opportunities. We are witnessing that gradually more and more organizations move from a traditional project approach to a more product-oriented approach and corporate culture.

Since many organizations have been managing work as projects for a long time, a project culture has developed and therefore, a serious predisposition to the project management perspective has developed. Benefits like time and money constraints on project-type work and the capacity to track progress and resources make work more manageable. The project is implemented, the agreed-upon outputs are delivered, the payments are made, and the team and other resources/facilities that were allotted are disbanded. It is quite straight forward for those who are used to this way of doing business. In various sectors, processes, regulations, budget systems, organization, culture, habits, etc. have evolved to create "projects" and address problems from a project perspective. Competition for funding and budgets at all levels within the organization, region, country, and even internationally is made for "projects". At the ecosystem level, incentive systems, R&D support mechanisms, public procurement works, etc. are designed, executed, and monitored entirely or to a large extent as project-type works. It is not easy to change and transform a strong, well-established culture.

Like any serious transformation, the shift to product-oriented thinking is first and foremost a change of mindset, paradigm, and culture. These should be followed by tools, processes, organizations, etc. A customer-oriented culture can be created throughout the organization or enterprise by approaching work as a product with specific customers (internal or external), assigning teams challenges to solve, and measuring success in terms of outcomes rather than outputs.

Successful organizations are now questioning the "validity" of their ideas before implementing them. Or in another way of saying, they want to make sure that **they make the right product before they attempt to make the product right**. It is this very transformation that is the most important step for product-oriented thinking.



CHAPTER

2

SUSTAINABLE PRODUCT CULTURE



KADİR KUĞU

Born in 1983 in İstanbul. He has received computer training since high school. He completed his undergraduate education at the Department of Computer Engineering, Karadeniz Technical University. For a semester he studied at the Department of Computer Science at Roskilde University, Denmark. He presented graduation projects and a thesis on artificial intelligence, image processing, and biometric systems. He worked as a software engineer in the fields of image processing and biometric systems for years. He established and managed product management departments in all the companies he worked for. In these companies, he undertook the management of products that achieved national and international success from the stage of idea development. Almost all the products, to which development he contributed and which have reached millions of users in many fields, such as the defense industry, security, banking, finance, tourism, transportation, smart cities, and cyber security, are still in use. In 2020, he founded PIAPEX, Türkiye's product management brand, to spread his product management experience to a wider group of people and to help create a product culture in companies. While providing product management services through PIAPEX, he continues to work as a consultant, mentor, and investor in the startup ecosystem. He is married with two children.

1.

INTRODUCTION

From mobile phones to operating systems, from automobiles to computer games, and even software languages, there are customer groups that embrace and become fans of many brands as if the latter is a football team. All these companies, which are enviously followed and have products with many fans, share the characteristic of having a strong product culture. Such companies place product culture at the heart of their business at every stage, from their foundation to becoming global giants. The (non-) formation of product culture is frequently influenced by a variety of environmental factors, including the society, geography, employee profiles, and organizational structures of companies. Nevertheless, regardless of the environmental factors involved, strategy and communication play an important role among internal factors in the creation of an effective product culture. These two cornerstones can be used to create a product culture.

Every year, a product management status report is released by ProductPlan, which provides products that track product management procedures. One of the questions posed in the reports that present the findings of surveys of numerous product managers is, “What is the most important skill in product management?” The most frequently mentioned response to this question is “communication.” The question was slightly modified and rephrased as “What is the most important skill that your product management colleagues in your workplace lack?” in “The State of Product Management Annual Report 2021,” which published the findings of a survey of 2,200 product professionals. This time, “ability to prioritize” ranks first with a difference of 5%. It is followed by “communication” (ProductPlan, 2021). The question “What is the toughest component of your job?” was sent to 100 product managers by Hotjar, a company that offers tools for measuring customer insights. The top response in the second quarter of 2021 was “organizational communication” (Hotjar, 2021).

In Türkiye, however, the situation is a bit different. What is the most difficult problem for product managers in your workplace? I questioned a group of product management experts on July 8, 2021, at a meeting of the Product Management Committee hosted by the Technology Development Foundation of Türkiye (TTGV) (PIAPEX, 2022). Then, I asked the same question via social media to other product managers who did not attend the aforementioned meeting. As a result of these mini-surveys, the ranking I reached was as follows: strategy, prioritization, people management, and communication. It can be said that the survey results are comparable to the results of international surveys if we take people management and communication into account within the same group. In short, the most challenging issues that Turkish product management professionals face are communication and prioritization. In Türkiye, however, it is observed that, unlike in other countries, the issue of strategy stands out among others.

One of the operational activities carried out by product management is prioritization, along with the formulation of a product roadmap, persona identification, process tracking, consumer insight collection, and many other jobs of a similar nature. Strategy and communication provide a solid foundation for product management to carry out operational tasks more effectively. Therefore, to create a sustainable product culture in an enterprise, the strategy and communication infrastructure must be strong.

Let’s first look at the status of communication as a shared concern in product management before we look at the reasons for the strategy’s prominence in Türkiye and its absence in other surveys.

2. COMMUNICATION

“Communication is an equation with multiple variables. Product managers have to solve dozens of these equations every day.”

Kadir Kuğu

Communication occupies a very important place in business life as it does in all areas of life. We observe that companies that establish and manage communication well understand the needs of their customers in the best manner and that the products they develop for these needs are appreciated and even defended by their customers. Therefore, we can say that companies with an established product culture have a collaborative and uninterrupted communication environment. Even in large-scale companies that have been doing product management for years and have a product culture in place, communication is one of the most important issues that product management teams deal with. This is due to several reasons, including education, generational and cultural differences. In the case of Türkiye, we can analyze the reasons for these communication problems in a little more depth. It should be noted that the evaluations at very this point are mainly made for technology companies that develop products or carry out projects. In addition, we can foresee that similar situations will be observed in many different sectors.

Nearly all Turkish businesses that have grown to a certain size and are institutionalized or on the verge of institutionalization list communication as a common complaint. In year-end evaluation meetings, SWOT analyses, or employee surveys, the problem of “inter-departmental communication” becomes prominent. Many of the other issues on the list are derivatives of this problem. In conversations with business owners or managers, we learn that initially everything was going great, even profitable, and expanding quickly, but that at some unpredicted point, things went wrong, they lost customers, money, and worse, their reputation. Despite allocating more resources to address the issue, the issue grew nonetheless. In order to find out where the problem stems from, counselors are sought for support. After the examinations, the “inter-departmental communication problem” becomes one of the most important main topics that emerged. To eliminate this problem, a series of action plans are created, and without wasting any time, these plans will start to be realized. Among the solution suggestions, trainings are frequently included. Solutions are tried to be created with trainings covering communication, being a team, leadership, working together, values, and many other topics. Despite the fact that these trainings, which bring great gains to organizations of all sizes, provide signs of improvement within the business for a while, it is seen that similar problems arise again after a while. It is often thought that this depends on the human resource cycle and can be overcome through regular training. Although these efforts have highly successful impacts, they provide only temporary pain relief and are insufficient to solve the root problem. Probably, the “inter-departmental communication problem” will recur at the company’s next year-end review meeting. If the root cause of this increasingly chronic problem is not found, the necessary solutions for recovery cannot be found. In order to understand the reasons for this communication problem, it may be useful to look at the educational process in Türkiye.

In Türkiye, students are forced to make an almost compulsory choice from high school onwards: science, social, or equal weight. Although these expressions, which indicate the score types of the departments to be chosen as a result of the university entrance exams, may initially appear as terms

expressing the scoring system, they are actually the first stage of young people's future career choices. This choice leads to the formation of two different groups that are miles apart after a while. The groups that start to be labeled as "science choosers" and "social choosers" begin to differentiate and group themselves during their university years. Given the course and examination loads, this polarization increases. A medical student communicates only with medical students, a computer engineering student with electronic engineering students, and a business administration student with finance students, while communication with students from other departments is almost non-existent. During the university years (4-6 years), students use sarcastic expressions about other departments and the students studying in these departments - in their communication among themselves or with their professors. Students who stay in this communication environment for years do not take part in a joint project or academic work with students in the "other group." Students who graduate without empathy find themselves in a similar environment in their professional life. Technical and commercial teams eat separately, attend events, and communicate as little as possible. When they look at each other, they see the labels that have been coded in their minds for years -to put it mildly, "science choosers" and "social choosers." I am well aware that this is a very generalized view. Although it is encouraging to see this assumption being debunked in both new educational approaches (based on a collaborative project and product development) and changing organizational structures, it is still not happening as quickly and widely as it should. I recall that when I was a computer engineering student in Denmark, students from various departments -including the biology department- were among those taking the artificial intelligence course. I can attest firsthand to the significant contribution of this to the interaction of various viewpoints. Focusing on projects involving interdisciplinary collaboration, interaction, and communication from the undergraduate level will be one of our universities' most significant initiatives. Before beginning a career in the workforce, taking interdisciplinary cross-curricular courses within the parameters of the chosen projects, working on joint graduation projects, and even going beyond the project and attempting to draw out a commercial product idea from these collaborations will all be critical contributions to the development of a product culture. It will become simpler to build teams that understand the customer and one another well, listen, and come up with solutions together in professional business life as the quantity and caliber of these studies that enable the development of empathic thinking increases. After this rough evaluation and solution suggestion, let's leave the educational and sociological facets of the problem to experts in their fields and look more closely at how it affects product management.

Communication in Product Management

When people from different disciplines and cultures collaborate peacefully, product development is possible. For example, in a company developing software, individuals from various departments, including software engineers, sales teams, marketing teams, and project teams, are present together and frequently collaborate. The communication issues that organizations complain about are specifically between these teams, or even worse, between the customer and the company. .

A lack of understanding of the needs of the customer, incorrect development of what is understood, and inaccurate representation of what is developed are just a few examples of the increasingly complex issues that can arise from unhealthy communication.

Successful product managers are individuals with good communication skills. Due to their position, they work to ensure the advancement of the product by keeping in touch with everyone who works

on it within the company throughout the product life cycle. They work to communicate with technical development teams the best understanding they can of market or customer needs. For sure, this transfer will most likely manifest itself as the conversion of straightforward everyday language requirements into a technical language. A technically complex product may sometimes need to be explained to sales, marketing, or customers in a clearer, simpler manner. In a sense, product managers play the role of brokering an understanding between groups that label each other as “science choosers” and “social choosers”, providing the translation or making sure that both sides understand each other correctly. Communication skills also include persuasion skills. The majority of a product manager’s time is spent persuading top management, technical teams, sales teams, quality, and test teams of something. This communication may take the form of debating the viability of supposedly unachievable technical advancements or it may take the form of soft-pedaling a feature that is wanted under the pretense that it will significantly boost sales but have little effect. This conflict, which can happen multiple times per day, is fought with or against individuals and groups from various fields for which the product manager is not directly accountable. The capacity to communicate is the sole influence the product manager has on these people and organizations. Product management makes ensuring that negotiations between all internal and external stakeholders go smoothly and that the product accomplishes its goal. In order to guarantee that the product completely satisfies the identified needs, that time and resources are used effectively, and that quality and customer satisfaction are maintained, it is crucial to have constant communication. At companies that develop products, this is possible only through product management.

Product management acts as a bridge to link departments across disciplines, individuals with various priorities and viewpoints, as well as businesses and customers.

As can be seen from the survey results, communication continues to rank among the top challenges that product management struggles with and has difficulties with, even if a business has been conducting product management for many years and even if product managers have outstanding communication skills. A few of the factors that can either help or hinder the communication challenge include culture, differences in time and space, priorities and perspectives, expectations and human psychology, and even language, beliefs, and ethnic considerations. One of the most challenging issues is how to solve an equation with so many different variables. Therefore, fixing communication issues requires more than simply establishing a product discipline once or designating a product manager for each product. The product culture needs to be made permanent and sustainable.

Although there are descriptions of product management challenges in Türkiye that include words like “science” and “social,” it is puzzling that communication does not show up as a top concern in the survey results. There is not any research on this topic that has been done in Türkiye, to start. However, the equation is made a little bit simpler by the fact that Turkish businesses are more locally focused than the participating businesses in previous polls, and that issues like language barriers, ethnic barriers, and time and distance differences are either nonexistent or insignificant. Organizations having an international personnel profile are particularly impacted by such issues. Additionally, companies in Türkiye require significantly less communication with individuals and groups than do international companies. This enables communication that is relatively quicker and more effective. Despite these things, one of the biggest problems of companies in Türkiye is communication. Communication is not at the top of the list since the strategy is a far bigger issue for our companies than it is for communication.

3. STRATEGY

“In a company without a strategy, a common communication language cannot be established!”

Kadir Kuğu

The desire to meet a significant demand or take advantage of a significant opportunity is what motivates product development decisions. Only with a carefully thought-out approach will this desire be realized, a successful conclusion will be obtained, and its continuity will be guaranteed. While a product idea may occasionally enable a company to exist, it frequently develops in line with companies' strategies in order to accomplish their purposes. For companies, a strategy is a series of plans and roadmaps that specify the reason for being and list the main objectives to be accomplished over the next medium and long periods. It is not about short-term or immediate objectives. It is not about establishing secret goals that are only known to the company's founders. It is unaffected by daily operations or temporary environmental factors. In truth, strategy is the “north star” that businesses rely on to keep them focused on their objectives and prevent them from forgetting their reason for being. Product strategy aligns with business strategies and dictates the life purpose of products.

It is a waste of time and resources to create a product that either operates independently or does not align with the corporate strategy.

Do you think the above sentence is weird? Although there were significant problems that product managers in international organizations faced, such as priority and communication, the strategy was left out. Contrarily, our observations in Türkiye showed that the most significant issue was the strategy. You could initially believe that developing a product strategy or choosing action plans that are in line with this strategy are challenging tasks. However, the actual cause of this is not the weirdness of the opening sentence of this paragraph, but rather the simple fact that such a sentence even exists. Companies with a solid strategy will not spend money on a product idea that is not in line with the corporate strategy. This indicates that no work is done on such a product because it is abandoned during the idea stage. Let's revisit the sentence now. It is a waste of time and resources to create a product that either operates independently or does not align with the corporate strategy. In short, it appears that the product proposal was approved for whatever reason, and more or less time and resources were spent. It is anticipated that the outcome would be underwhelming. No matter how good the product idea is, if it is not in line with the corporate strategy, it is not taken into consideration in companies with a product culture. Because of this, product management does not generally struggle with strategy in such companies. Because the company's strategy is clear and straightforward. Product management's job is to develop the product strategy in tandem with the corporate strategy and to decide on action plans that are in line with this strategy. Here, the problem that may arise involves issues with the formulation of product strategy or tactical choices as a result of environmental factors. In the case of companies in Türkiye, the issue is that the product is either out of alignment with the corporate strategy, or, worse, that there is no corporate strategy at all. Let's take a closer look at both cases.

Relationship Between Corporate Strategy and Product

When we consider companies that do not have a direct correlation between their corporate strategy and the products they create, we can see that their original goals were to create a project with a ready customer, to maintain, support, or integrate an existing product, or to engage in sales activities as a distributor or manufacturer's dealer, rather than to create products to address a particular need. These companies eventually generate "products" as a result of the completion of their projects, the existence of too many projects that are similar to one another, and the emergence of various ideas based on actual field experience in maintenance, support, and integration work. As a matter of fact, even this approach is a short-term measure taken to make use of resources for other objectives rather than to accomplish a specific goal. Project work is frequently done to take advantage of government incentives to pay staffing costs and operating expenses while preserving the core business. For example, in 2020, TEYDEB projects received a total of more than TRY 669 million, of which TRY 376 million, or 56% of this support, was given to the 456 projects that were chosen from the applications received under the 1501 - Industrial R&D Projects Support Program (TÜBİTAK, 2020). However, it is unknown how many of these projects have been profitable or are perfectly in line with business objectives. Such companies eventually stop devoting time and resources to concepts that are in the development stage for whatever reason. Projects completed in order to acquire government incentives are put on hold, hastily developed products are given up in favor of new projects to bring hot money, and resources are reallocated to new projects in another popular industry. While the pursuit of bigger commercial returns quickly may appear to be the driving force behind these shifts in corporate strategy, the true cause is that company's product development initiatives are not in line with its strategy.

Consider a software company that has staff with expertise in the field of embedded software and that offers project-based labor to numerous businesses in the sector and the public sector. This company also uses government incentives to lower its operating and labor costs. Without being aware of the firm strategy, the teams chosen to receive the incentives develop a concept for a mobile application. Although the idea appears to be feasible given the human resources at hand, government incentives are also available given the idea's focus. As a result, these incentives might be used to compensate the expenditures of the staff who occasionally remain idle. Some employees may even be given concurrent assignments to multiple projects, resulting in double income. Senior management or business partners support the concept. A technical team is swiftly put together using available resources and starts developing. Government incentive is used, and the implementation is finished within the allotted time. The application is put on hold, and the relevant team is moved to another project after the auditing organization has reviewed and approved the project deliverables. The application developed lacks a roadmap, a true sales target, customer and user requirements, market and competitor analysis, or a product strategy. Also, the business model, documentation, and marketing action plan for the product were either not studied or were created only for project acceptance. The company owner or manager who believes that he/she is saving money on employee costs for a certain period of time is actually losing a lot of money. First of all, in order to get temporary gains, the company used its time and resources for a work that makes no contribution to its sustainability. Employees that took part in the project lost their respect for their workplace and their motivation after facing the reality that the work they made efforts for would not be used by anyone or solve any problems. The idea that could be turned into a commercial product by someone else was prevented from being supported by the government. A result with no winners. This example is created to better explain the importance of a strategic approach. There are several valuable projects and products that were and are being created with government incentives in Türkiye. On the other hand, losses like the ones set out here are also suffered.

Worse than companies with no alignment between their strategy and the products they develop are companies that do have no strategy at all. Such companies are usually those that are founded to



directly solve a problem and even to produce products for it. Like in many other companies, founders set out to find a solution in their area of expertise or to a problem they noticed. The development of the idea from a technical standpoint is the main objective in such ventures that typically have technical capabilities. There is no comprehensive plan for the medium and short terms. Even if there is a plan in place, it lacks a strategic approach. Either market, competitors, customers, and users are either not fully analyzed or commercial models are not put in place. Because there is no powerful and written strategy, they have no action plans aligned with that. The company set out as a ship that has neither a route nor a destination. A while after launching their products, such companies complain that the customer does not understand the product, that the market is not yet ready, that customers prefer competitors' products even though they are more expensive, that the product is unusable for various legal reasons, or that they cannot make sales. We can enable some of these companies to hold on to the market and grow by conducting strategy studies, albeit late. However, such enterprises that are built on ideas that are too late to be strategized or that should never have been developed in the first place are disappearing. According to Deloitte, 90% of startups fail in their first 5 years, while around 45-50% die before seed funding (Deloitte, 2021). On the other hand, 20% of the startups in Türkiye cease their activities in their first year (TÜİK, 2020). The reasons include financing problems, human resources, product-market mismatch, mismanagement of operations, and deviations from the original strategy. The majority of these reasons can be taken into account in the scope of the mistakes made in the beginning analyses and problems with the strategy.

Regardless of the company or product, the key to a good strategy is analysis. Good market and competitor analysis, accurate analysis of customer and user requirements, investigation of legal constraints, and knowledge of strengths and weaknesses for internal and external factors are crucial in making investment decisions and creating the right strategy. Despite the fact that analyses show certain results, pre-realization of the idea and product and verification by the customer and user would prevent bad surprises after the actual production. These inputs and all others alike would be used to create the strategy. Based on these inputs, a comprehensive strategy that includes the creation of a business model, access to finance, investments in human resources, product roadmap, customer acquisition, global objectives, and exit goal is created. In order to realize the strategy, key performance indicators (KPIs) should be clearly identified and required action plans should be created. In order to ensure that the company or product is acting in line with the strategy, key performance indicators should be regularly checked. Where required, new indicators or action plans may be created for new conditions.

We have a concrete objective and a strategy to use to attain that objective. Now, we can question the alignment with our strategy when making decisions about the future of our company and/or products. This way, we do not bother with the game development project if we have a business operating in the field of cyber security. On the contrary, we ensure the development of both our own business and the ecosystem by building business partnerships with game development companies. Our product's strategy aligns with our corporate strategy, and we have detailed action plans including the risks.

The realization of all of these and the ship's reaching its destination is possible only with confident and patient leaders. These leaders do not take initiatives that may look like short-term gains but will make them compromise their strategy. Nevertheless, in structures with a chain of command system, the fact that the strategy is known only by the leader makes them win the struggle, whereas in today's business structures situation will lead to failure. Employees that are unaware of the goal and strategy, cause resources to be misused even if their intentions are good. Add to this the fact that their self-sacrificing efforts are not recognized or appreciated, and you have a spiral of unhappy employees and unhappy customers. The key to overcoming this is to create a product culture throughout the organization.

4.

PRODUCT CULTURE

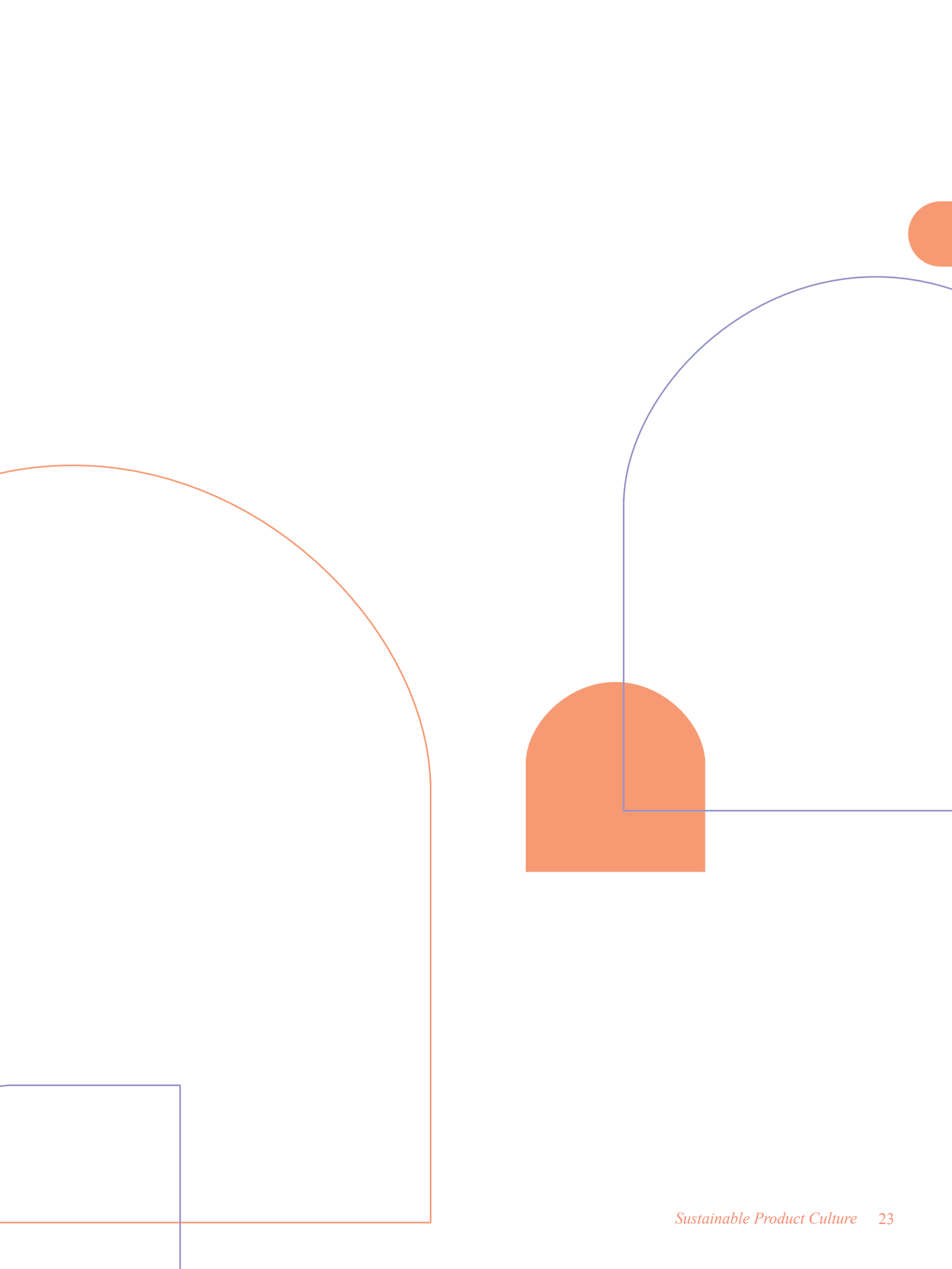
No matter what is done, there may still be some communication issues. Changes in human psychology in response to individuals and circumstances may disturb the balance of communication. Many variables from demographic characteristics to the platforms on which communication is established affect communication. One of these is the national culture. Studies showed that national culture affects the performance of the product. For example, companies with collaborative cultures tend to have better cross-functional integration, or, in other words, better departmental communication, than companies with individualistic cultures. A strong integration between cross-functions positively affects the product's performance (Andreas Engelen, 2012). The situation is similar with respect to strategy. Clearly communicating the strategy does not ensure that all activities will always be carried out in accordance with it. It should be ensured that actions are aligned with strategy. Both of these concepts need to be maintained and a product culture needs to be created by product management in order to maintain strategy and ensure uninterrupted communication with organizations that develop products.

Culture is about people. Therefore, to create a strong product culture, product thinking should be incorporated into the mindsets of people within the organization. People who are results-oriented or process-oriented need to ensure that they incorporate the product in every decision they make. For example, it should be ensured that a software expert thinks each of the features he or she develops is appropriate for the scope of the product. Sometimes, some experts get carried away with the joy of development and want to include additional features that are not actually requested but that they think will bring good results. Called “gilding the lily”, this situation would usually lead to the realization of Murphy's law. It should be ensured that the sales team has similar concerns. New customer requests not covered by the product strategy need to be managed well, and no pressure should be put on product development teams. In companies with a well-developed product culture, software teams do not feel the need to gild the lily, and sales teams do not tend to stray off-product paths to attain their sales objectives.

Product culture can be created and maintained through product management, particularly in organizations that are trying to acquire this culture later. Product managers in charge of product management endeavor to ensure that the other people and teams they work with do not stray from the product culture. Product strategy, and therefore corporate strategy, continues to be regularly communicated through product management to every group that touches the product, from development teams to sales and support teams. This way, it becomes an established behavior for each member of the group to take the strategy into account when making decisions. From product road mapping to scoping, from prioritization to collecting customer feedback, product culture muscles continue to be strengthened by the impact of product management. On the other hand, if regular and disciplined works are not continued, these muscles get weak again. Sometimes, rapid growth or rapidly changing ecosystems may lead the culture to get weaker. The globalization of a local business, unplanned growth in human resources, or changes in organizational structure can cause this weakening. We can see this even in some technology companies that have become international giants. One of the biggest challenges in such companies is to ensure the unity of purpose among multicultural human resources and to increase interoperability. Product management tries to ensure that bridges are built between people from different cultural backgrounds and that communication and interaction, and therefore collaboration, are maintained.

5. CONCLUSION

In organizations such as companies that develop software products, product management makes it possible to establish communication and interaction channels among different departments or individuals, especially between technical teams and sales teams. Likewise, it is also possible to spread the product strategy throughout the company, to stick to the strategy, and thus deliver the products to the target through product management activities. The dissemination of the product perspective to all employees involved in product processes and its maintenance by product management ensure the creation of a sustainable product culture. While the products of companies with strong product management attain the target, companies that create a sustainable product culture turn into brands with international fan customers.





CHAPTER

3

THE PROPOSITION OF DIGITAL TRANSFORMATION IN PRODUCT MANAGEMENT LEADERSHIP: CHANGING- TRANSFORMING PRODUCT MANAGEMENT



ÖMER HAKAN KUTLU

Ömer Hakan Kutlu graduated from Izmir Science High School and Electronics Engineering Department, Bilkent University. He holds an MBA degree from Middle East Technical University and an MSC in quality management master's degree from the University of Sunderland, UK. He started his professional career at the Department of Business Administration, Middle East Technical University with the goal of an academic career, and he worked in the private sector in the cement and ready-mixed concrete sector for a short period and then in consumer electronics for many years.

Currently, he works as a C-level executive responsible for brand management, branding, sales and marketing management, online sales platforms, product management, product design, business development, international and multinational organization building/development, and strategic business units in international markets. He is also an active member of the fund allocation board of a private venture firm that supports entrepreneurs. In addition to that, he teaches global management courses as a part-time faculty member in a university's executive MBA program.

1.

INTRODUCTION

In the 2000s, digital technologies gave everyone who wanted to start a business the chance to do so, as well as opportunities for existing companies to differentiate their business areas. Organizations doing business in consumer electronics were also very advantageous as these opportunities were given. Some organizations have taken full advantage of the transformation opportunities brought by digital technologies, whereas others have missed them. This article observes what has and has not been done in consumer electronics over the last 10 years from a product management perspective and proposes a working model where product management can contribute much more to utilizing digital transformation opportunities. I have tried to build this proposition on 20 years of international product management and marketing experience in high-tech business areas. Proposed methods have never been exactly applied in any company. The applicability and success potential of the proposed methods can be identified by an additional academic study.

2.

THE CONCEPT OF DIGITAL TRANSFORMATION

Digital transformation defines the process of creating solutions to social, organizational, and industrial needs through the integration of digital technologies and the resulting development and change of ways of doing business and business culture. Centering on creativity and innovation, digital transformation emerges to achieve more efficient results than traditional methods. The requirement of “technology adaptation” in digital transformation has been added to the concept of “change,” which has been ardently studied in organizational theories for years.

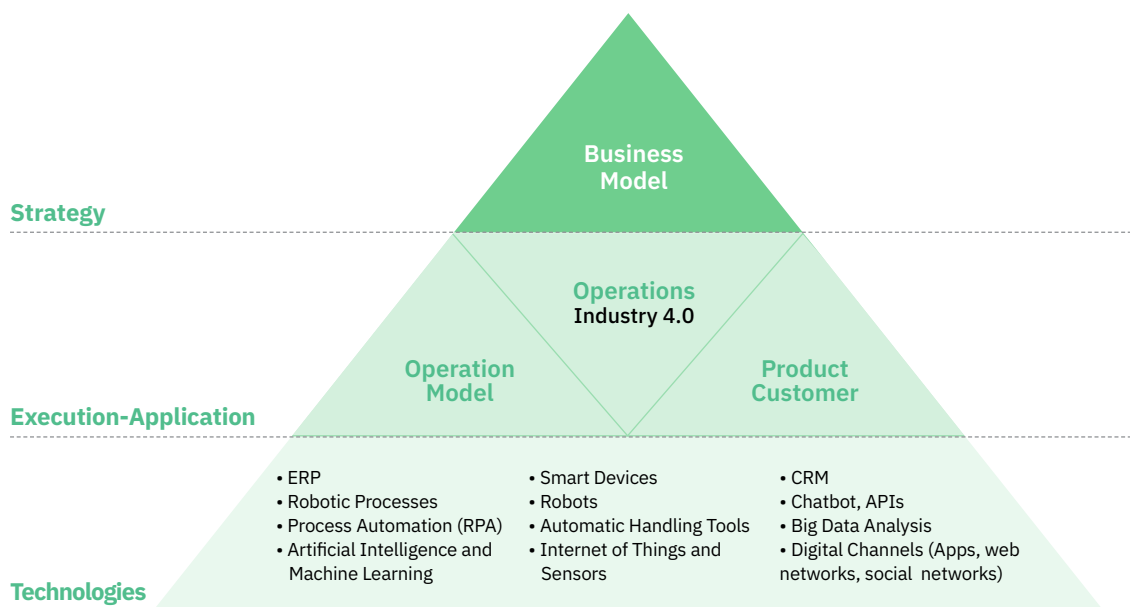


Figure 2: Digital Transformation Pyramid (Turchi, 2018)

The objectives of digital transformation can be analyzed under two main categories. The first and relatively more important of these categories is that organization starts to do business and makes money with a new business model in a brand-new field. The second one is efficiency, operational improvement, optimization of processes, and customer satisfaction. To explain digital transformation and its relevance to product management, which is one of the main objectives of this article, Turchi's (2018) pyramid in Figure 2 is a useful tool. Certain objectives are achieved by assigning missions and tasks to the functions at the bottom two levels of the pyramid. These are more operational, more technical objectives that can be attained by getting external support. Positive results are obtained when the objective and budget are set together and with the right timing.

“Digital transformation projects,” which bring the greatest benefits from digital technologies and serve as models for all organizations, are among the first that are encountered by individuals who are interested in, study, and read this issue. At the top of the pyramid, these businesses -which we all envy- created brand-new business models and grew to be the biggest in every industry. With the help of digital transformation and digitalization initiatives, entrepreneurs and existing organizations are inspired by what these companies do and are trying to create a solution model that their customers and/or consumers will adopt for any problem they find.

Amazon: As it was on its path to becoming the world's largest virtual marketplace, it turned its data storage system into a product and created a brand new business completely independent of its work.

Airbnb: It created the virtual platform that provides the most accommodation options without owning a single hotel.

Netflix: It created the world's largest virtual movie streaming platform without a single physical movie screening location.

Uber: It created the world's largest transportation platform without owning a single vehicle.

Meta: It has created the world's most widely used social communication and advertising platforms.

Tesla: It created the platforms that triggered the proliferation of electric vehicles and recyclable energy.

3.

THE ROLE OF PRODUCT MANAGEMENT

To attain their digital transformation goals, some of the organizations used the method of hiring an outside consulting firm or outsiders with transformation experience and creating new positions. Similar difficulties and opposition to change processes are encountered by external initiatives to modify and transform organizations. Because transformation efforts are also aimed at differentiating the existing culture, it is not easy to put strong organizational muscles into the desired shape.

The other method, on the other hand, was the efforts to ensure digital transformation by putting additional responsibilities on the shoulders of product management through a fast organic restructuring, instead of defining new positions in the hierarchy. Over time, this method has been understood to be fast and practical. This was the practical method observed particularly in organizations in Türkiye. This is how transformation efforts that were seemingly nice for the board members and stakeholders started. How much of this can be accomplished with the correct authority and effectiveness is one of the topics this study questions.

One of the key roles in digital transformation activities is usually played by product management. The proposition of this article is to define the absolute lead role for product management.

The transformation must be led by “product management,” which can keep up with technological advancements, adjust to the requirements of new business models, and relate to the established order.

Even in organizations without a designated product manager position, someone is tasked with carrying out product management duties. These persons often have both commercial and technical competencies. In order to create the new business models that the transformation at the top of Turchi's (2018) pyramid requires, a product management leadership that is able to develop technical capabilities, see commercial potential, articulate customer needs, and link and coordinate functions is needed.

3.1. CHANGE OF BASIC WORK PLAN

The work plan for product management, which is primarily based on market development and customer requests, now includes two other crucial components: inclusion in the ecosystem and data evaluation. Sacolick (2016) explains that in Figure 3.

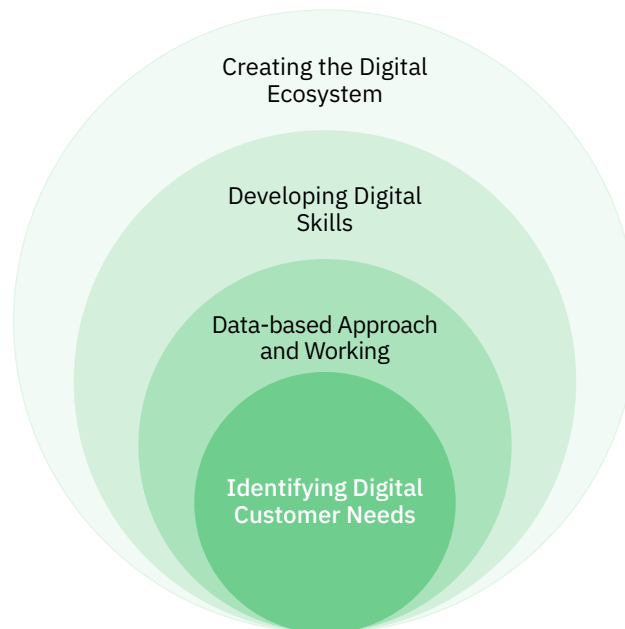


Figure 3: Product Management Responsibilities in Digital Transformation
(Sacolick, 2016)

What customer wants was important also when no one mentioned digital transformation. Then, product management was again questioning market and customer needs. With digital transformation, changing needs are still being questioned. Likewise, product management is expected to lead the development of the organization's capabilities in order to design new products and services. On top of these, the duties of product management to alert and guide the organization to the adaptation requirements of digital technologies are increasing.

Digital Customer Needs: Product managers are also required to view customer requests through a digital lens in order to fulfill their responsibilities. Digital technologies that can be utilized to meet customer needs and solve their problems must be understood and employed. The best way to make the services that will be offered to consumers through products or online, mobile, or social media into a condition that is advantageous for the consumer is sought after in a cycle.

Data-based working and approach: Any kind of data explains much when it is analyzed. After data analysis, it is possible to discover consumer behavior, buying habits, how and how frequently a product is used, and various other details alike. Finding a solution to the question "How is data created?" is where this job begins. Software that is embedded into the designed service or the good can be used to store data on fixed sites or in the cloud. One of the initial steps is to design the products to record the data to be generated by the consumer in a maximum manner and in compliance with the law.

Creating the ecosystem, being included in the ecosystem: Smart products become "smart" when they are able to communicate with other products in addition to being connected to the internet. Smart products are positioned in the market depending on the digital ecosystem they are to work in and their interoperability. Product management plays a key role in building ecosystems from scratch or being included in existing ecosystems.

Developing digital skills: Under the leadership of product management, the organization's capability and infrastructure gaps on the road to transformation and digitalization are identified and complementary steps are taken. Fundamental skills, such as access to data, data utilization, digital communication, adaptation to competitive conditions, problem-solving, and adaptation are required.

3.2. CHANGE AND TRANSFORM

There are many potential transformation projects that consumer electronics and home appliances companies have potentially initiated or are about to initiate. The first thing that pops up in mind is the transformation of design, production, and procurement sub-functions, which seem ordinary in their work, into an added value with a transformation perspective. Some of these are as follows:

- The transformation of the data occurred as a result of the use of smart devices by consumers into added value by manufacturers and brand owners. Developing a system for collecting, storing, and analyzing data, and providing added value by selling the interpreted data to the brand owners that sell the devices to create new product ranges and use them in after-sales service activities.
- Making the data generated as a result of the use of smart devices by consumers to provide added value to companies engaged in the production and marketing of products that are used with the device, such as detergent manufacturers, and ready-to-eat food manufacturers. Developing a system for collecting, storing, and analyzing data, and providing added value through the sale of meaningful data to companies that study and use consumer purchasing behaviors.

- Enabling devices with screens to deliver advertising and content to consumers. In products, such as cookers, washers, dryers, coolers, and television receivers, displaying food storage recommendations, cooking techniques, usage tips, and other information alike and commercial advertising content on the screens of the device at specified frequencies, provided that it is accepted by the consumer, and providing commercial added value in return..

In this article, I will make the transformation model and product management role proposition through the project “Creating, Collecting, Making Sense of, Using and Monetizing Data.”

3.3. PROJECT STUDY: CREATING, COLLECTING, INTERPRETING, USING, AND MONETIZING DATA THROUGH SMART DEVICES

With the development of digital technologies and internet infrastructure, smart devices that can connect to the internet and communicate with servers and other devices have been designed and offered to consumers. Initially, it did not attract much consumer attention, except for the benefits such as “turn on, turn off, give status information.” With the proliferation of platforms that create ecosystems, the use of multiple smart devices together has become more useful for the consumer. On the other hand, the smart features of televisions, one of the leading smart display devices, have become more widely used by consumers with content becoming richer and easier to access.

With the impact of digitalization, intangible assets are now becoming as important as tangible assets. Data is seen as the most important intangible asset in the current economy and spans across many branches such as data creation, distribution, management, etc. In this respect, the majority of data value creation in the digital economy is believed to occur within companies that create their own data (Sonderegger, 2019). Stating that most data can be bought and sold and that this practice has its own risks, Sonderegger says that despite this, data is often never actively on the market and is used within the company where it was created, unlike other assets. This means that value creation in the data economy usually occurs within the company that produces the data. According to Sonderegger, there is a hidden data economy within each company. The data supply in these companies and the demand for data from their customers and their own employees also pose challenges with respect to management.

In a world where the annual amount of data generated by all users is expected to reach 175 zettabytes in 2025, for preventing the accumulated data from turning into “information garbage”, it needs to be analyzed and interpreted correctly (Ozdogan, 2021). Because good data management results in significant value and revenue for companies in making the right strategic decisions, better risk management, and actions for customers. The definition of data as “the new oil of the economy” highlights that data that is not processed will not generate value or become a source of income. Producing knowledge by processing and making sense of data and accumulating experience from this knowledge adds value to the organization. Therefore, it is possible to generate income indirectly through data analytics based on the idea that “by discovering new and digital data mines, incorporating more, diverse, and rapidly growing data into the organization, new methods can be found and answers to business problems can be sought”.

Diversifying, collecting, and making sense of the data generated by the use of smart devices by users is a complete digital transformation project for those working in this field. Consumer usage and behavior data that is interpreted (how they use the device, when they turn it on and off, which functions they use and with which priorities, how often consumers in which location use the devices, etc.) can be used for developing new products, sold to content and advertising companies, i.e. it has monetary value.

It is possible to tap this potential with the product management perspective. Once its potential is

recognized, it is very likely to be presented by product management to senior management for approval to be selected as the primary digital transformation idea and project

4. KEY CONCEPTS IN TRANSFORMATION

Following the definition of digital transformation, the two concepts described at the beginning of the article as the goals of transformation, “making digital technologies available and benefiting from them” and “creating brand new business models” encourage the organization to evolve towards a digital culture. The successful implementation of transformation ideas depends on the pace of the culture change as well.

We can list the important concepts for the realization of the idea as soon as possible and the success of the project under the following 5 main categories:

1. Adoption by the top management
2. Product/idea ownership and leadership organization
3. Strategic goals
4. Agile approach
5. Product and servicing alignment

4.1. ADOPTION BY THE TOP MANAGEMENT

One of the most important assumptions of mine is the willingness of the executive board, and the top level of management, especially the CEO, to implement digital transformation not because it is a general trend, but to utilize organizational efficiency and even to explore new organic and inorganic business fields. Ideally, the leaders constituting the top management are in the learning mode (Ashford and Keating, 2020). Top management that is ready to reduce the level of decision-making to lower levels and to share decision-making mechanisms with transformation project leaders is a prerequisite for success in the adaptation of brand-new ideas inspired by benchmark organizations. The “data creation, use, interpretation and monetization” project may seem too small in the overall financial production value of the organization, but it requires exemplary top management leadership since it can lead to innovation and other transformation projects that can bring radical results. This may be called change leadership as well. In addition to the data to be created by the devices in the market, designing new devices in the manner to create and store much more data and increasing their future benefit potential is possible with the top management support that transformation projects are to be provided with and with sharing authority with project leaders. It is critical that the transformation project and budget are quickly approved by the CEO or the Executive Board and that internal communication is effective. “We pay importance, we are fast, it is very important to us, we are investing in the future” should be the message.

4.2.

PRODUCT/IDEA OWNERSHIP AND LEADERSHIP ORGANIZATION

The “change and transformation” leadership tasks that top management practically imposes on product management are not as easy as expected. It is often not possible to manage the targeted process with the existing organizational structure against the hard organizational muscles. In addition to the responsibilities given, authorization must be given as well. This is where the powers that product managers need to be given and the recommendation for positioning within the organization begins, for organizations to effectively make digital change and transformation. Digital transformation trends and change requirements are more or less known and followed at every level of the organization. It is the instruction of the top management that ensures action is taken within the organization. The idea of implementing this project of using data and creating added value on the path to digital transformation will most likely not come from top management, but from younger employees who better understand the value of data. It is essential that those who came up with the idea are involved in the project. If the owner of the idea is not in product management, one of the elements of the recommendations is that this person should be partially or fully assigned to product management and, if possible, assigned as the project leader. Another important issue is to appoint a product manager as the project leader and to manage the project with a single leader. It is an advantage at the initial stage if the project leader is a mid-level manager whom product managers who are responsible for products in the consumer electronics category report to. This accelerates the early stages of the project. This way, the project team is created faster, and more people adopt the project more quickly. The project leader reports to the CEO, rather than the person he/she reports to for and during the project.

4.3.

STRATEGIC GOALS

Strategic goals are one of the much neglected and pretty effective concepts. An organization's strategies, mega-goals, and road plans are determined based on the vision and mission set by its shareholders and senior management. Even without the transformation movement, strategies and goals were determined based on vision and mission statements and communicated to the right levels. As experience has shown, vision statements written on the back of ID cards or big signboards in the organization are not enough. The strategies of the transformation movement are built on the primary vision and mission. The executive board should delegate the strategy for the transformation project to the project leader in order to develop the mega-goals and road plans and should act as the approval authority only. The strategy and mega goals should be communicated to middle management (vice general managers, directors, group managers, depending on the organization), and it should be ensured that these persons act in line with what is written. When goals are achieved, it is announced. An organization that aims to derive value from data should adopt such a strategy that is in line with its vision and mission -for example, “product designs that create, interpret, and add value to consumer behavior data while providing customer satisfaction”- and set sub-goals. On the other hand, as for the mega targets, for example, “to generate data evaluation revenue of 2% of total sales turnover through new product designs in 3 years” would be a very guiding and clear target. On the contrary, a transformation movement that says “we created the project group, appointed its leader, let's see what they come up with” and lacks goals is unlikely to succeed.

4.4.

AGILE APPROACH

Formation of the project group, setting strategy and goals, and approval of the budget should follow each other and be fast. Digital transformation projects are also innovations made by the organization. The basis of being agile and agile transformation is positive developments in the corporate culture in addition to being fast. Although the number of people in the group aiming to derive value from data is not crucial, it is up to 10 employees in technical and commercial fields. The primary work of the group members is this transformation project. Full-time work is preferable but not essential. The agile approach takes group workers out of their own functions, enabling them to creatively contribute to solving complex project problems and manage the group. The main objective is to significantly increase the efficiency of creating new ideas and problem-solving in the project. The most sensitive issue for the project leader is the project staff and their interactions. Processes, time management, methods, and tools to be used are important, but the people and their interactions are more important than these. For sure, it is not easy to implement the agile approach only in transformation project groups if it is not applied throughout the company. For differentiating from entrenched ways of working, pre-training first the leader and then half of the group may lead to faster progress. The purpose is to change entrenched perceptions of company management and create a new definition of the issues targeted for transformation.

4.5.

PRODUCT AND SERVICING ALIGNMENT

There were organizations that have been working in this manner for years, thinking that the entire process ends after the design, production, and delivery of the product to the customer, market, and consumer, and such organizations still exist. Such organizations do not have the slightest data on how much the product is appreciated by the consumer unless very serious product failures occur. Because digital transformation has made prominent the end consumer and the use of data, it has become important to continue communication, update product features, and facilitate consumer feedback after the product reaches the consumer while designing the product. This planning that we roughly call “designing the product with the flexibility to create servicing” has become one of the primary responsibilities of product management.

4.6.

PROJECT IMPLEMENTATION

The project group utilizes a business plan inspired by A. Osterwalder’s “Canvas Business Model” in their works. The noteworthy issue here is that the project group does not make a traditional project plan, but manages the project by making a business plan. Based on the observation that following detailed forecasts and plans used in traditional project management reduce the speed of project groups, it is more appropriate to follow a business plan based on strategy and mega-goals. There is a division of labor and assignments within the project group, and those who are assigned tasks follow the relevant plans themselves.

Important Partnerships	Important Activities	Value Proposition	Customer Relations Customer Segments
No important partner was envisaged at the beginning. The key partners to sell the product/service are original material manufacturer (OEM)/ original design manufacturer (ODM) customers.	• June 2019 - Phase 1 Start • Customer meetings • Collecting feedback • Reshaping the data and the table of indicators • September 2019 - The first sale agreement • November 2019 - The first sale invoice • December 2019 - Phase 2 Start	Customers can analyze and learn the following: • General average user monitoring • Average product lifecycle • Average product connection • Average user's content consumption behavior • Relationship between monitoring behavior, content consumption, product category • Regional comparison with the competitor	The key partners to sell the product/service are original material manufacturer (OEM)/ original design manufacturer (ODM) customers.
	Important Resources • Yönetim ve insan kaynaklarının tahsis edilmesi • Bulut yatırım		
Cost Structure		Revenue Streams	
To be determined		1. Control panel sales will be offered to customers on monthly payments (e.g. X000 Euros/month). • Free of charge in the first 2 months • Aims to secure 10 control panel customers in 2020 • Aims to secure 20 control panel customers in 2021 2. The Proposition AI will be offered to customers based on cost (e.g. X USD/unit).	

Figure 4: Canvas Business Model Case Study

As seen in the figure above, the first to be identified are the business partners and customers to work with. It is essential that the project phases are shaped at every stage with close collaboration with customers and feedback.

4.7. CUSTOMER ALIGNMENT

The final product of the project group is a dashboard. The sum of the meaningful data to be sold is presented on this dynamic dashboard. It is important to present the dashboard to customers periodically in a “prototype” logic and to collect their questions and additional needs. It is inconvenient at the presentation stage to enter sales arguments that will bind customers. Customers should be asked to take their time only and feel free to tell their ideas. Another advantage that the agile approach creates in transformation projects is that it targets customer satisfaction. Acting together with customers ensures that more realistic and faster solutions are created.

There are two types of customer potentials: The first one is brand owners who buy electronic devices, and the second one is advertising and media organizations who want to use the data in their work. As expected, the first group is relatively easy to reach. It is ensured that the existing seller-customer relationship evolves into the creation of a different product and, if possible, trade. After the customer sees the potential benefit, the cooperation process gets faster. The second group of customers is mostly unknown, and it takes time to reach them. It is known that media groups are also interested in such data, but reaching the right people and communicating the benefits takes longer than it does

with the first group. The product to be designed for the second group of customers is different. It is differentiated by the demand to create and aggregate data that was not previously planned.

The design of the software to collect data goes through an iteration process with feedback from customer interviews. The members of the project group responsible for the design hearing the customer demands first-hand eliminates the time lost between iterations.

Particularly because of the personal data protection laws developed in recent years and the principles regarding the rights of data subjects, it is essential to have a member within the group to assume legal responsibilities in the process of collecting data and using the interpreted data. This person does not need to have a law degree, but only an interest in the issue.

It is important to collect data autonomously. Making data assets easy to be accessed and analyzed by analysts and building an algorithmic structure out of the accessed data are important outputs in the project implementation.

5. CONCLUSION

I discussed my ideas on what must be done for success and the ideas that should be taken into consideration using the example of a transformation project that partially addresses both “doing business and making money in a brand new field with a brand new business model” and “improvements in efficiency, operational improvement, optimization of processes, and customer satisfaction” targeted with digital transformation. I emphasized that by giving product management, a crucial organizational function, a leadership role, this can be accomplished more quickly and successfully. The adoption by top management, product/project leadership, strategic objectives, and an agile project management approach are crucial after defining digital transformation projects. The successful outcomes of pioneering transformation-focused projects will open the door for others. Creating the proposed transformation groups and using agile methods that are not used throughout the organization in in-group management bring the chance to spread throughout the organization, as well as successful results. With the outcomes of these transformation projects, the organizational culture will inevitably change. Despite the length of the process, improvements in process management, response times, and value definition renewal should be anticipated.

It is reasonable to assume that organizations other than those engaged in the consumer electronics industry have noticed a significant increase in the importance of data creation, interpretation, and added value.

An additional academic study can look into the significance of the concepts emphasized and the role that product management is given in the digital transformation that is described and proposed in the article. An additional study can be conducted on what organizations are doing in terms of utilizing data as well.



CHAPTER

4

FACTORS AFFECTING THE SUCCESS OF PRODUCT INNOVATION



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ABSTRACT

The most crucial key that businesses need to possess in a competitive market is innovation. The source of this key is actually hidden within the companies themselves. There are many different types of innovation that can reveal this hidden power, but the most important one is product innovation. This study evaluates the factors affecting product innovation and for this evaluation, the CRITIC method, which is one of the other multi-objective decision-making methods but uses objective data unlike its counterparts, was utilized. Among the factors related to product characteristics, the most important one was found as the level of innovation of the product; among the factors related to strategy characteristics, the most important one as the resources of the company; among the factors related to process characteristics, the most important one as the process inputs related to customers; among the factors related to market characteristics, the most important one as the possibility of competitors' reaction/response to new products; and the most important factor related to organizational characteristics as the organizational climate that supports innovation.

1. INTRODUCTION

Due to the rapid change, development, uncertainties, and differentiations in customer expectations that have arisen with the widespread use of technology in all aspects of life, businesses are in a fiercely competitive race and must constantly come up with innovative ideas and turn them into income/benefit models in order to survive (Aydar, 2010). The steps that generate income/benefits are called innovations. Innovation derives from the Latin word “innovatus.” It means “the introduction of new methods in the social, cultural, and administrative environment” (Akman, 2003).

Innovation in general is the introduction of new or improved products, services, or processes in business organizations. The concept of innovation is a phenomenon that has entered the lives of not only businesses but also every segment of society, whether they are aware of it or not. Despite the fact that innovation can be seen in many areas, from scientists conducting research in the world of science to a housewife rearranging the counter in order to cook comfortably, it is predominantly adopted by businesses.

The Organization for Economic Co-operation and Development's (OECD) definition of innovation is “transforming an idea into a marketable product or service, a new or improved method of production or distribution, or a new social service” (OECD, 2015).

When several sources are examined, it is observed that there are many types of innovation depending on dimensions. In some studies, it is grouped under eight main headings, in others under eleven, and in others under four. When compiled from various sources, there are many types of innovation, including product innovation, service innovation, process innovation, marketing innovation, organizational innovation, technological innovation, presentational innovation, disruptive innovation, submarket innovation, applied innovation, experience innovation, radical innovation, incremental innovation, and business model innovation (Memiş & Korucuk, 2019; Akın, 2021). The Oslo Guidelines state that there are four main types of innovation. These can be listed as product innovation, service innovation, process innovation, and marketing innovation (OECD, 2006).

This study will address product innovation and its dimensions. Product innovation means differentiating the existing product and introducing it to the market by making new changes to it and is a subject of

interest in the field of innovation. It is important to analyze the type of innovation strategies used by companies in the face of changing environments (Marzi, Dabic, Daim, & Garces, 2017).

Product innovation refers to a company's ability to offer new and useful products to meet a market need through the use of new ideas. At the country level, product innovation is a measure of a country's readiness to adopt and embrace new technologies that are consistent and relevant to national circumstances (GEDİ, 2017).

Product innovation is a process consisting of the technical design of all commercial activities related to the new or improved product, R&D, manufacturing, and management. All product innovations typically start with design creativity, which involves the visual perception of new concepts, plans, and ideas, often presented schematically (Smith, Smith, & Shen, 2012).

Product innovation is the most important factor in companies' profitability and the growth of customer-driven economies. Product innovations help a company maintain, expand, and strengthen its position in the product market, particularly by addressing frequent changes in customer preferences and responding to emerging scientific and technological opportunities. Despite all their advantages and importance, product innovations are risky investments since they require long-term research (Chen et al, 2022). R&D and marketing efforts are subject to several uncertainties, and therefore, may sometimes require unpredictable budgets, and therefore, decision-makers sometimes take different attitudes (conservative or supportive) toward product innovation.

Measuring the awareness of product innovation and the sector's perspective are crucial for identifying new areas of national breakthrough and structuring its strategy. Investigating the importance that decision-makers attach to product innovation in the sector and the factors they take into consideration are very important in setting future strategies. To identify the factors and measure the perception of their importance, this study sought answers to the following questions:

1. What are the factors that affect product innovation in Türkiye?
2. How important are these factors for product innovation?
3. What are the most prominent ones among these factors?

The study was structured as follows to answer the questions: In the second section, the studies on product innovation and the factors affecting product innovation were summarized, and this way, thus the factors critical for product innovation were identified, and the questionnaire was designed with relevant questions. The third section explains the methodology used in this study, while the fourth section presents the results of the study. The study ends with conclusions and recommendations.

2. LITERATURE REVIEW

Studies on product innovation from the past to the present have been reviewed within the scope of the literature review, and important criteria have been identified. Studies observed in all countries and industries are summarized below.

There are six factors that affect product innovation capability and development in organizations, according to a study by Bergendahl et al. (2009) that looked at how organizational and behavioral factors affect the development of product innovation capability and development in organizations. These factors are understanding and involving the user, resources, risk-taking permission and environment,

learning and knowledge reuse, balancing creativity and structure, and leadership. On the other hand, Evanschitzky et al. (2012) focused on empirically summarizing research and studies on new product development success variables that address the needs caused by the evolving market environment and recent methodological advancements in meta-analytic research. To that end, they examined 233 empirical research, in addition to Henard and Szymanski's (2001) seminal meta-analysis.

Olsson et al. (2012) used a meta-analysis approach to assess the success factors influencing product innovation. To that end, they analyzed 233 empirical researches on the success of new products from 1999 to 2011. They compared their findings with the influential meta-analysis by Henard and Szymanski (2001). Product features, strategy, process, marketplace, and organizational characteristics are the key factors affecting the success of product innovation.

Spanjol et al. (2012) divided product innovation outcomes into breakthrough product innovation and incremental product innovation using the stimulus-organism-response framework to select, decompose, and reshape a set of strategic orientation components that had previously been identified as essential. The conceptual model was put to the test by the authors using partial least squares with a sample of 222 directors from manufacturing and service companies in Germany and Switzerland. In general, their findings demonstrate that the connection between strategic orientation and product innovation is more nuanced than has previously been suggested by the literature. For instance, the findings demonstrate that technology orientation affects innovation differently in service organizations than it does in manufacturing firms.

In order to provide an integrated framework that covers antecedent paths to successful product innovation, Cheng et al. (2013) used fuzzy cluster qualitative comparative analysis (fsQCA) to study the patterns contributing to high product innovation performance. They divided the antecedents of product innovation into five categories—those connected to organizations, projects, processes, products, and markets—in order to achieve this.

Kim, Kim, and Park (2015) used empirical data from the Korea Innovation Survey 2010 to conduct an ordinary least squares regression analysis to identify the variables that directly affect product innovation performance and to compare the relative weights of variables in dynamic and non-dynamic environments. They found that some factors affect the dynamic environment only, while some others affect both environments.

Thongsri and Chang (2019) evaluated the conceptual model they created to look at the relationships between factors affecting product innovation and innovation behavior using survey and structural equation modeling. They consequently saw that connections between business relationships, customers, and competition orientation can promote sustainable product innovation, whereas interactions between government support and political relationships can enhance the sustainability of innovation behavior. Market orientation, managerial ties, and government support are other mediators that can result in greater business performance, as can product innovation and innovation behavior.

According to Atiase and Dzansi (2020), the main forces behind product innovation activities among African businesses are now competitiveness and the development of human capital. To that end, they investigated how human capital, competition, and networking—which they identified as the forces behind product innovation— affect product innovation. They concluded that product innovation is positively and significantly impacted by human capital and competitiveness.

Heredia et al. (2020) used the integrative strategy tripod approach to investigate the factors that influence new product innovation and a new methodological approach (fuzzy set qualitative comparative analysis) to analyze data from the World Bank Enterprise Survey of 1,692 manufacturing firms in China. According to their findings, R&D investment by itself is insufficient to promote a company's product

innovation; instead, R&D investment requires stable government policies and R&D supports.

Parmigiani et al. (2021) looked into how relational and technical capabilities affect component and whole product innovation in the American RV market. They noted that product modification, manufacturing, supplier management, and customer relations are all part of the innovation skills and concluded that supplier management is crucial for component innovation while production expertise is crucial for full product innovation. Additionally, they claimed that deficiencies in particular skills may be made up for by strengths in other areas, outlining other potential routes for product innovation.

The factors affecting the success of sustainable product innovation in the textile, apparel, and leather industries were studied by Rese et al. (2022). They carried out a literature review and a survey study for this purpose. They came to the conclusion that “fulfilling consumer expectations” is the key to success. Compliance with laws and regulations, green creativeness, awareness of the elements influencing sustainable purchasing, investments in R&D infrastructure, and competition surveillance come after this one.

3. METHOD

The method utilized in this study is summarized in Figure 5.

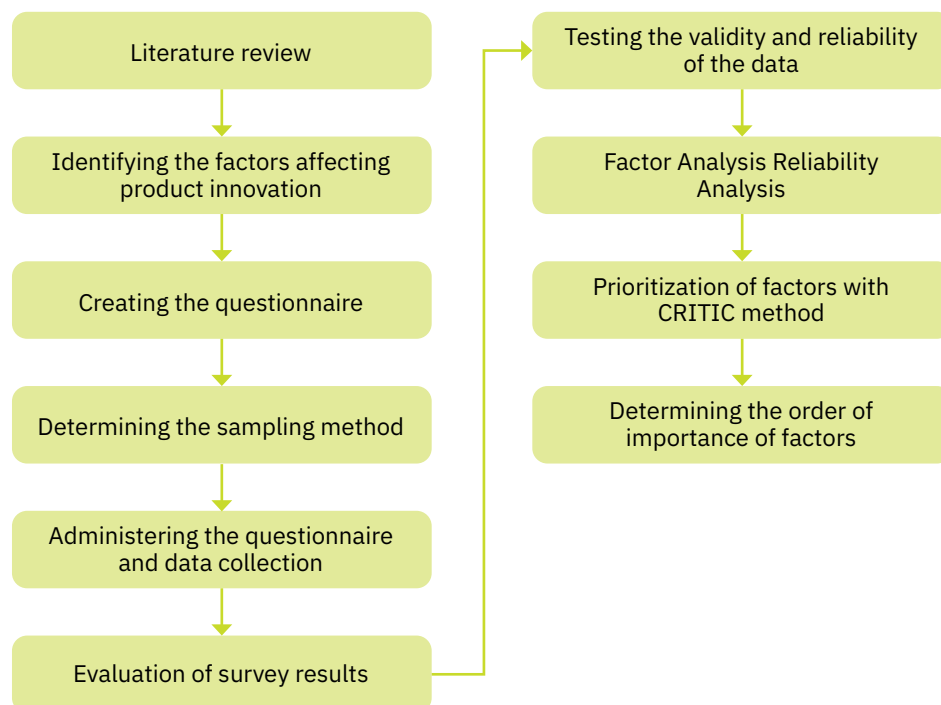


Figure 5: Methodology of the Study

CRITIC (Criteria Importance Through Intercriteria Correlation) Method

The term “multi-criteria decision-making methods” (MCDM) refers to a group of methods where the decision-maker evaluates the criteria to optimize the usefulness of several criteria. Diakoulaki, Mavrotas, and Papayannakis first suggested the correlation between the criteria importance through the intercriteria correlation (CRITIC) method in 1995. It is mostly used to calculate the weights of criteria (Alinezhad & Khalil, 2019).

The CRITIC method is superior to other MCDM methods because it makes objective weighting using standard deviations of criteria and intercriteria correlations rather than relying on subjective data derived from expert opinions (Ayçin, 2020).

The five steps of the CRITIC method involve computations utilizing a decision matrix. Following are the steps of the approach (Yalçın, Karakaş, 2019; Ayçin, 2020):

Step 1: Creating the Decision Matrix

The Decision Matrix, represented by X , is made up of x_{ij} . It is shown as follows:

$$X = \begin{matrix} & \begin{matrix} A_1 & \dots & A_n \end{matrix} \\ \begin{matrix} A_1 \\ \vdots \\ A_m \end{matrix} & \begin{bmatrix} X_{11} & \dots & X_{1n} \\ \vdots & & \vdots \\ X_{m1} & \dots & X_{mn} \end{bmatrix} \end{matrix} \quad (1)$$

Step 2: Normalization of the Decision Matrix

For both maximization and minimization problems, normalization is used. Equation (2) for maximizing problems and Equation (3) for minimization problems are used to conduct normalization.

$$r_{ij} = \frac{x_{ij}^{\max} - x_j^{\min}}{x_j^{\max} - x_j^{\min}} \dots \dots j = 1, 2, \dots n \quad (2)$$

$$r_{ij} = \frac{x_j^{\max} - x_{ij}^{\min}}{x_j^{\max} - x_j^{\min}} \dots \dots j = 1, 2, \dots n \quad (3)$$

Step 3: Creating the Correlation Coefficient Matrix

A correlation coefficient matrix made up of linear relationship coefficients (ρ_{jk}) is produced in order to compute the correlation degrees of the assessment criteria that have been identified. According to Equation (4), the correlation coefficients are calculated.

$$\rho_{jk} = \frac{\sum_{i=1}^m (r_{ij} - \bar{r}_j) \cdot (r_{ik} - \bar{r}_k)}{\sqrt{\sum_{i=1}^m (r_{ij} - \bar{r}_j)^2 \cdot \sum_{i=1}^m (r_{ik} - \bar{r}_k)^2}} \quad j, k = 1, 2, \dots n \quad (4)$$

Step 4: Calculating C_j Values

From the contrast intensity and conflicts in the assessment criteria, the CRITIC Method seeks to extract the information in the decision-making problem. The C_j values, which combine the contrast intensity and the conflicts value and represent all of the data in the j th criterion, should be calculated using equations (5) and (6).

$$C_j = \sigma_j \cdot \sum_{k=1}^n (1 - \rho_{jk}) \quad j = 1, 2, \dots, n \quad (5)$$

$$\sigma_j = \sqrt{\frac{\sum_{i=1}^m (r_{ij} - \bar{r}_j)^2}{m-1}} \quad (6)$$

Step 5: Calculating Criteria Weights

In this step, Equation (7) is used to calculate the criteria weight value w_j . The weight of a criterion is determined by the relationship between the C_j value of each criterion and the total C_j value of all criteria.

$$w_j = \frac{C_j}{\sum_{k=1}^n C_j} \quad (7)$$

4. APPLICATION

4.1. IDENTIFYING THE FACTORS AFFECTING PRODUCT INNOVATION

The factors affecting product innovation used in this study are adapted from Evanschitzky et al. (2012). Five categories are used to define these factors:

1. Product features, 5 factors
2. Strategy characteristics, 7 factors
3. Process characteristics, 10 factors
4. Market characteristics, 4 factors
5. Organizational characteristics, 6 factors

4.2. CREATING THE QUESTIONNAIRE

There are two sections of the questionnaire. The characteristics of the participants and the firms are covered in the first section, while five headings are used to group the criteria required for the success of product innovation in the second section. Six organizational characteristics, five related to product features, seven to strategy characteristics, ten to process characteristics, four to market characteristics, and five to product characteristics were identified. The relevance of the factors was assessed in the second section using a 7-point Likert scale, with 1 being the least important and 7 being the most important.

4.3. DETERMINING THE SAMPLING METHOD AND ADMINISTERING THE QUESTIONNAIRE

The convenience sampling method was chosen in order to expedite the research due to the time limitation for data collection. With this method, the researcher is free to take action based on accessibility and proximity. The survey was created in Google Forms, and participants were sent a link to it by email and LinkedIn. The survey link was first distributed to the TTGV's Product Management Türkiye Platform members. To boost the sample size, it was then distributed to staff members at businesses with a reputation for investing in R&D and new product development. Thus, the data was collected online.

The questionnaire was completed by 69 people in total. Table 1 lists the participant demographics as well as details on the participating companies. The majority of participants hold bachelor's degrees, work as managers or executives, have been employed by the company for more than 20 years, and are primarily employed in the R&D division. The majority of the companies employ more than 100 people and have at least 21 years of experience in the electronics, information, and communication industries.

Table 1: Information on Participants

Information on participants		
Education	Frequency	%
Bachelor	34	49,3
Master's	25	36,2
Ph.D.	10	14,5
Total	69	100,0

Information on Companies		
Number of Employees	Frequency	%
1-9	5	7,2
10-49	12	17,4
50-249	12	17,4
250-499	4	5,8
500-999	8	11,6
1000 and over	28	40,6
Total	69	100,0

Title	Frequency	%
Company Owner, General Manager, Vice General Manager	11	15,9
Director	4	5,8
Manager	16	23,2
Executive	14	20,3
Chief	9	13,0
Engineer	15	21,7
Total	69	100,0

Operational Period	Frequency	%
11-20 years	7	10,1
21 years and over	51	73,9
Less than 3 years	2	2,8
3-10 years	9	13,0
Total	69	100,0

Term of Employment	Frequency	%
Less than 2 years	12	17,4
2-4 years	13	18,8
5-9 years	13	18,8
10-14 years	12	17,4
15-19 years	5	7,2
20 years and over	14	20,3
Total	69	100,0

Sector	Frequency	%
Electronics	13	18,8
Informatics, Communication	14	20,3
Automotive	9	13,0
Chemicals	5	7,2
Iron and Steel	4	5,7
Other	24	34,8
Total	69	100,0

Department	Frequency	%
R&D	24	34,8
Engineering	18	26,1
Planning	5	7,2
Sales and Marketing	12	17,4
Production	10	14,5
Total	69	100,0

4.4. EVALUATION OF SURVEY DATA

4.4.1. ASSESSING THE VALIDITY AND RELIABILITY OF THE DATA

Factor analysis was applied to test the validity of the data and to determine whether the thirty-three criteria in the questionnaire were divided into main factors as expected. In order to achieve this, the principal component analysis method was applied, and the axis rotation method used was Varimax. A criterion linked to strategy characteristics, three criteria related to process characteristics, and two criteria related to organizational characteristics were discarded as a result of the factor analysis. Table 1 displays the findings of the factor analysis made accordingly. These changes were taken into consideration when calculating Cronbach's α coefficients for each factor in the reliability analysis, and the results are shown in Table 2.

The factor loadings range between 0.405 to 0.921 when the findings of the factor analysis of all variables are examined. Additionally, the components' explained variance percentages range from 41% to 58%. An ideal circumstance and indication that the analysis' validity is relatively strong is when the explained variance ratios of the factors are higher than 40% (İnal & Toksarı, 2006).

The Cronbach α coefficients of all factors were found to be higher than 0.6 when the values obtained as a result of the reliability analysis were evaluated. According to the literature, this coefficient must have a minimum value of 0.6. (Bagozzi & Yi, 1988). These results from the analysis show that the evaluation of the collected data is valid and appropriate for further analysis. The data obtained were found to be valid and reliable as a result.

Table 2: Validity and Reliability of the Data

			Factor loading	KMO	Explained variance (%)	Cronbach Alpha
Product features	URN1	Advantage of the product	,741	0,679	41,795	0,722
	URN2	Product meeting customer needs	,489			
	URN3	Product sale price	,405			
	URN4	Technologically advanced level of the product	,812			
	URN5	Innovation level of the product	,745			
Strategy characteristics	STR1	Marketing synergy	,566	0,730	53,735	0,787
	STR2	Technological synergy	,582			
	STR4	Dedicated human resources	,575			
	STR5	R&D resource dedicated to innovation	,921			
	STR6	Company's resources	,917			
	STR7	Strategic orientation for innovation	,739			
Process characteristics	SRC2	Task (job) adequacy of pre-product development processes	,761	0,795	47,565	0,787
	SRC4	Launch competence for new products to be introduced to the market	,512			
	SRC5	Reduced product development cycle time	,648			
	SRC7	Process inputs related to customers	,677			
	SRC8	Inter-functional integration and coordination	,834			
	SRC9	Effective inter-functional communication	,759			
	SRC10	Senior management's support	,463			
Market characteristics	PZR1	Likelihood of competitor reaction/response to new products	,839	0,558	53,610	0,686
	PZR2	The intensity of competitor reaction/response to new products	,870			
	PZR3	The market potential for new products	,449			
	PZR4	Environmental uncertainty	,695			
Organizational characteristics	ORG2	Project/organizational size	,711	0,703	58,795	0,815
	ORG3	Interaction with the external environment	,783			
	ORG4	Strategic collaborations on innovation	,674			
	ORG5	Organizational climate supporting innovation	,835			

4.4.2.

EVALUATION OF CRITERIA BY THE CRITIC METHOD

Step 1. Creating the Decision Matrix

The evaluations of 69 participants were taken into account when developing the decision matrix. The evaluation covered a total of 26 criteria within five areas. The evaluation using the CRITIC technique includes five criteria linked to product features, six related to strategy characteristics, seven related to process characteristics, four related to market characteristics, and four connected to organizational characteristics. The decision matrix is shown in Table 3.

Table 3: Decision Matrix

	URN1	URN2	URN3	URN4	URN5	STR1	STR2	STR4	STR5	STR6	...	ORG4	ORG5
KV1	6	6	6	6	6	6	6	7	7	7	...	6	4
KV2	6	6	4	6	7	7	4	7	6	6	...	2	1
KV3	6	7	6	5	6	6	6	6	6	6	...	6	5
KV4	5	7	5	5	6	6	7	7	7	7	...	4	5
KV5	4	7	7	4	7	6	5	6	7	7	...	6	4
KV6	7	7	7	7	7	7	7	7	7	7	...	7	7
KV7	7	7	7	7	7	6	6	6	5	5	...	6	6
KV8	6	6	4	2	5	6	5	3	5	5	...	5	5
KV9	5	6	4	5	6	6	6	5	6	6	...	5	2
KV10	6	6	5	7	7	4	6	6	6	6	...	6	6
...	...	...	...	...	...	...	...	...	...	...	...	...	...
KV65	5	5	7	6	4	6	6	5	5	5	...	6	4
KV66	6	7	7	4	5	7	5	4	4	4	...	6	6
KV67	6	7	7	7	6	6	6	7	6	5	...	7	5
KV68	7	7	5	6	5	5	5	6	7	7	...	7	5
KV69	6	7	7	6	5	5	4	6	6	6		5	5

Step 2. Normalization of the Decision Matrix

Because all criteria are maximization oriented, in this step of the CRITIC method, the decision matrix in Table 3 is normalized using Equation (3). And the normalized decision matrix seen in Table 4 is obtained.

Table 4: Normalized Decision Matrix

	URN1	URN2	URN3	URN4	URN5	STR1	STR2	STR4	STR5	STR6	...	ORG5	ORG6
KV1	0,667	0,667	0,750	0,800	0,800	0,800	0,750	1,000	1,000	1,000	...	0,800	0,500
KV2	0,667	0,667	0,250	0,800	1,000	1,000	0,750	1,000	0,800	0,800	...	0,000	0,000
KV3	0,667	1,000	0,750	0,600	0,800	0,800	0,750	0,750	0,800	0,800	...	0,800	0,667
KV4	0,333	1,000	0,500	0,600	0,800	0,800	0,750	1,000	1,000	1,000	...	0,400	0,667
KV5	0,000	1,000	1,000	0,400	1,000	0,800	0,250	0,750	1,000	1,000	...	0,800	0,500
KV6	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	...	1,000	1,000
KV7	1,000	1,000	1,000	1,000	1,000	0,800	1,000	0,750	0,600	0,600	...	0,800	0,833
KV8	0,667	0,667	0,250	0,000	0,600	0,800	0,000	0,000	0,600	0,600	...	0,600	0,667
KV9	0,333	0,667	0,250	0,600	0,800	0,800	0,750	0,500	0,800	0,800	...	0,600	0,167
KV10	0,667	0,667	0,500	1,000	1,000	0,400	0,750	0,750	0,800	0,800	...	0,800	0,833
...	...	...	...	...	...	...	...	...	...	...	...	...	...
KV65	0,000	0,667	0,500	0,400	0,400	0,400	0,500	0,500	0,600	0,600	...	0,800	0,500
KV66	0,667	0,667	0,250	0,600	0,000	0,800	0,500	0,250	0,400	0,400	...	0,800	0,833
KV67	0,333	0,333	1,000	0,800	0,400	0,800	0,750	1,000	0,800	0,600	...	1,000	0,667
KV68	0,667	1,000	1,000	0,400	0,600	1,000	0,500	0,750	1,000	1,000	...	1,000	0,667
KV69	0,667	1,000	1,000	1,000	0,800	0,800	0,750	0,750	0,800	0,800	...	0,600	0,667

Step 3. Creating the Correlation Coefficient Matrix

In this step, the linear correlation coefficients (ρ_{jk}) are calculated using Equation (4), and the correlation coefficient matrix is created. The correlation coefficient matrix is obtained as shown in Table 5.

Table 5: Intercriteria Correlation Matrix

	URN1	URN2	URN3	URN4	URN5	STR1	STR2	STR4	STR5	...	SRC9	SRC10	PZR1	PZR2	PZR3	PZR4	ORG2	ORG3	ORG4	ORG5
URN1	1	,536	,470	,568	,379	-.235	-.036	,422	,379	...	,616	-.199	-.083	,073	,358	,142	-.154	-.327	-.315	-.211
URN2	,536	1	,375	-.281	-.187	-.150	-.605	-.215	-.217	...	-.018	,085	-.141	,093	,065	,000	-.405	-.040	-.089	,070
URN3	,470	,375	1	,200	-.134	-.429	-.310	,451	,270	...	,296	,141	,034	,176	,342	,259	,152	-.013	-.276	,134
URN4	,568	-.281	,200	1	,597	-.245	,393	,671	,623	...	,716	-.113	-.204	-.247	,349	,161	-.095	-.384	-.450	,113
URN5	,379	-.187	-.134	,597	1	-.163	,607	,511	,613	...	,586	-.327	-.345	-.275	,039	,000	-.095	-.384	-.450	,113
STR1	-.235	-.150	-.429	-.245	-.163	1	,265	-.205	-.063	...	-.226	-.161	-.319	-.441	-.280	-.345	,128	-.051	-.022	,134
STR2	-.036	-.605	-.310	,393	,607	,265	1	,317	,358	...	,329	-.025	-.166	-.218	,125	,000	,128	-.051	-.022	,134
STR4	,422	-.215	,451	,671	,511	-.205	,317	1	,728	...	,724	-.145	-.168	-.126	,357	,097	,186	-.051	-.022	,134
STR5	,379	-.217	,270	,623	,613	-.063	,358	,728	1	...	,436	-.076	-.171	-.372	,097	,287	,186	-.051	-.022	,134
STR6	,415	-.096	,183	,557	,657	-.046	,312	,658	,977	...	,413	-.103	-.204	-.396	,020	,277	,186	-.051	-.022	,134
STR7	,048	-.227	,000	,440	,660	-.059	,492	,422	,600	...	,315	-.199	-.676	-.508	-.102	-.071	,058	-.148	-.082	,134
SRC2	,235	,056	,339	,384	,256	-.375	,011	,333	,004	...	,552	-.065	-.122	-.110	,357	,323	,032	,099	-.241	,092
SRC4	-.199	,215	,093	-.244	-.657	,056	-.150	-.107	-.550	...	-.005	,572	-.254	,046	,259	-.067	-.207	,358	,329	,584
SRC5	,026	-.065	-.062	,160	,107	-.264	,308	-.022	-.097	...	,337	,609	,117	,153	,622	,507	,094	,508	,459	,450
SRC7	-.145	-.278	-.352	,000	,055	,264	,518	-.126	-.313	...	,172	,174	,165	,087	,537	,064	-.029	,222	,140	,288
SRC8	,361	-.154	,083	,547	,560	,083	,498	,569	,283	...	,874	-.077	-.289	-.129	,418	,227	-.014	-.109	-.219	-.088
SRC9	,616	-.018	,296	,716	,586	-.226	,329	,724	,436	...	1	-.142	-.151	-.021	,401	,441	,037	-.162	-.324	-.138
SRC10	-.199	,085	,141	-.113	-.327	-.161	-.025	-.145	-.076	...	-.142	1	-.009	,025	,377	,219	,224	,644	,843	,688
PZR1	-.083	-.141	,034	-.204	-.345	-.319	-.166	-.168	-.171	...	-.151	-.009	1	,724	,212	,425	,258	,313	,126	,306
PZR2	,073	,093	,176	-.247	-.275	-.441	-.218	-.126	-.372	...	-.021	,025	,724	1	,192	,128	-.202	,174	,035	,288
PZR3	,358	,065	,342	,349	,039	-.280	,125	,357	,097	...	,401	,377	,212	,192	1	,338	,096	,162	,234	,276
PZR4	,142	,000	,259	,161	,000	-.345	-.080	,297	,287	...	,441	,219	,425	,128	,338	1	,592	,558	,551	,403
ORG2	-.154	-.405	,152	,186	-.095	,128	,137	,318	,555	...	,037	,224	,258	-.202	,096	,592	1	,606	,784	,459
ORG3	-.327	-.040	-.013	-.276	-.384	-.051	-.127	-.184	-.088	...	-.162	,644	,313	,174	,162	,558	,606	1	,784	,894
ORG4	-.315	-.089	,113	-.212	-.450	,099	,004	-.203	,025	...	-.324	,843	,126	,035	,234	,257	,551	,784	1	,749
ORG5	-.211	,070	,134	-.302	-.479	-.022	-.072	-.096	-.193	...	-.138	,688	,306	,288	,276	,403	,459	,894	,749	1

Step 4. Calculating C_j Values

In this step of the CRITIC method, C_j values are calculated for each criterion using Equations (5) and (6). C_j values are obtained as shown in Table 6.

Step 5. Calculating Criteria Importance Weights

In the last step of the CRITIC method, Equation (7) is used to calculate the importance weights of all criteria. Results obtained with the CRITIC method are given in Table 6.

Table 6: Criteria C_i Values, W_i Importance Weights and Importance Ranking

			C_i	w_i	Sıralama
Product feature	URN1	Advantage of the product	21,42251	0,034006	18
	URN2	Product meeting customer needs	20,4093	0,032398	20
	URN3	Product sale price	29,64018	0,047051	5
	URN4	Technologically advanced level of the product	17,73548	0,028153	25
	URN5	Innovation level of the product	29,70965	0,047161	4
Strategy characteristics	STR1	Marketing synergy	22,7618	0,036132	15
	STR2	Technological synergy	19,2341	0,030532	22
	STR4	Dedicated human resources	18,53636	0,029425	23
	STR5	R&D resource dedicated to innovation	25,35608	0,04025	10
	STR6	Company's resources	26,90676	0,042712	9
	STR7	Strategic orientation for innovation	22,6259	0,035916	16
Process characteristics	SRC2	Task (job) adequacy of pre-product development processes	23,1396	0,036732	14
	SRC4	Launch competence for new products to be introduced to the market	24,34609	0,038647	12
	SRC5	Reduced product development cycle time	23,57794	0,037428	13
	SRC7	Process inputs related to customers	24,85768	0,039459	11
	SRC8	Inter-functional integration and coordination	17,95841	0,028507	24
	SRC9	Effective inter-functional communication	20,90725	0,033188	19
	SRC10	Senior management's support	20,14993	0,031986	21
Market characteristics	PZR1	Probability of competitor reaction/ response to new products	28,91595	0,045901	7
	PZR2	The intensity of competitor reaction/ response to new products	27,75683	0,044061	8
	PZR3	The market potential for new products	11,74578	0,018645	26
	PZR4	Environmental uncertainty	21,49633	0,034123	17
Organizational characteristics	ORG2	Project/organizational size	34,14699	0,054205	2
	ORG3	Interaction with the external environment	31,52893	0,050049	3
	ORG4	Strategic collaborations on innovation	29,44828	0,046746	6
	ORG5	Organizational climate supporting innovation	35,64676	0,056586	1

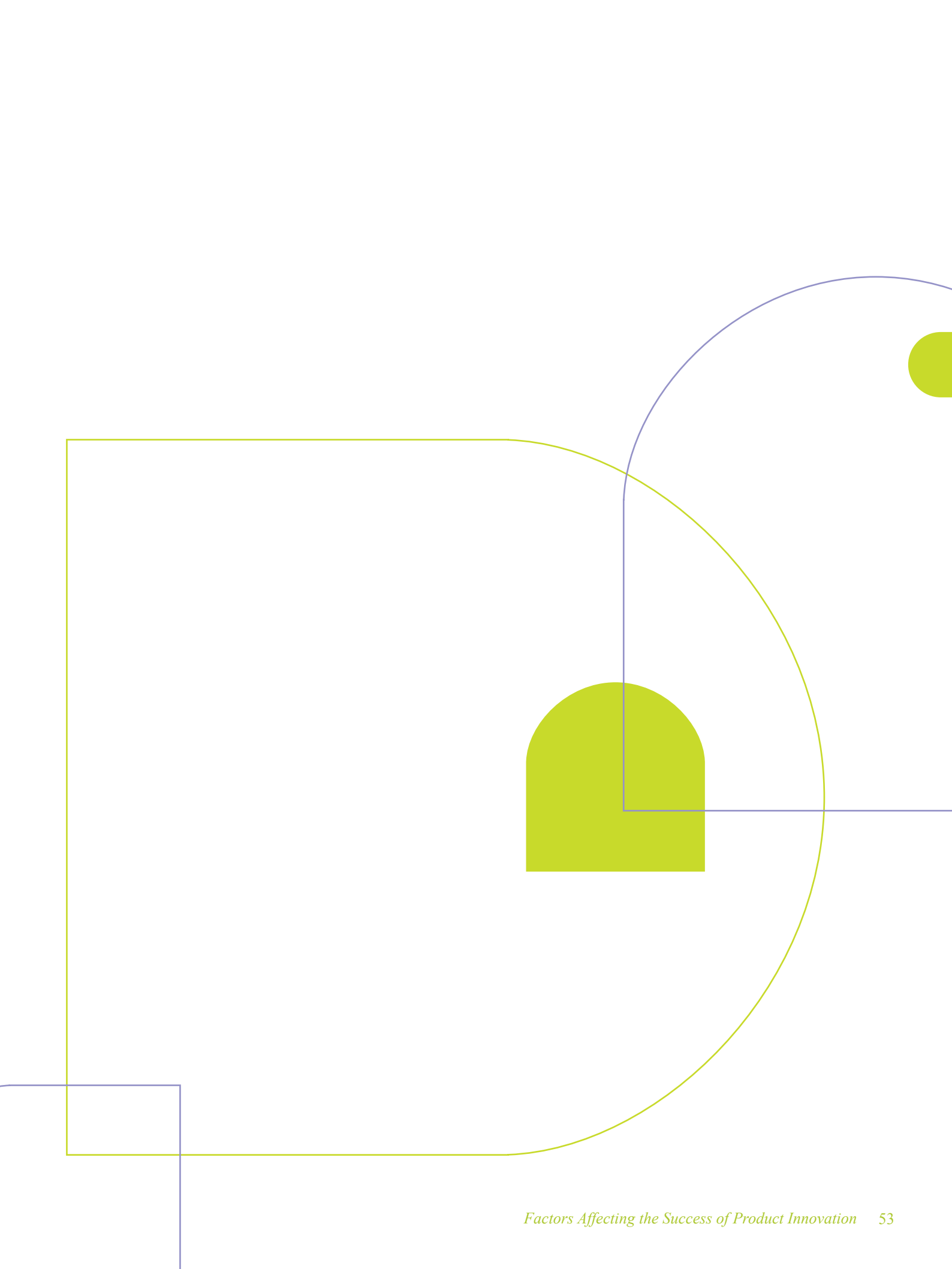
5. CONCLUSION

Innovation is the process of transforming great ideas into brand-new goods or procedures, or betterments to existing ones, in order to make money. It is referred to as revenue-generating innovation in numerous publications. One might name a wide variety of innovations. The creation of a new product or an enhanced version of an existing product is referred to as product innovation and is evaluated from the standpoint of the company in this study. A seven-point Likert scale questionnaire was created for this purpose. The opinions of 69 respondents were considered within the parameters of the survey. The evaluation included 26 criteria in all, organized into 5 areas. Because the innovation is confidential, the convenience sample method was chosen to prevent respondent restrictions. In order to group the data obtained, factor analysis was applied. In order to achieve this, the principal component analysis method was applied, and the axis rotation method used was Varimax. As a result, the CRITIC technique was applied to pinpoint critical factors.

The existence of an organizational climate supporting innovation was found to be the most important factor. The project/organizational size, interaction with the external environment, product innovation level, product sale price, strategic collaborations on innovation, probability of and intensity of competitor reaction to new products, company's resources, and R&D resources dedicated to innovation are factors that respectively come after this one

Among the factors related to product characteristics, the most important one was found as the level of innovation of the product; among the factors related to strategy characteristics, the most important one as the resources of the company; among the factors related to process characteristics, the most important one as the process inputs related to customers; among the factors related to market characteristics, the most important one as the possibility of competitors' reaction/response to new products; and the most important factor related to organizational characteristics as the organizational climate that supports innovation.

This study has shown that, like total quality or lean philosophies, innovation should be embraced as a culture within the organization and managed with the assistance of all organizational members. Because innovation is a process that requires creativity; innovation on the product, the timeliness of the company processes, speed, and appropriate organizational structuring are critical for providing superiority over competitors. It is suggested to emphasize the prominent factors in future studies.





CHAPTER



5

LEAN AND NEW PRODUCT DEVELOPMENT



AYŞEGÜL ÖZKAVUKCU

Dr. Ayşegül Özkavukcu is currently working for her own business. Previously she had a role as head of Migros UP which is co-innovation center of corporate and entrepreneurs at Migros Ticaret A.Ş.; R&D Center which is pioneer of retail in Turkey. Earlier then this position she was business development manager in the same company. She graduated with a Ph.D. in industrial engineering in 2017 from Istanbul Technical University. She began her career at Arçelik A.Ş. and then held positions with Tekso Teknik Soğutma A.Ş. and Migros Ticaret A.Ş. “New product design and development,” “lean thinking,” “technology innovations,” and “strategic management hoshin kanri” are some of her specialties. She is a trainer for ITUSEM’s certificate in lean expertise program. She instructs a course at Bilgi University called “Lean Thinking and New Product and Process Development,” which she created. She also works as a trainer in a factory. Beyond technical competencies, she considers self-esteem to be the fundamental precondition for the growth of not only individuals but also society, and the world. She is one of the authorized trainers for Mümin Sekman’s program “Everything Starts with You.” She finished a 92-hour coaching course in the Adler school in 2022. By educating business owners and top executives about the benefits of coaching, she hopes to help create a more productive nation. Zeynep, her daughter, has been the biggest mentor in her life.

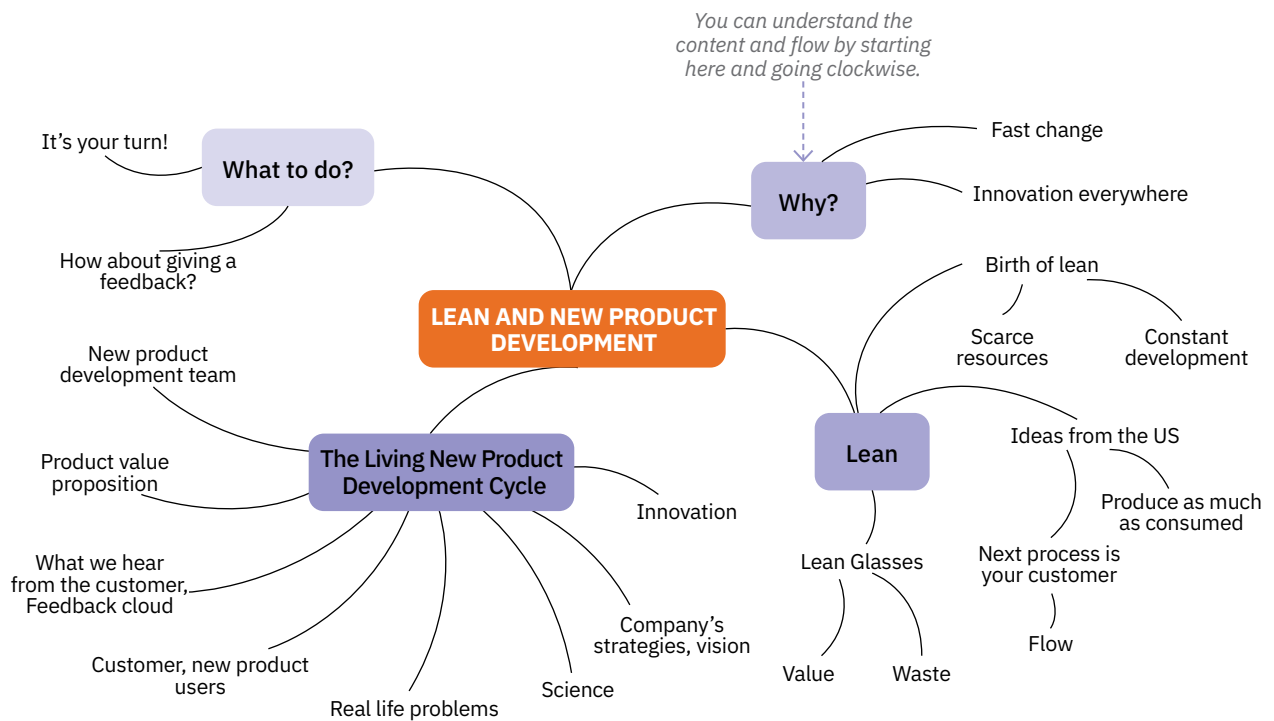


Figure 6: Lean and New Product Development

1. INTRODUCTION

The pace of the world has never been faster. When we were young, we used to concentrate on what career we wished to pursue, and we were unable to decide for ourselves what was best for us. We had to make a decision in order to be certain, but being certain now and in the future, when the change will occur more quickly, is probably a bit ambitious. Fortunately, the younger generation has a lot to teach us. For several years now, my 11-year-old daughter has responded to the question “What do you want to be when you grow up?” with “I want to do 27 different jobs.” She discusses working in a different career every day. Can this be done? Why not is the correct response if we have encountered numerous things in the past ten years that we initially believed to be impossible.

According to Daniel Pink, author of “Drive” and “When,” information parity has replaced long-standing information asymmetry (Pink, 2022). Ten years ago, the salesperson had greater knowledge about the product we wanted to purchase. Does that still apply today? Many things have changed, and now the customer can go to the store to purchase a product with more knowledge than the salesperson, regardless of how new the product is.

When you apply for jobs, the scenario is comparable. Before beginning to work in a job in a company, it is quite possible to gather information from people who have held comparable positions in the past through networks like LinkedIn.

As a result, you are not required to base your decision solely on the responses to the questions you pose during the job interview. Let’s note that information parity is one of the greatest distinctions brought about by this rapidly changing environment.

***“Information parity has replaced information asymmetry.”
Daniel Pink***

There is information all around us in a variety of formats. We are continually exposed to new knowledge through what we see, hear, and learn. The most important thing is to be able to select the appropriate information and apply it to our life. The power that emerges when the shifting demands and issues of real life feed the theory and when the theory feeds practice is highly effective, and this is perhaps one of the facts that I believe in as a part-time academic. From the perspective of an engineer, I believe that our goal is to produce benefits for humanity. We can surround ourselves with innovations that have a long-lasting and consistent impact on real life rather than pure theory, which is a theory that has no application to human existence. Innovation that is used and brought to life speaks to us. It inundates us with feedback and turns into the most important input for constant development. Producing information, selecting the appropriate knowledge, and applying it to our lives -even in a tiny way- will encourage the creation of new knowledge.

I think that innovation and the lean perspective will lead us into the future. For those who are interested in the issue, I have collated my ideas and experiences.

I attempted to respond to the subject of “How to design successful new products in a world that is changing quickly” in this article. With the knowledge I have gained from both academic studies and real-world experience, I tried to provide some perspective. In the following sections, we will address the ways to wear “value” and “waste” glasses with the “lean” perspective, the power of teamwork consisting of people from different backgrounds, and a living new product development cycle.

2. LEAN

Lean thinking is a philosophy that aims to continuously get closer to the customer’s actual expectations.

It prioritizes people and involves everyone in an organization. Other names for lean thinking include Toyota Production System, just-in-time production system, and the lean production system. Although John Krafcik was the one who first used the term “lean,” its roots can be found in the tools Toyota used to achieve world-class production with limited resources in the immediate post-World War II period. To study American assembly lines, Toyota engineers traveled to Ford and General Motors factories in the US in the 1930s. They found that the assembly line system is effective when there is an extremely high demand volume. In fact, the Japanese market at the time required 900 cars per month, as opposed to 9000 in the US. The Toyota team returned to the US auto factories in the 1950s and was shocked to discover that not a single thing had changed in nearly two decades. They are surprised because another important concept in the lean perspective is the “constant development” philosophy. The system evolves even at a small degree every moment, every day. These small and constant improvements are called kaizen. In my opinion, kaizen culture surrounds the organization like the capillaries of a human being, and this feature cannot be copied easily. Constant development is one of the keys to standing out in the competition or staying ahead.

After their second visit to American factories, Japanese engineers took some basic ideas back to Japan with them. The first two that stand out are the following:

1. Producing as much as consumed, and
2. Points of view where the next process is the customer.

One of these Japanese engineers is Taiichi Ohno, who is said to have been inspired by the system in supermarkets while he was mentally laying the foundations of lean. There are two different stories. In one, Ohno notices that there is a specified space allocated on the supermarket shelves for each product. He says that the space that opens up on the shelves as customers buy products functions as a work order for the stock clerk. When the number of products on the shelf reduces to a certain level, the employee fills the space allocated for the product on the shelf from the warehouse. This way, while the customer finds the product on the shelf at all times, the level of products never exceeds the total space on the shelf.

The other story is about the fruit-veggie sections of supermarkets. Every morning when customers arrive, they find fresh products in the aisle, while in the evening when the store closes, the aisle is almost empty, and in the morning customers find fresh products again. In both stories, customers can access the product they want, and the stock level serves as a visual signal. This was also a source of inspiration for the production environment. The goal of the production systems in use at the time was to produce as much as possible in a shift, and this may still be present in some production systems today. With two fundamental concepts they brought back from their visit to the US, Japanese engineers changed and improved the perspective of aiming to produce the highest number of units per unit time by reducing cycle time or by other methods.

In the lean perspective, we strive to continuously cut down on lead time, or the interval between when a customer places an order and when he/she actually receives the product. This period covers several interdependent processes, so the processes are not singular. Let's bake a cake to better describe these two perspectives. Let's say we have a boutique business where we bake and sell cakes. Let's consider cake production in three processes: dough preparation, baking, and packaging. In conventional production systems, these processes are guided by a central unit, which tells them what to do during the day. They are not much interested in how each other is doing. Let's imagine that these three processes aim at doing their best during the day. Let's take the daily sales figure as 100 pieces, with the production facility producing 100-120 pieces. Where the sales figure is 50 for 3 days in a row due to whatever reason, we end each day with 50 units of excess inventory and start to consider other solutions, such as discounted product sales, bulk product sales, etc. in order to deplete these finished product stocks. It is a far smarter way to ensure production depending on the sales of the product instead of focusing on making this sort of sales.

Let's consider another scenario, where there is a malfunction in the baking process. Baking is the customer of the dough preparation process. When the failure in baking cannot be fixed, a stock of semi-finished products will build up between the two processes if the dough preparation continues to produce as much dough as it can in order to fulfill the work orders it receives from the central system. After a certain period of time, these doughs will go straight to waste. When you say, "I just mind my own business, I don't care what happens after me," this is what happens. Let's consider our production processes from this perspective.

Lean tells us that the next process is our customer and that we need to be sensitive to his rhythm of taking products. Processes that interact with one another in the field can adjust the production rhythm instead of waiting for a work order from a centralized system. This way, the production may slow down or accelerate. Processes are aligned without accumulating stock of semi-finished products in between. Therefore, what is essential in lean is the customer and the customer's pace of buying products. At the beginning of the article, we mentioned that change is very fast. One of the simple ways of managing the change is observing, communicating, and authorization.

People who are authorized can manage processes with a higher level of belonging and creativity with the awareness of his/her responsibility. The system continuously improves itself with the self-confidence that finding solutions to problems and putting ideas into practice brings.

Lean places the human at the center and believes that the creative potential of people is limitless.

We arrive at the concept of flow and the cooperation that results from effective communication by following the logic that states that processes are each other's customers. Instead of focusing on what each process can do best individually, it is preferable for the system to be in flow and strive for the best overall. The fundamental tenets of this system are collaboration, the pursuit of common objectives, and a focus on the demands and expectations of the customer.

When viewing a system through lean glasses, we see operations in two colors: value and waste.

“Value is any operation or feature of a product that the customer is willing to pay for. Waste, on the other hand, is any kind of activity that consumes resources but does not create value.”

Waste is the main focus of the lean perspective, and it seeks to continuously reduce and eradicate it. In many systems, more than 90% of the lead time is actually deemed to be wasted. I liken the focus on waste to the logic in the Pareto principle. The gain is significantly greater when I focus on 90% of the whole than when I concentrate on 10%. This is why I describe the lean to be smart.

For example, transporting a product somewhere does not add value to it. Do you, as a consumer, want to pay more money for a product just because it has passed through the factory not once, not twice, but three times? In fact, lean is quite lean. Our questions are also simpler: If I were a customer, would I want to pay the additional cost incurred for this operation?

When we reduce waste by using value-waste glasses, the whole process from the moment the customer places the order to the moment he/she receives the products, the lead time will continuously get shorter. To see the lead time and identify waste, a “value stream mapping” tool can be utilized.

Reduced lead time increases quality, reduces total product cost, and improves delivery performance.



Is it waste?

Is it value?

Figure 7: Lean Glasses

In conclusion, lean is a philosophy, not just a production system. Everyone is covered by this system, which prioritizes the customer and the people, aims to respond quickly and effectively to the customer's changing demands, believes that human creativity is limitless, assigns responsibility to individuals, encourages inter-personal and inter-process cooperation, promotes continuous development as a culture, and begins with the voice of the customer and ends with customer satisfaction.

Resuming our story, the oil crisis in the 1970s led to the realization of the uniqueness of this system, which had been used and developed in Toyota factories since the 1950s. While many companies issued red alerts during this crisis, Toyota only occasionally did so. The Japanese government studied what Toyota did differently and disseminated these viewpoints throughout the country. Then, at the end of the 1990s, lean thinking, which the entire world adopted as an example, began to be applied in our country as well. In recent years, it has been used everywhere there is a process, including office procedures, new product development procedures, and production systems.

3.

LIVING NEW PRODUCT DEVELOPMENT CYCLE

realize it or not, innovation is all around us in these times of rapid change. Innovation, in my opinion, refers to goods or services that significantly raise the bar for individuals, society, and the entire world. A product or a service has users. The more those users embrace the innovation, the faster it spreads and becomes permanent. As a result, the user or customer has a major influence on how the new product is developed. Let's talk about one difference: The people who use the product and the people who decide to purchase it -i.e., the people who pay for the product- might not be the same. Understanding the distinction between users and customers in terms of the product or service can help us improve our processes. In this text, I will use the term customer.

Consider communication systems, for example. Following the letter and the telegram, the invention of telephone communication, which is simpler and faster, entered our lives. The use of cell phones and the internet for communication has increased even more recently. The innovations that defined the previous era are now being used much less frequently as a result of their widespread adoption and accessibility. For a large portion of society today, writing letters would be nothing more than a nostalgic memory.

Similar to how lighting with candles or kerosene is no longer favored by the majority of society due to the invention of electricity, the development of the light bulb, and its widespread use. Based on these examples, we can conclude that one of the most important success factors for a new product or innovation is its widespread acceptance and preference among the target customer base. These parameters can also be followed as the market share.

The real question in new product development is as follows: "Whose problem are we solving?". The answer to this question will lead us to the value proposition. In global terminology, the term "underserved needs of the customer" is used in the market. I think "Whose problem are we solving?" is a far simpler and more understandable question.

In order to holistically describe the product development process, let's use the definition of a "living new product development cycle" (See Figure 8). The lead actors in the development of the new product are as follows:

1. Company's strategies and vision
2. Scientific advancements
3. Real-life problems
4. Customers, new product users
5. What we hear from customers: feedback cloud
6. New product, value proposition
7. New problem development team interacting with all these actors.

The new product development process is triggered by two main channels and is actually a strategic issue. The first channel is the company's vision, and the second one is the evolving customer demands. Items 3, 4, and 5 above help us to see the evolving customer demand in the market.

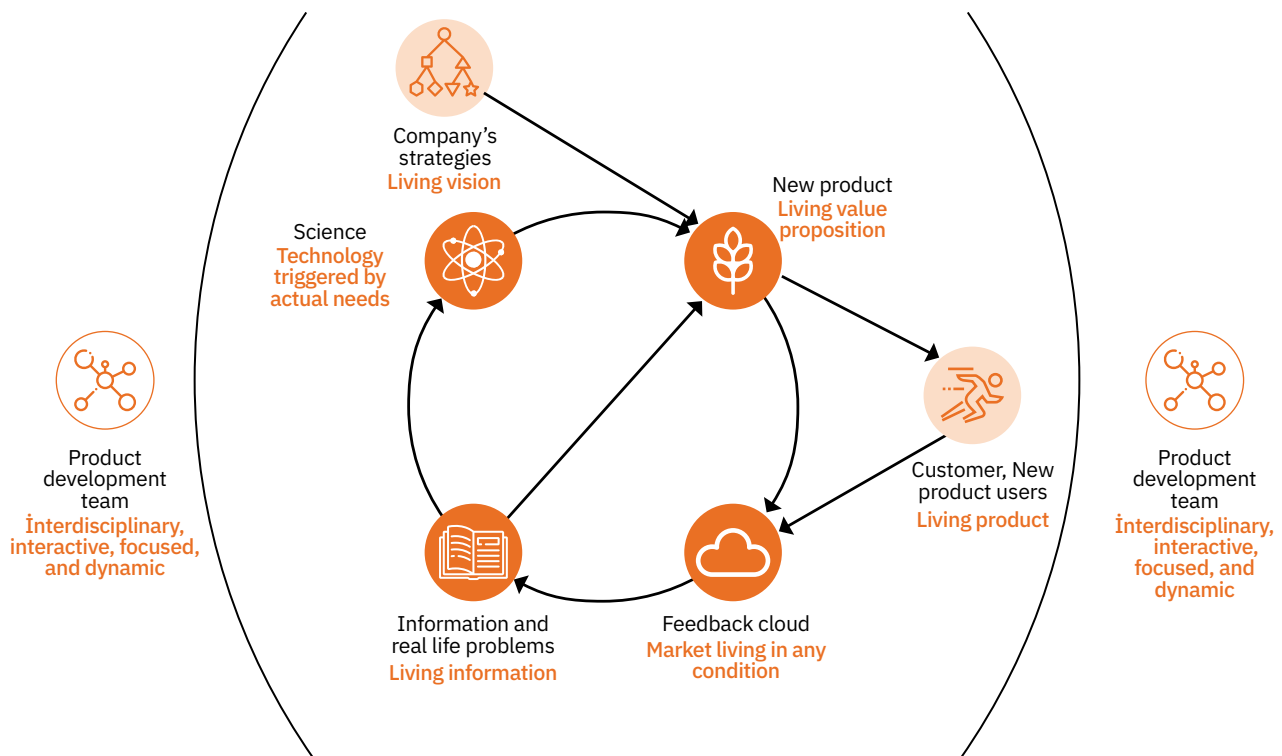


Figure 8: Living New Product Development Cycle

3.1. COMPANY'S STRATEGIES AND VISION

Vision refers to where an organization wants to be in the future. The new product to be developed must serve the company's strategies and vision. Vision shows us the route and is therefore crucial. What is the vision of the company you own or work for? Where is your company heading? What are your strategic personal goals? Where are you heading to? If the answers to these questions are as clear as possible, we can more easily understand whether the situations we face are opportunities or threats. Consider this sentence by Roy T. Bennet about vision:

“Create a vision for yourself and work relentlessly to realize it.”

We must have a vision, but that is not enough. What matters is what we do with this vision, and what we do and what we do not are what determines our results.

3.2. SCIENTIFIC ADVANCEMENTS

In this article, I will address science through engineering. While the engineering discipline produces innovation and conducts scientific studies, its main purpose is to benefit humanity. The greatest mutual benefit occurs when theory and practice are constantly feeding off of one another. The evolving issues in daily life can be used as a tool for prioritization as the academic community works on new theories. I find it impossible to think of a new product development process that does not consider academic research and scientific advancements. As much as possible, we should utilize theory and science, and we can add feedback from the product -the one that is made available to the public- to our scientific work. The great energy released when theory and practice are constantly feeding off of one another reveals a sustainable development process.

3.3. REAL-LIFE PROBLEMS

Real-life problems are our most important starting point in the new product development process. These problems present us with new product and market opportunities. Real-life problems must be observed and approached methodically in order to be understood, prioritized, and further, intelligently addressed.

The customer and the problem the customer is facing are two crucial parts of the question “whose problem are we solving?” Instead of focusing on the solution, we must keep our minds fixed on the problem. (Depending on the situation, there may be several possible ways to solve the issue. We risk missing chances if we fixate on the answer or the final product. The major way we learn about problems in real life is through the feedback we get from customers.

3.4. CUSTOMERS, NEW PRODUCT USERS

Almost every lean tool starts with the voice of the customer and finishes with customer satisfaction, as we mentioned while discussing lean. We lack the comfort of relying just on our opinions, past experiences, or what our managers or superiors have to say. When developing a new product, it is important to understand our target market, or the product’s intended user, and to put special emphasis on designing features that take into account their experiences with the product as well as their expectations and desires.

Persona analysis is the most well-known tool for getting to know customers. The group of people we refer to as our target customers is not an individual. Instead, it is a whole made up of the insights we learn through studying our target customers. This process can be provided with inputs by creating a map of empathy.

For example, 38-year-old engineer Ayşegül is a full-time employee. She is married with one child.

She wishes she had more time for herself in the midst of life's hurry and bustle. Even though Ayşegül is not a bad user of technology and pays attention to her diet and exercise routine in order to live a healthy life, she feels this is insufficient. She cannot live without spending time with her daughter in developmentally appropriate activities and traveling with her spouse. She wants to be more engaged in art and archaeology, but she never has time for either.

Although we mentioned the name Ayşegül, no particular individual is referred to here. We built this text using a comprehensive inference from interviews we conducted with numerous target customers that are part of this group.

Persona analysis is an effective method. Imagine a product development team seated at a table. Let's set aside a chair for the customer. Let's paste his/her representative photo. Let's even summarize the key details from the persona analysis in writing. Let's go back and ask questions to the customer while the team is working on the product. I saw this method in Daniel Pink's masterclass videos (Pink, 2022).

Conversations we conduct with customers prior to product development are only one aspect of our interactions with them. The customer is also our business partner in my opinion. Because the market is dynamic and change comes quickly. Therefore, it is inevitable that we will make changes to it while the customer is utilizing the product. We may make it a priority to consistently learn from customers about their experiences and how those experiences are changing. Through our interactions with customers, we will be able to stay informed about not just our own product but also other products on the market and what they have to offer customers. The customer is, in fact, our benefactor.

3.5.

WHAT WE HEAR FROM CUSTOMERS: FEEDBACK CLOUD

We can make use of a few tools to examine unmet consumer needs in the market and, in addition, to convert what is visible and invisible into knowledge. First of all, is the problem we are dealing with actually a problem? What exactly does the customer want? We can only comprehend this by speaking with the customer. When we continue to comprehend the customer's experience after the product is launched, we can adopt similar approaches. The most popular tools are surveys and interviews. We can create a procedure that is as learning-oriented as we can while designing the survey questions. Here are a few illustrations from Magrab's book *Integrated Product and Process Design and Development - The Product Realization Process* (Magrab, 2010) that I want to share with you:

- We can ask "Can you tell us what you like about our product?" instead of "What do you like best about our product?". If we ask what they like best, the response can be quite personal and only point us in one direction. However, we are interested in the customer's perspective on the product from a wider angle.
- We can ask, "What do you pay attention to when buying the goods, how do you decide?" instead of, "Is low price important for you?". The first question will have a yes or no response, and these types of questions are common in real-life projects. "We asked and 90% of them replied yes," they say, for example. Sadly, this response doesn't lead anywhere. Instead, knowing what the customer is thinking and what they focus on when making a purchasing decision will provide us with a lot of information to consider when deciding on a product's features.
- We can ask "Can you tell us about your experiences with the product?" instead of "Are you satisfied with the product?" Again, yes/no questions will not satisfy us sufficiently as we move through the product development process. We will have the opportunity to learn many things about the process that we do not know and to have our assumptions confirmed when

we ask questions about their experiences. Likewise, asking “Can you tell us what you do when you get in the car until you set off?” instead of “Do you wear your seat belt when you get in the car?” will give us the opportunity to understand what we do not know.

All of these inquiries occur to me as if I were handling the process and thinking like a coach. Asking comprehensive questions and listening without jumping to conclusions are crucial components of the coaching process. One of the biggest errors is attempting to understand the other side’s perspective. We can concentrate on asking without assuming as new product creators, as individuals who prioritize innovation in their daily lives, or as enthusiasts for innovation.

The customer importance-satisfaction matrix is one of the techniques I use in real life and theoretically train with great belief. We have been utilizing this lean tool since I first encountered it in Dan Olsen’s Lean Product Handbook (Olsen, 2017). Here is a brief description of the tool. When creating a new product, we concentrate on the features that could be included based on the problem. Which features should the product have in order to maximize value and satisfy unmet market demand?

It can be used for a product that we have not yet released to the market or for one that is already available and facing competition. It would be beneficial, in my opinion, to use this tool regularly or perhaps to create a system to routinely collect this data from customers. What then is this tool? Let’s assume we believe the product we will create should have 7 features. Which of these we can stand out in the market is what we are investigating. Before asking them about their satisfaction with current products, we first find out how significant this function is to our potential or present customers. We keep focusing on the features that the customer cares about but is dissatisfied with in our design. Even the product’s marketing and communication efforts might give priority to these features.

Finally, I would like to mention the Kano model. In this model, we categorize a product’s features into three categories: must-have features, performance features, and differentiating features. Customers are not satisfied when essential qualities are included in a product, but they are dissatisfied when they are missing. The consumer is more satisfied when there are more performance features, and they are more dissatisfied when more performance features are lacking. If there are performance and must-have features, the features that matter make sense. We might claim that the only thing that sets us apart from the competition is the features in our product. There is no consumer dissatisfaction if there are no unique qualities, but if there are, the customer feels an unexpected satisfaction. Consider ice cream as an example. Ice cream must be cold. There is no customer who is satisfied because the ice cream is cold. However, there is a lot of dissatisfaction if it is not cold or if it has melted. The flavor and ingredients might be seen as performance features. We are more satisfied when it is delicious and healthy. We can also consider the ice cream’s shape as a differentiating feature. If the flavor is good and the ingredient is pure, an ice cream served in the shape of a rose using a unique approach might distinguish out from competitors. The shape can be a differentiator, especially given that children are the target market.

Here, it is important to remember that the market is active and incredibly dynamic. We cannot stop it from evolving and changing, just like time. The market will always be working to fill the unmet needs of the customer, regardless of whether we develop our product or not. That is why we can strive to be both quick and efficient.

3.6. NEW PRODUCT AND VALUE PROPOSITION

If we know what problem we are attempting to solve, we are aware of our target customer, and we have converted the customer’s initial views about new product features into insight, it is time to show the minimum viable product to our early customers and solicit as much feedback as possible. We can learn

from the process more quickly the sooner we deliver this first product to the customer. We might be too late if we wait for the ideal product. The question of choosing the selling price arises as the product is being introduced to the market. I will not go into detail about it here, but learning more about “target costing” will give you a different viewpoint.

We can develop a value proposition based on the feature set of the product. This value proposition explains what we give to each customer as well as how we solve their problems. The book *Business Model Generation* by Alexander Osterwalder can be used in this process. Consider all the qualities and activities that the consumer is willing to pay for when considering value. By imagining the process from the time the customer places the order for the good or service to the time they receive it and what kind of experience they have, we can optimize value. Here, one of the lean tools, the value flow mapping technique, shows the flow, value, and waste. Because it is fast, effective, and simple, it is the lead role in constantly reviewing value.

3.7. NEW PRODUCT DEVELOPMENT TEAM

I think the process of developing a new product is like an exciting journey of exploration. As we start out, there are enormous dust clouds in front of us, and nobody is entirely sure what the rest of the road looks like. It is nearly impossible not to turn the process of developing a new product into an opportunity and not to learn from it while using a deterministic approach and millimetric planning. We have tools in our toolkit, including mental flexibility, iterative development, and analyzing how we address the problem in light of consumer feedback. All these can be learned and improved. We, the people, are the ones who will learn and improve it. When we work as an effective team, we are better able to manage the inherent uncertainty in this process. So what are the characteristics of such teams?

Above all, it consists of individuals that believe in the upcoming new product. There is no one else like us in this world; we are all unique. We have values that make us who we are. I believe that the belief in the process and the product grows if the value of the person is equal to the value of the team and the value of the business. Regardless of whether a person values continuous learning, if the new product being developed will help society learn more easily and effectively, the person will join the team with a willingness and belief that goes beyond the possibility of earning money. Consequently, the team's composition including individuals with high levels of individual awareness may be the key to creating a difference with that product.

The second characteristic is effective communication. People with high self-awareness are always trying to improve their communication skills. This will make it easier to foster teamwork and focus on the entire process, as we mentioned indicated at the beginning of the article. In fact, the lean perspective of processes viewing one another as suppliers and consumers encourages increased communication, and like the chicken-and-egg relationship, as communication gets more effective, processes get better.

An active team is the third characteristic. Traditional organizations limit the interaction of functions to certain areas. For instance, sales teams typically have one-on-one meetings with customers. Less frequently, an engineer at the production site meets with the customer. The innovative teams, the innovative teams of the future, in my opinion, have cyclical communication. The new product development team can communicate with everyone both inside and outside the organization. This direct communication allows for fast and effective learning. This is why the dynamic new product development cycle is the focal point of this team. Agile working methods based on empiricism and lean can also be used when creating the team. However, I think it is preferable to assist the team to learn from action rather than blindly adhering to such framework approaches and methods.

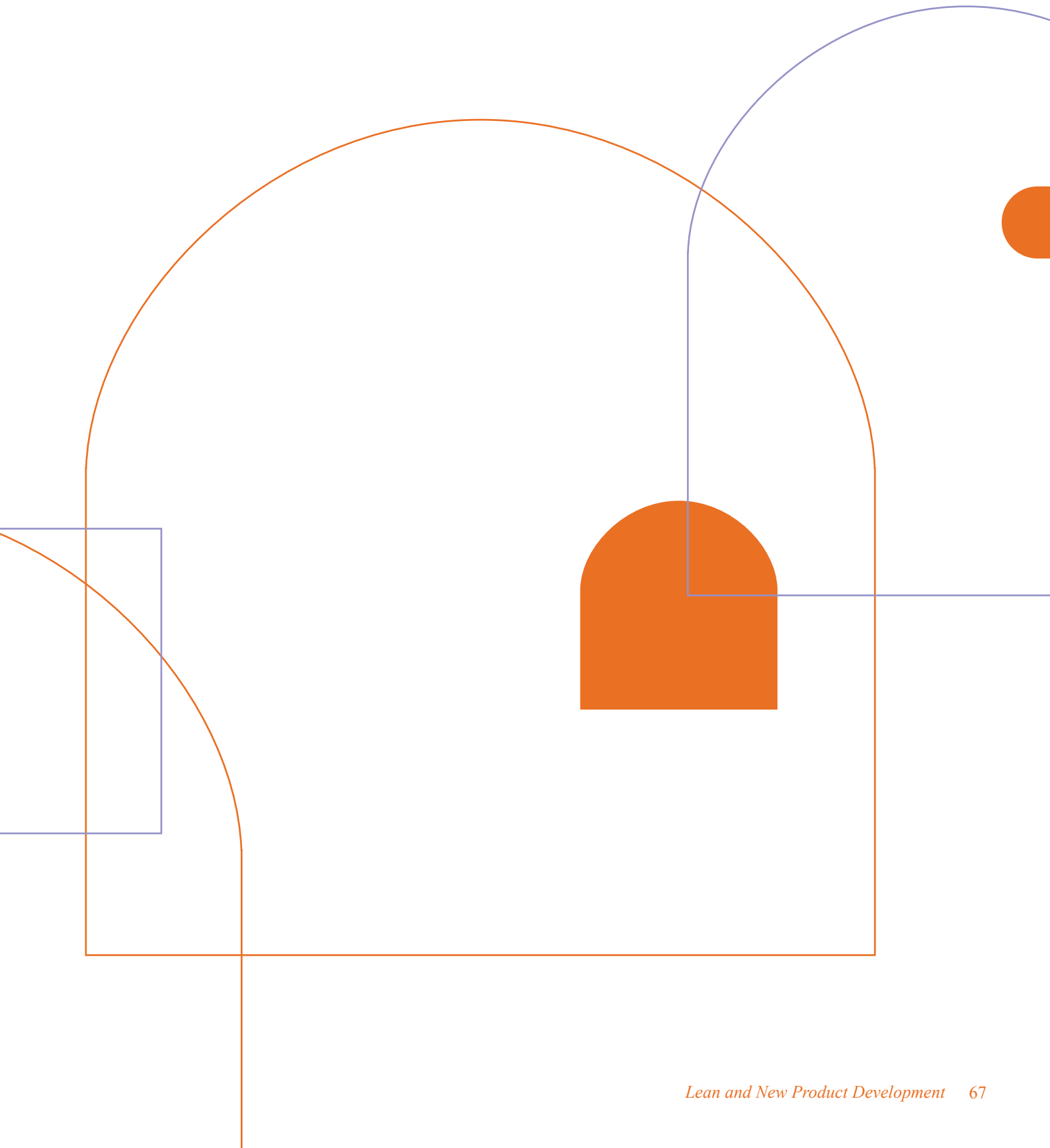
Having an interdisciplinary setting, or an interdisciplinary approach, is the fourth characteristic. If creativity is the fuel for innovation, then the more diverse the colors, the more creative the team is. A team with members from various disciplines and backgrounds will be better able to communicate innovation to us.

The fifth characteristic of this team is that it is self-organized. A team managed by roles and responsibilities rather than a hierarchical structure will act, assume responsibility for its activities, and learn.

The team's pursuit of a common objective is the sixth characteristic. This shared goal encompasses everyone and is supported by the company's vision.

4. WHAT TO DO NOW?

For me, putting something learned, no matter how minor, into practice right away, without waiting, is the best way to learn quickly and efficiently. This article is intended for those who are curious about lean and new product development, as well as potentially for those who are just learning about it. My goal was to spread the news and provide you with a comprehensive viewpoint. Consider how and where you may apply the most memorable passage you read in your daily life. I hope you will take that tiny step because you think it is the way to make improvements that really matter.



CHAPTER

6

MANAGING R&D AND MARKETING INTERACTION FOR NEW PRODUCT SUCCESS



DİLEK TURAN

Dilek Turan, Ph.D., was born in 1984 in Bursa. She received her bachelor's degree in Chemical Engineering and her master's degree in Business Administration, respectively from METU, and her Ph.D. degree in Business Administration/Marketing from Anadolu University. Due to her interest in innovation, entrepreneurship, strategic management, and marketing, she focused on these fields in her master's and Ph.D. theses. Since her graduate studies, she has worked at METU Teknopark, Formin Denge, and Yeşim Tekstil in the fields of international grants project writing and management, quality management, and social compliance. At Vitra Innovation Center, where she worked between 2012-2021, she had the opportunity to both discover and experience many topics related to R&D and innovation management. She led the Innovation Projects Management Office lastly and worked with several different teams within the company and innovation ecosystem. In 2021 which marks the 15th year of her career, Dilek Turan, Ph.D. left corporate life and founded ReCode Training and Consultancy Services company. Currently, she continues to support institutions in their R&D and innovation studies by providing trainings and consulting services.

1.

INTRODUCTION

In today's extremely sensitive, volatile, and competitive business environment, the new product development process is crucial for organizations to thrive and achieve sustainable growth. "Building the right product" and "building the product right" are two issues that are intrinsic to the process of developing new products and will never change. The development of these two pillars depends first on accurately detecting the needs of customers, whether they are obvious or not, and then on effectively managing the processes and the relationships between departments that support the processes as these needs are converted into products.

The interaction between R&D and marketing teams is important for the success of innovation, regardless of whether companies adapt their own technology to meet customer needs or develop new products in response to market demand. If the interaction between these two teams during the development of a new product is poor, the process will either produce products that are designed to exceed customer needs or expectations, products that are overburdened with features and consequently cost more than they are supposed to, or outdated products that offer little value to the customer. One of the major barriers to the return on innovation efforts, according to several studies, is the poor interaction between the R&D and marketing teams.

Establishing a collaborative R&D and marketing effort is a difficult but crucial endeavor for leaders in charge of innovation, new product development, and product management. Since the 1970s, academic research has focused on the interaction between these two departments. In order to explore the effects of various variables on this relationship, studies in many industries have been done, and several models have been developed. In this study, first, conceptual definitions of R&D/marketing interaction will be presented, and significant studies from the literature will be summarized. Next, how the interaction should take place during the development of new products, as well as the challenges that are encountered will be discussed. Finally, recommendations from different sectors for managing the interaction will be provided, in order to contribute to the leaders working in this field.

2.

LITERATURE REVIEW

Since the 1970s, academic studies have focused on the interaction between R&D and marketing teams, and numerous authors have underlined the significance of this interaction. Crawford (1977) noted the significance of the issue and stated that many businesses are unaware of this interaction problem (p.2). Although 45 years has passed from those days, his words still ring true, and many businesses still struggle with the way these two teams collaborate.

"All functional interfaces in the product development process have the potential to create areas of friction, but in our experience, the one between marketing and R&D has the most disruptive impact and is the most challenging to be solved effectively... But it surprises me that most companies are unaware that this specific problem exists."

In the literature, R&D/marketing interaction has been referred to as “integration” (Gupta, Raj, and Wilemon, 1986; Souder & Moenaert, 1992; Song & Parry, 1993; Moenaert et al, 1994; Fain & Wagner, 2014), “collaboration” (Jassawalla & Sashittal, 1998; Simula, 2012), “solidarity,” (Pinto and Pinto, 1990; Song, Montaya- Weiss, and Schmidt, 1997; Lu and Yang, 2004), and “harmony” (Warren, 1992; Kiss, 2008). The ability to work together toward the same objective and maintaining this effort under all conditions, however, is the common denominator of all definitions.

R&D/marketing interaction is the process of communication and collaboration between these functions, according to Li and Çavuşgil (1999). (p.133). As stated by the authors:

“This process is critical because it combines the knowledge of market needs with the knowledge of how to develop a product to meet those needs. The first knowledge is in the domain of the marketing function due to its interaction with end users, and the second is in the domain of the R&D function due to its expertise. If these two functions do not communicate and collaborate, market needs and the product are separated, resulting in a mismatch between what is actually needed and what is produced.”

The interaction between R&D and marketing has been studied over time with various focuses, and significant models have been proposed. The intensity of this interaction has been examined at various stages of the new product development process depending on the type of innovation, the industry, and the company’s strategies, making it one of the most frequently discussed issues in the literature (e.g. Gupta, Raj, and Wilemon, 1985; Lu and Yang, 2004; Fain and Wagner, 2014).

The identification of elements influencing the interaction is a different topic that has drawn a lot of attention. Numerous studies have attempted to assess the effects of a variety of factors on the relationship between these two departments, including organizational structure, organizational climate, top management support, environmental uncertainty, the way functions operate, and personality variations (e.g. Gupta, Raj, and Wilemon, 1987; Calantone, Benedetto, and Divine, 1993; Atuahene-Gima and Evangelista, 2000).

Researches have also looked at cross-country variances, the effect of R&D and marketing interaction as an output indication on new product success, and market entry strategies (e.g. Wang and Montaguti, 2002; Song and Thieme, 2006; Shin and Roh, 2015).

It is clear that most studies make use of two conceptual frameworks and models mostly and building on them to advance the field. The first model, shown in Figure 9, was created by Souder and Chakrabati (1978) as a result of a thorough literature analysis and field study. In this study, the authors reviewed the R&D and marketing management literature published between 1959 and 1976 and studied 74 model propositions and 500 propositional phrases. They chose a few key hypotheses to test based on these analyses. These hypotheses are as follows:

- H1A: Project success is directly correlated with the extent of R&D and marketing interaction
- H1B: The success of the project is directly correlated with the effectiveness of knowledge transfer and a clear grasp of the issue and the needs of the user.
- H2: The degree of the integrator role’s legitimacy and the presence of common reward systems are closely related to how well integration works. In short, effectiveness rises (falls) as legitimization levels do rise (fall).

- H3: The presence of technical and marketing uncertainty is correlated with the level of conflict between R&D and marketing.
- H4: The amount of necessary interaction depends on how much uncertainty is there.

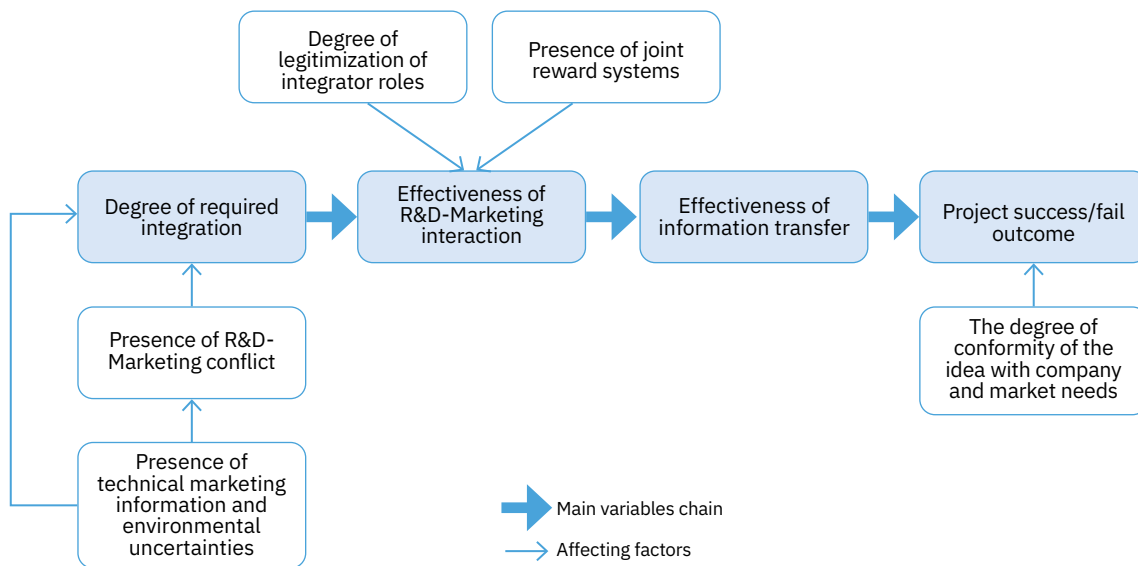


Figure 9: Souder and Chakrabati's R&D and Marketing Interaction Model

Data collected from the field verified all hypotheses. The advantages of a formal role, such as a project manager chosen by top management and in charge of coordinating between R&D and marketing units, were stated in order to boost the effectiveness of R&D and marketing integration in particular. The effectiveness of the interaction decreases with the reduction in the formal authority of the person responsible for building this relationship. Creating incentive systems and rewarding R&D and marketing teams equally for each successful effort is another proposed strategy to boost effectiveness. It was established that in this way, both departments will value collaboration and feel equally accountable for the projects.

The model proposed by Gupta, Raj, and Wilemon in 1986 is the other most widely cited model in the literature. In this model given in Figure 10, the authors sought answers to three main questions:

- How much integration is required between the R&D and marketing departments? Do some companies need more integration than others? What are the factors that affect the required level of integration between these two departments? (perceived need for interaction)
- How much integration is currently ensured between these two departments? What are the factors affecting the integration level ensured? How can senior management and others affect these variables to achieve the desired level of integration? (degree of the ensured interaction)
- How does integration affect the innovation's success? To what extent does the level of R&D and marketing integration contribute to innovation's success? - (interaction gap - innovation-success relationship)

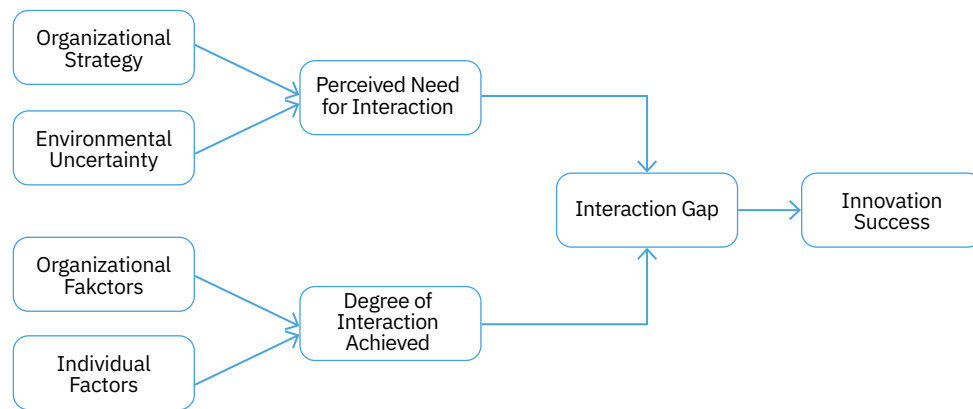


Figure 10: Gupta, Raj, and Wilemon's R&D and Marketing Interaction Model

From these three basic questions, a total of 14 hypotheses were derived. Authors argue that the perceived need for interaction is affected by the organization's new product strategy and environmental uncertainty. The more proactive the company's strategy for the entry into new markets/products and the higher the perceived environmental uncertainty, the greater the need for integration. Perceived environmental uncertainty is affected by competition, consumer requirements, technological changes, and legal restrictions.

On the other hand, the degree of achieved interaction is affected by organizational and individual factors. Organizational factors include the components, such as the structure of the organization, the role of senior management, and the operational characteristics of R&D and marketing departments, whereas individual factors refer to sociocultural differences between R&D and marketing managers. The less bureaucracy and hierarchy in the organization, the more employee participation in new product decisions, and the higher the level of integration is.

Likewise, as senior management encourages risk-taking behavior in both R&D and marketing managers, as both departments are jointly rewarded for new product success, and as the need for R&D and marketing integration is formally expressed by senior management, interaction occurs at a higher level.

Also, integration increases as the operational characteristics of R&D and marketing departments converge. The alignment between the two departments, for example, increases as both departments participate from the beginning of the innovation process, understand one another's viewpoint, resolve disagreements at the lowest possible level, and discuss issues rather than just accepting them.

Individual factors affecting the degree of interaction achieved are R&D and marketing managers' professional/bureaucratic tendencies, their tolerance for ambiguity, their perception of time, and their preferred product/project types. R&D staff tends to be part of networks outside the organization where their expertise is appreciated and supported by others working in a similar field, whereas marketing staff tends to be well-known within the organization. The closer the perspectives of these two sides are to each other, the more interaction is possible.

With respect to tolerance for ambiguity, R&D managers are more likely to act on objective data and facts, whereas marketing managers are more comfortable acting on judgmental data and instincts.

When it comes to tolerance for uncertainty, the closer the parties are to each other, the more integration takes place.

R&D and marketing managers also perceive time differently. While R&D managers have more of a long-term perspective, marketing managers have more of a short-term perspective, and the more similar the perception of time, the greater the interaction is.

On the other hand, in terms of the type of product/project preferred, marketing units are interested in products that can be successful in the market even if they have small returns for the company, while R&D units focus more on radical, groundbreaking projects, and significantly new products. The difference between these preferences affects the level of integration as well, and the closer the preferences are to each other, the higher the level of integration is.

Lastly, the smaller the difference between the perceived level of interaction and the actual level of interaction, i.e. the better integrated the R&D and marketing teams are, the more likely the innovation is to succeed.

These hypotheses have been tested in different sector and country contexts in the following years and valuable contributions have been made (Lu and Yang, 2004; Song and Thieme, 2006; Fain, Kline, and Duhovnik, 2011; Fain and Wagner, 2014, etc.).

3.

NEED FOR INTERACTION DURING THE NEW PRODUCT DEVELOPMENT PROCESS

We often hear complaints from R&D teams that the new technologies/products they develop are not being pushed to market by sales and marketing teams, while sales and marketing teams complain that the new technologies do not offer exciting value propositions for customers, and unfortunately this dynamic causes another disconnection. As senior management pushes teams away from traditional incremental product innovation towards disruptive digital service and business model innovations, there is a backlash from the front lines of both product development and commercialization, and teams shift towards incremental product innovation where they feel more secure. Therefore, teams not only do not talk to each other but also unwittingly maintain the status quo (BCG, 2021, p.16).

As can be seen in Figure 11, in the process extending from the idea to the customer, R&D divisions are responsible for directing demand-driven or demand-neutral product/service or technology innovation to one or more market units. Market units, on the other hand, are responsible for commercializing the product/service in their geographical area or applying the technology to a specific area. Researches show that companies are particularly challenged when innovation is pushed rather than pulled by market units, when it is adjacent to or completely outside the core business rather than related to the core business of the organization, and when it is done for multiple market units rather than customized to the market unit. If technical and commercial teams are not aligned, the new product development/innovation process results in products/services that do not achieve commercial success (BCG, 2021, p.17).

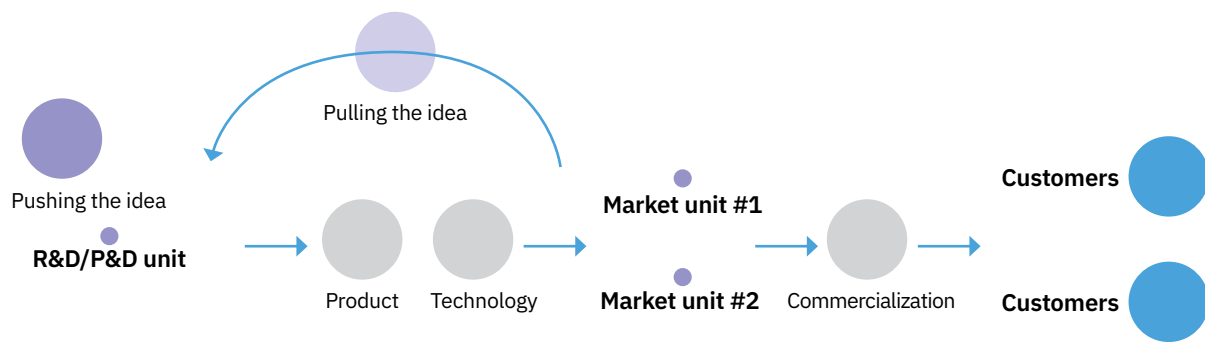


Figure 11: Process of Innovation from the Idea to the Customer

The new product development process is a multi-step and multi-disciplinary process by nature. In general, the new product development process consists of some steps, including needs assessment, idea development, idea review/screening, concept development, concept testing, product development, testing and validation, and commercialization. This process is preceded by the often neglected planning phase and followed by the post-commercialization phase. As can be seen in Figure 12, the planning stage involves such activities as formulating the innovation and product strategy, setting priorities and targets, and preparing the timetable and budget. On the other hand, in the post-commercialization stage, the following activities are carried out: analysis of the product's market position, managing customer feedback, evaluating sales and distribution networks, and reviewing product diversification and differentiation options (Gupta, Raj, and Wilemon, 1985, pp.290-292).

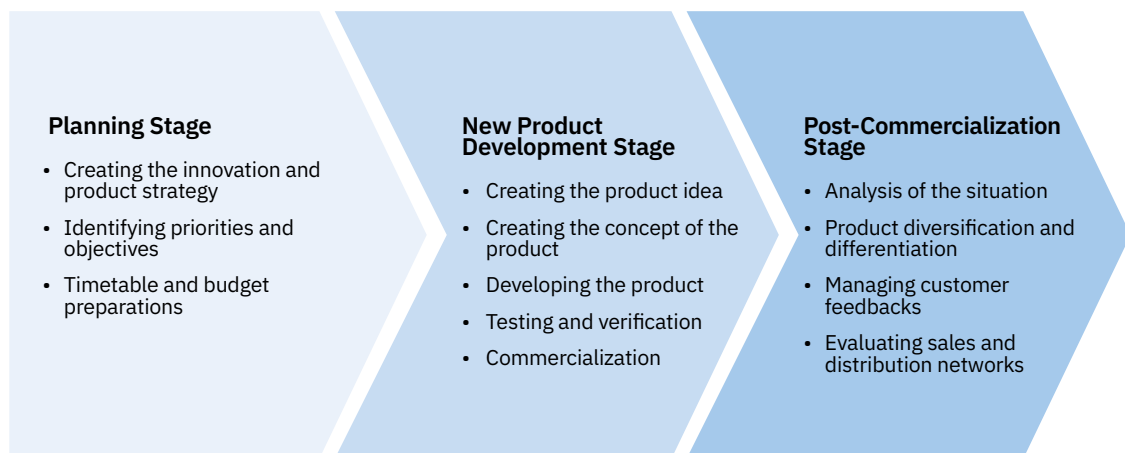


Figure 12: Integrated Innovation Management and R&D-Marketing Interaction

Considering product innovation as an integrated process, there should be an interaction between R&D and marketing teams not only throughout the product development process but also from the planning stage to the post-commercialization stage. It is important that R&D teams are involved in the market planning process and marketing teams in the technology planning process. This way, both sides will be able to understand each other's priorities and competencies, a common strategy will be created, and the process will start in line with the same goal.

Differences in terms of background, perception of time, and priorities between R&D and marketing teams usually lead to difficulties in managing time and budget during the product development stage. It is important to create the timeline and budget together in order to see how it will affect the timeline if there is a disruption in the process and to be able to identify which activities should be abandoned in case of a budget cut. Therefore, the required time should be allocated to the planning stage.

The new product development stage is the stage that requires the most collaboration, often requiring daily communication between R&D and marketing teams. The more integrated the R&D and marketing teams are in the process of discovering needs and generating ideas, the higher the quality of ideas. This integration not only brings both functions closer to the user but also allows users' visible and hidden needs to be revealed.

In the idea evaluation step, ideas must be assessed for both technical and commercial feasibility. Reactions to competition or regulations can be made at an early stage if there is an integrated R&D and marketing team.

In the development stage, where ideas are transformed into concepts or actual products, the marketing department can provide valuable input and feedback to the R&D team on many issues, including what price range is acceptable to customers, product quality as perceived by customers, how customers will use and dispose of the product, desired product benefits and features, product safety and environmental constraints, constraints imposed by the distribution system on the product design, and many more. This information can be used to create products that meet the expectations of the customers in terms of product quality and features as well as price.

One step before commercialization, during the field testing stage, it is important that the teams work together, going to some customer installations together, and getting feedback. In the commercialization process, R&D teams can help marketing departments to prepare a communication strategy so that the unique features of the product can be effectively communicated to customers. This help is particularly critical in communicating new technologies where marketing departments are not so familiar. Marketing teams also should accurately convey customer evaluations of the products to R&D units, which will facilitate the required modifications to the product design.

After commercialization, the product's performance in the market should be analyzed jointly by the R&D and marketing teams. When assessments, such as those regarding sales figures, market shares, profitability targets, competitors' reactions to the product, customers' complaints and feedback, and whether product features and usage, are well understood and made jointly, faster steps can be taken and more value can be created. Therefore, it is important to consider product innovation as an integrated process from planning to post-commercialization and to ensure the interaction of R&D and marketing teams throughout this process to create successful products in the market.

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4.

OBSTACLES TO R&D AND MARKETING INTERACTION

There is a clear need for R&D/marketing interaction throughout the new product development process, but there are several obstacles to effective interaction. These obstacles can be categorized into four groups: perceptual factors, cultural and organizational factors, language factors, and process factors (Trott, 2017, p.608).

Marketing teams think that R&D teams are people who are not aware of real-world problems, never finish developing a product, have no concept of time, are only interested in technology, and do not care about costs, try to standardize everything, and need to be kept away from customers. From the perspective of R&D teams, on the other hand, marketing teams want everything now, focus on customers who do not know what they want, are quick to make promises they cannot keep, do not have a clear head, do not understand technology, want to ship products before they are ready, and are only interested in temporary solutions. The way how these two teams perceive each other is the first obstacle to interaction.

The second obstacle is cultural and organizational factors. The main causes of cultural differences are the differences related to background and education between the two groups. In contrast to marketing teams, which mainly worry about tangible incentives like bonuses and premiums and the acknowledgment of their employers, research and development teams are concerned with the appreciation of other professionals in their field as evidenced by the articles they produce or the awards they win. Departmental structures and the two groups' various activities are the root causes of organizational obstacles. Since marketing teams and R&D departments typically work in separate locations, there is no opportunity for mutual understanding and trust to grow. The two groups' business practices also diverge significantly.

The interactions between the two groups reveal the language obstacle as well. R&D teams utilize quantitative language when discussing a product's performance and features, but marketing teams tend to focus more on the product's utility and market position. All of this, in addition to process concerns like the absence of a structured procedure for new product development, the dearth of communication tools, and the ambiguity surrounding the assignment of roles and duties across the teams, result in significant obstacles.

5.

RECOMMENDATIONS FOR MANAGING THE R&D-MARKETING INTERACTION

Successful businesses, according to Gupta, Raj, and Wilemon (1987), view the integration of R&D and marketing as an organizational test as well as a "people" problem and design strategies accordingly (p.38). Companies with successful innovations manage the interaction between R&D and marketing better than others in four areas, according to BCG research from 2021 (p.17). As suggestions for controlling the R&D-marketing interaction, the following four points might be made:

- 1. Develop a one-team culture instead of silos:** Many innovation leaders excel at assembling cross-functional teams. One insurance innovator, for instance, created small, international cross-functional teams by combining the strategy, product development, and sales divisions in order to identify and develop growth prospects in related fields. Team members are centrally managed and taught to have a minimal level of cross-functional competencies. The company has become the leader in the delivery of new insurance solutions in developing and high-potential market areas like autonomous vehicles and car sharing because the members work toward the same objective.

Two significant adjustments to its processes helped a large hardware and software company that had long failed to turn deep research results into solutions for its customers to flourish. The first adjustment involved moving centralized R&D spending to business divisions, while the second involved altering the culture of the engineering staff. R&D and marketing teams became closer as R&D resources were allocated to business units, and they began to create goods and services based on user and consumer insights. The project portfolio should be managed in a way that balances the two sides against the propensity to come up with innovations that are more step-by-step and focus only on the short term. The corporation required engineers to participate in both product development and sales in order to alter the mentality of the engineering team. It also permitted rotation between R&D and business groups. This way, engineering teams started to focus more on the consumer than the product.

- 2. Aligning incentives with innovation metrics:** While everyone is aware that incentives are crucial in encouraging desired behavior, the majority of businesses do not consistently reward innovation. Metrics that focused on R&D and business units were established by a multinational manufacturer of industrial products. Business unit leaders were recognized for the sales share of recently introduced items (share from the sales of products launched in the last 3 years), while R&D leaders and engineers were recognized for the new sales results brought about by the innovations and patented products they produced. The two departments worked together more successfully because they used complementary metrics to track their respective performance.

To align cross-functions, more abstract metrics can be constructed in place of such concrete ones. For instance, a top worldwide information technology corporation used three different conversation forms to try to enhance involvement. These include annual meetings where later-stage technologies or early product ideas are introduced by the R&D department and business unit interest is assessed, science fairs attended by 30-150 people and teams that meet virtually and explore broad application areas, and science fairs where the R&D department presents early-stage technologies and prototypes. The upshot of the company's enormous resource investment to bring various teams together at such events was products, services, and business models that added value over the long term.

- 3. Establishing clear lines of authority, communication, and responsibility:** Successful innovation systems must have clear lines of authority and responsibility. One of the top cybersecurity and privacy organizations uses roadmaps that are mutually decided by R&D and product owners to govern its medium- to long-term innovation outputs. As this kind of innovation necessitates a common comprehension of long-term customer needs, it has been particularly successful in integrated services, where hardware and software solutions are merged and provided to end users via a subscription model.

Likewise, the R&D and sales teams need to work more closely together, and a top medical technology business recognized this need. To address it, the company began at the top by elevating R&D management to the board level and defining the position of the chief technology

officer. The chief technology officer, chief sales officer, and chief innovation officer were then brought together in an innovation council to manage the innovation portfolio and project pipeline together. In order to foster equal cooperation between the commercial and R&D teams, it was also necessary for the R&D department to assume full technical ownership of goods for the first year after their release.

- 4. Changing the status quo and celebrating achievements:** Businesses are discovering new ways to view opportunities by changing the status quo. For instance, to realize the full potential of the technology, a top electronics and telecoms company employed patent-holding R&D engineers as members of a technical steering committee throughout the product lifecycle. This promoted international information exchange while also highlighting the commercial contributions of engineers who had innovative ideas.

After many years of incremental product development, one of the world's leading multinational medical technology companies also realized the advantages of customer value propositions over technical requirements. The company's marketing teams are now posing problems for the product development teams from the standpoint of the end user, as opposed to previously standing on the sidelines and telling the product to be built. As a result, R&D teams started to create more innovative solutions that satisfied customer needs.

The aforementioned examples demonstrate that there are different strategies to improve R&D-marketing interaction, even though the best approaches depend on the organization, sector, and the starting point. Leaders' role should be asking the proper questions, to find out where the interaction is going wrong and closing the gap using a range of strategies.

6. CONCLUSION

When we look at businesses that have had unprecedented success with novel goods, we find that internal teams successfully combine customer insight and technology foresight. Due to the founders' desire to fill a gap in the market, achieving this combination is easier for entrepreneurs. However, as businesses mature and grow, silos are built as functional structures, making it more challenging to sustain this symbiotic relationship. The main obstacle to the success of new products and innovations is thus this gap between product-facing R&D teams and customer-facing business development/marketing/sales teams.

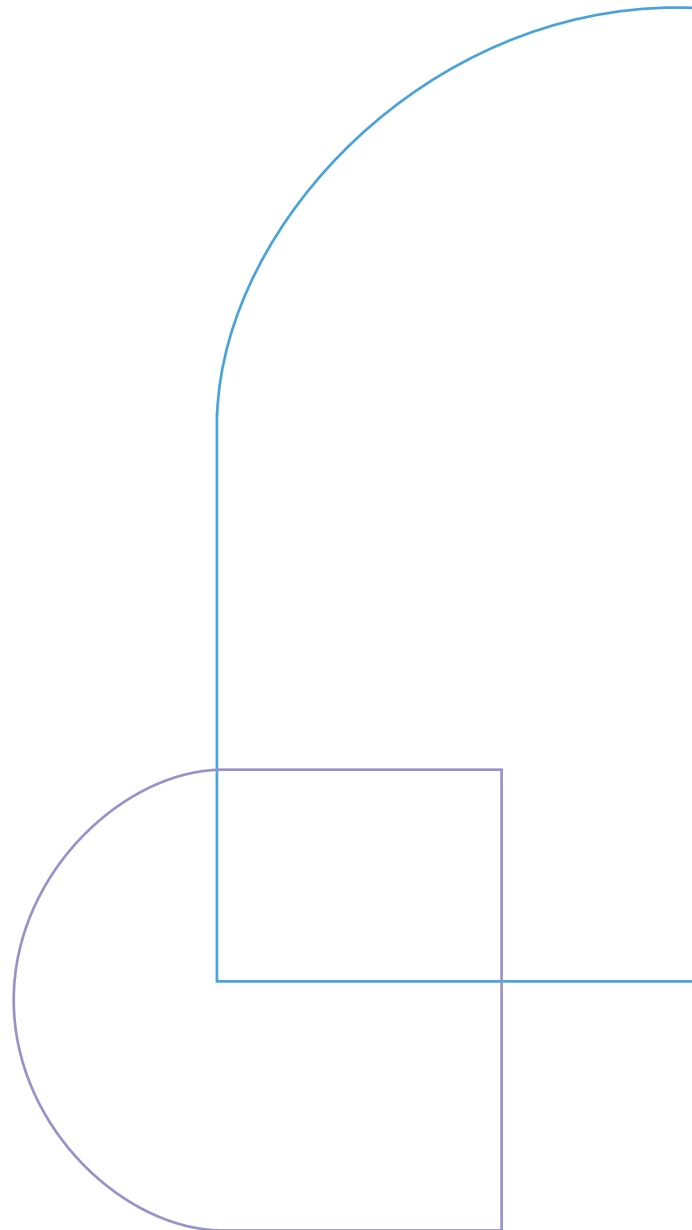
The interaction between the R&D and marketing teams is crucial since the key to a company's long-term success is to think about the product with the consumer or user without avoiding product adoration. Successful products and services are achieved in the market when R&D and marketing interaction is well managed. Managers should handle the problem by taking into account their own company culture and dynamics and seeking the answers to the following questions in order to ensure this engagement:

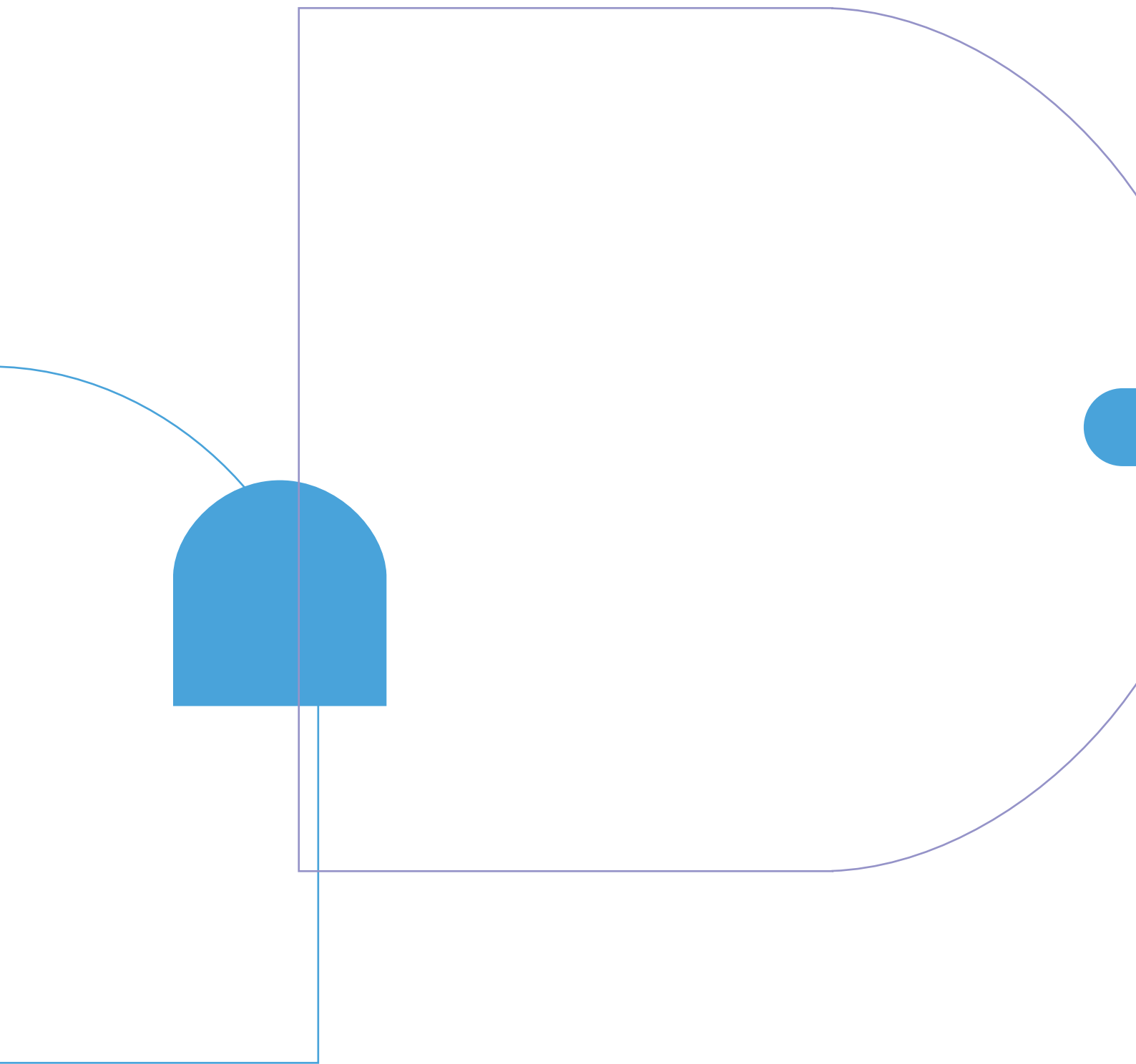
- How are user/customer insights transferred to technical teams in our organization and how do these insights impact the new product development process?
- Which stages of the new product development process require the most interaction between R&D and marketing?
- On which themes and how frequently should the R&D and marketing teams communicate throughout the new product development process?

- How well the interaction is now, and what factors are the main obstacles to interaction?
- What kinds of strategies can we use to overcome these challenges?

It is believed that new product success will be favorably affected if these and comparable questions are sought to be answered in meetings including the two teams, solutions are developed and executed together, and interaction is encouraged and monitored by senior management.

One of the main responsibilities of top management is to create a well-integrated organization. In the current business environment, where launching successful new products is crucial to an organization's survival, top management must focus on creating an efficient R&D and marketing effort. Only in this manner can business models, goods, and services be created that far exceed consumer expectations and lead to long-term success.





CHAPTER

7

THE USE OF TRL IN TECHNOLOGY MANAGEMENT



TOLGA GÜVEN ÇEVİKSEVER

Born in Gaziantep on July 18, 1981, Çeviksever completed his primary and secondary school education there and graduated from Firat University in 2015 as a Mechatronic Engineer. He began working as a structural design responsible at Silverline, a business that makes built-in products for the white goods sector, in 2016. There, he took part in numerous projects as both a designer and a project leader. He worked as a structural design specialist before transitioning to team leader roles in his ongoing career, guiding various projects to mass production with the project team. He obtained his master's degree in mechatronic engineering from Gaziosmanpaşa University in 2020. In order to advance his knowledge in the field of innovation, he enrolled in Amasya University's Technology and Innovation Management Master's Program in the same year. He joined the Silverline Technology and Innovation Management team in 2021 as an Area Manager and actively participated in the organization's technology and innovation management. He has been working for BSH Home Appliances' R&D department as a Specialist since July 2022.

1.

INTRODUCTION

In order to stay up with the quickly changing environmental conditions and technical innovations and even to lead these changes, companies in today's competitive environment need to practice technology management (Ünsal, 2009)

For businesses to fulfill their operational and strategic objectives, their technology skills must be developed, managed, controlled, and coordinated. Technology roadmaps can be used in this regard to plan the conversion of technologies into products and to develop technology plans with a targeted time for the interaction between technology, product, and market.

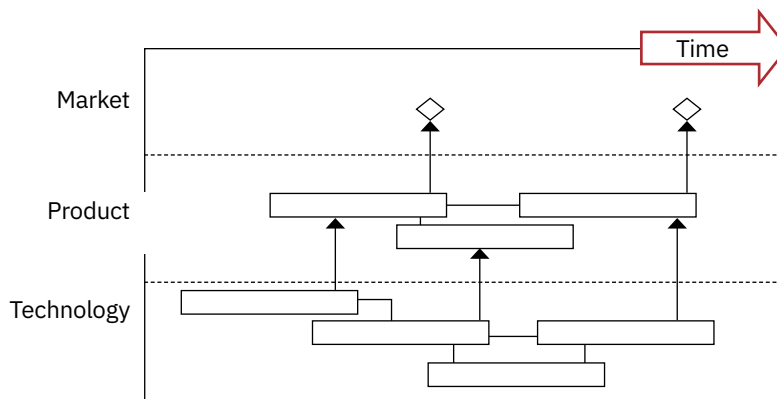


Figure 13: Technology Roadmap (Phaal et al., 2000)

The new technologies that will be required for the target market and product may be shown in technology roadmaps. The incorporation of new technology into products can have positive effects in a variety of areas, including cost advantage, performance increase, customer satisfaction, ease of manufacturing, and brand reliability. However, technology development studies are frequently needed in order to incorporate technological advancements into products. The technologies that are intended to be employed in the project and will be required in technology development studies should be thoroughly examined for the success of the project because resources will always be limited. Otherwise, the goals of the system into which it will be integrated may not be met by the new technology. Often technology infusion causes delays, cost overruns, and sometimes even cancellations or breakdowns in the project plan. Technology assessments and rigorous monitoring of technological advances are required to eliminate these risks.

First, a technology maturity assessment and then a technology development challenge assessment should be carried out in order to undertake a technology evaluation. Prior to creating the project plan, the technology development plan, risk assessment, cost plan, and technology assessment should be completed. At various stages of the project, technology evaluation needs to be done again.

NASA sources were the first to have used the term “technological maturity” in the 1960s (Markins, 1995). The term was used to describe the flight readiness of developed systems during those years, though. The term TRL (Technology Readiness Levels) was used to denote levels of system or technological maturity in the 1970s (Markins, 2002; Markins, 2009).

2. TECHNOLOGY READINESS LEVELS

Initially prepared by NASA and directly contributed to the success of many projects, the TRL method has been recommended by the United States General Accounting Office (GAO) for technology procurement and development processes to be used in defense systems projects since the 1990s. It has been employed in numerous significant projects since 1999 (Fernandez, 2010).

TRL is a structured measurement framework that enables technology comparison based on maturity level (Mankins, 1995). TRL essentially establishes a common language for R&D activities for technologies that are motivated by technology push and market pull (Mankins, 2002; Mankins, 2009). This metric has been utilized extensively in recent years in projects involving cutting-edge technology carried out by defense industry firms, white goods firms, governmental organizations, and academic institutions (Ali, 2016).

Stan Sadin is known as the pioneer of the TRL system (Straub, 2015). The system had seven tiers when it was first discussed in an article in 1989 (Sadin, 1989). In 1990, the system was revised to include nine levels. In order to provide a brief overview of each level and success criteria, John Mankins revised the nine-level TRL system in 1995 (Mankins, 1995). Table 7 displays these levels.

Table 7: Technology Readiness Levels

TRL1	Basic principles observed and reported
TRL2	Technology concept and/or application formulated
TRL3	Analytical and experimental critical function and/or characteristic proof of concept
TRL4	Component and/or breadboard validation in a laboratory environment
TRL5	Component and/or breadboard validation in a relevant environment
TRL6	System/subsystem model or prototype demonstration in a relevant environment
TRL7	System prototype demonstration in a space environment
TRL8	Actual system completed and “flight qualified” through test and demonstration
TRL9	Actual system “flight-proven” through successful mission operations

Without a thorough understanding of the TRL level of all system components, it is impossible to comprehend the size and scope of the project. The first step to a successful project is determining the TRL level of the new technology to be used. The notion that establishing TRL levels is challenging and useless in reality is untrue. The basis of such thinking is the terminology used. For instance, the “relevant environment” may not be clearly understood by everyone. Therefore, the TRL levels and level definitions simply shown in Table 7 will not be sufficient to accurately determine the TRL level.

The TRL level can be calculated quickly and precisely by adhering to the flowchart in Figure 14 and using an experienced assessment team to ask the appropriate questions (NASA, 2007).

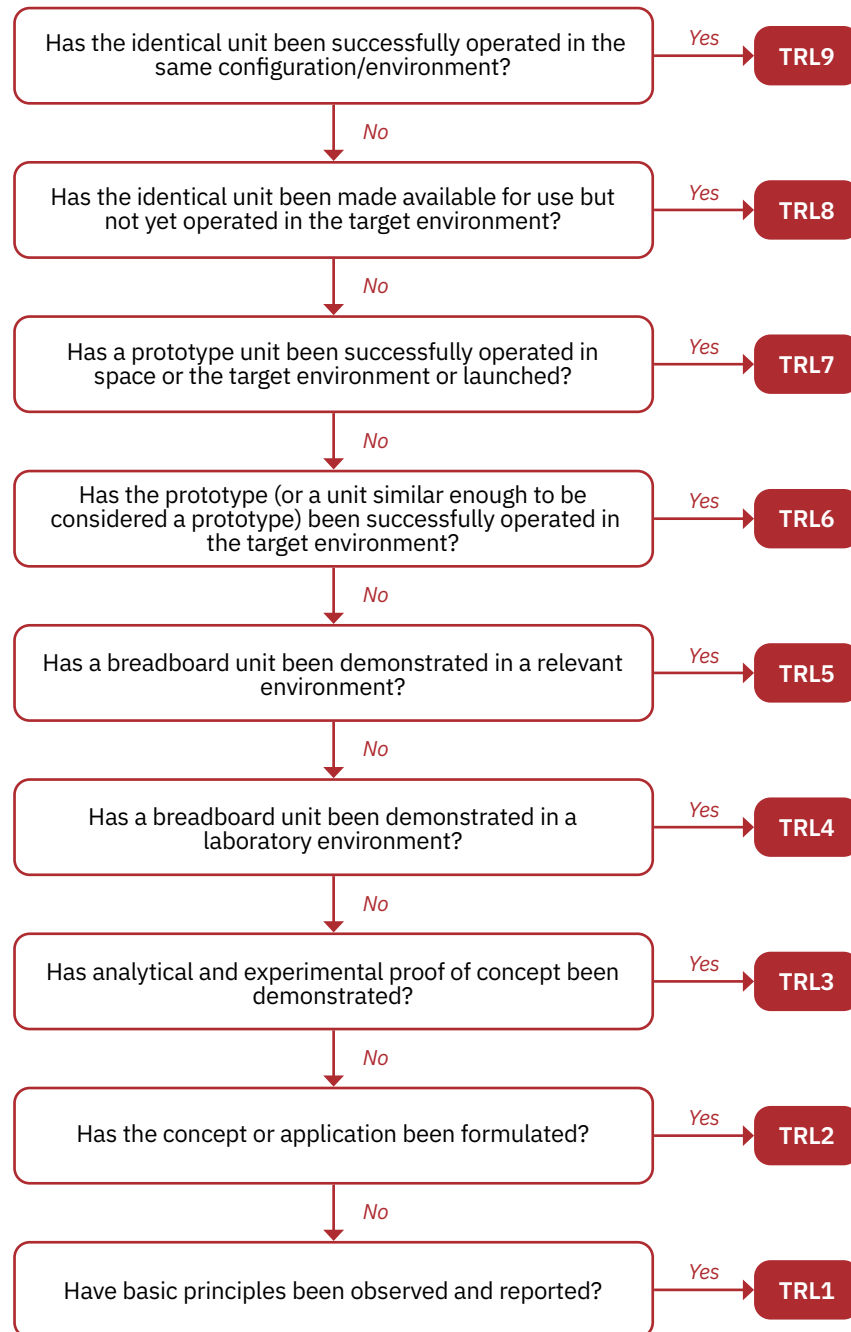


Figure 14: TRL Determination Chart

Table 8 provides thorough explanations of the NASA-defined technology maturity levels as well as illustrations of applications for each level (URL, 2022).

Table 8: Detailed Descriptions of the Technology Readiness Levels

TRL	Description	Application
TRL1	It is the process of moving from scientific research to applied research. Systems' and architectures' fundamental characteristics and behaviors are listed. Algorithms or mathematical formulations are descriptive tools.	In the lab, a brand-new synthetic rubber compound is identified and reported.
TRL2	It is the process of applied research. To define the concept, theory and scientific concepts are concentrated on a particular field of application. The application's characteristics are described. For the simulation or analysis of the application, analytical tools are created.	How much of this newly discovered rubber can be used for car tires is determined.
TRL3	The validation of concepts is proven. Analytical and laboratory research serves as the foundation for R&D. Utilizing sample data and experimental applications, technical feasibility is prepared.	To prove that the rubber is suitable for use in tires, tests are done to assess its durability and shaping capabilities.
TRL4	Independent prototyping is implemented and tested during this process. Technology components are integrated. Full-scale problems or data sets are used in experiments.	Rubber is tested to determine whether it has the right abrasion characteristics.
TRL5	Prototypes are put through extensive testing in a representative setting. All applications will undergo lifelike environment testing that incorporates important technological components into support components that are ostensibly realistic. Applications for prototyping are suitable for the target interfaces and surroundings.	A prototype tire is made of rubber and tested on a wheel.
TRL6	Prototyping applications are performed on full-scale realistic problems. They are partially integrated with available systems. There is not much documentation available. Engineering feasibility in real system application is fully demonstrated.	The tire is mounted and tested on a bumpy road. Here, the car and the road are simulated.
TRL7	The system is prototyped and tested in an operational setting. Most function tests and demonstrations can be conducted using the system. The prototype has been effectively incorporated into both the supporting and core systems.	Tire tests are done on the vehicle on a real road.
TRL8	It is the last step in the system development process. The operational hardware and software systems are fully integrated with it. The majority of the user, training, and maintenance documentation has been completed. Every feature test has been run through simulation under operational scenarios. The validation process is completed.	Certification processes are completed for the use of the tire.
TRL9	It is completely incorporated into active hardware and software systems. The actual system has undergone rigorous testing and demonstration in its operational setting. All paperwork is finished. Experience in operations has been attained. At the location of use, engineering support must be maintained.	The tire has undergone testing over the course of its life to guarantee user safety.

USE OF TRL IN PROJECT MANAGEMENT

The Technology Readiness Level (TRL) denotes the level of technology's maturity or readiness to shift to the system. The project team should identify any new technologies that are planned to be used in projects and assess the technology readiness levels for any crucial technologies. The project's potential hazards related to new technology can be recognized and managed using this approach.

The subcomponent to be employed in the system with the lowest TRL level determines the technology readiness level of the system. In conclusion, the system has a TRL2 technology maturity level if the subsystem it will employ has a TRL2 level of technology readiness. An evaluation matrix, like the one in Figure 15, can be used to determine the TRL of the system, subsystem, and components. The columns in this matrix identify the categories that will be used to determine the TRL level, i.e., which units make up, at what scale, and in what environment they have been tested. The rows in this matrix represent the systems, subsystems, and components (Kapurch, 2010).

[illegible]

Figure 15: TRL Assessment Matrix

Because TRL4 and lower-level technologies carry risk, the US Department of Defense (DoD) often does not deploy them in its systems. Technology risk is the difference between the level of technology readiness and the capacity to fulfill system requirements.

Figure 16 (GAONSIAD, 1999: 24) schematically depicts the relationship between technology readiness levels and technology risks and uncertainties. The danger is greatest at TRLs 1, 2, and 3, as shown in the figure because these are the levels where the technology is still only a concept and there is no evidence of its viability.

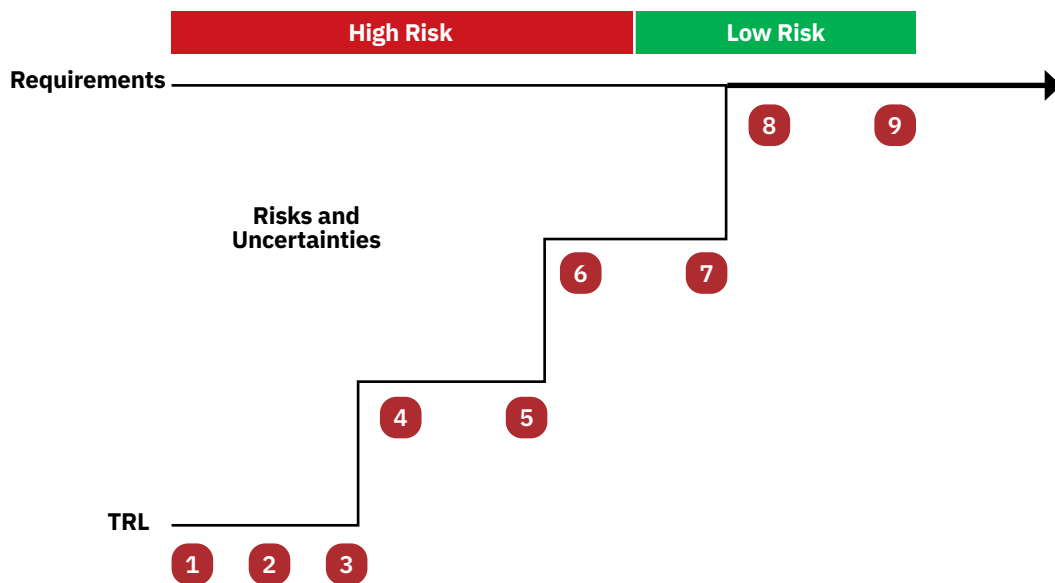


Figure 16: TRL and Technology Risks

There is the least risk at TRL8 and TRL9. Technologies that are this ready have been tried and tested in real settings. As technology-related uncertainties lessen, the risk also decreases.

Between TRL2 and TRL9, 23 essential technologies with varying levels of readiness are included in a GAO research report. According to the report, technologies with low levels of readiness raise the system's overall cost, fall behind schedule, and even force performance objectives to be abandoned. Table 9 displays the effects of projects involving technology at various stages of readiness on the cost and time overrun of the product development process in 4 distinct projects (GAONSIAD, 1999: 27).

Table 9: Cost and Time Performance of Product Development Programs

Product development and associated technologies	TRL	Product Development	
		Cost growth	Schedule slippage
Comanche Helicopter		101%	120%
Engine	5		
Rotor	5		
Forward Looking Infrared	3		
Helmet-mounted display	3		
Integrated Avionics	3		
BAT		88%	62%
Acoustic sensor	2		
Infrared Seeker	3		
Warhead	3		
Inertia measurement unit	3		
Data processors	3		
Hughes HS- 702		None	None
Solar cell array	6		
Ford Jaguar			
Adaptive cruise control	8		
Voice Activated Controls	8		

This table shows that projects using technologies with a TRL of less than 6 can result in cost overruns of more than 100% and project time overruns of 120%. However, in projects using technology with a readiness level of TRL6 and higher, no cost or time overruns were noted.

Because projects that enter the engineering and manufacturing development phase of procurement projects with insufficiently developed technologies experience problems with project cost and schedule compliance, the US Department of Defense mandates that the technology be demonstrated in the pertinent environment (TRL6) before Milestone B approval (DoD, 2008). The beginning of the system development stage will be with milestone B, which is a crucial approval point and milestone. A successful milestone B evaluation requires the application of a technological readiness level metric and technology assessment tools. Figure 17 depicts the TRL levels arrangement that was created in this manner.

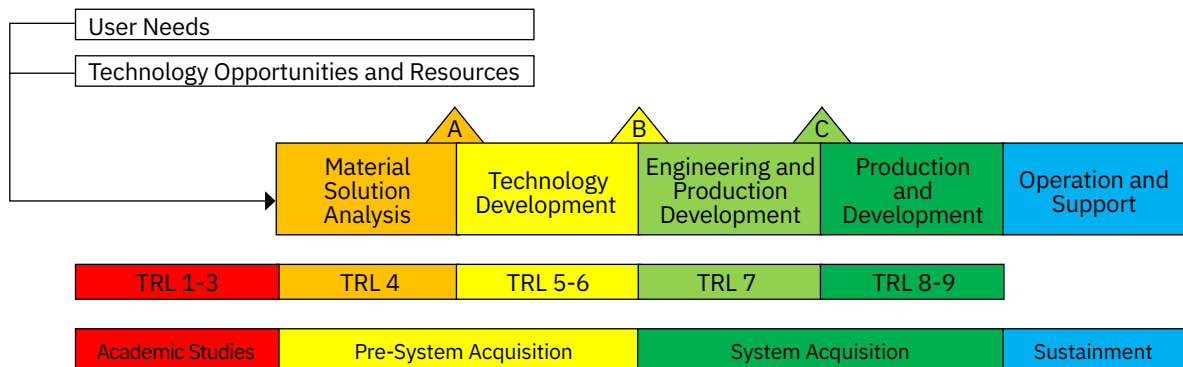


Figure 17: Technology Readiness Levels Alignment

It is incorrect to assume that the acceptance of milestone B totally divides the process of developing technologies from the process of developing products. TRL7 studies link technology readiness and product requirements, allowing for the co-development of products and technologies. The technology development process and the product development process are interwoven until milestone C's approval.

4. EXAMPLES OF PROJECTS USING TRL

It is known that technology readiness level assessments have been carried out in many important projects since 1999 and that this method has a direct impact on project success. In this study, the TRL processes applied in Ford and NASA projects are examined in detail.

4.1. JAGUAR S-TYPE

GAO's research offers a timeline of the TRL levels of the technologies Ford produced for its Jaguar model by technology development. The report claimed that Ford was developing a voice-activated control system that would let the driver give verbal orders to operate the radio and windows. A 1993 market survey found that buyers desired more features and functions but fewer driving distractions with the release of other complementing technologies like faster processors and inexpensive memory. Ford made the decision to pursue speech technology as a strategic technology for product differentiation in light of this market information, realizing the significance of being the first to market with this enabling technology. The timeline for the development of this technology is depicted in Figure 18 (GAONSIAD, 1999: 28).

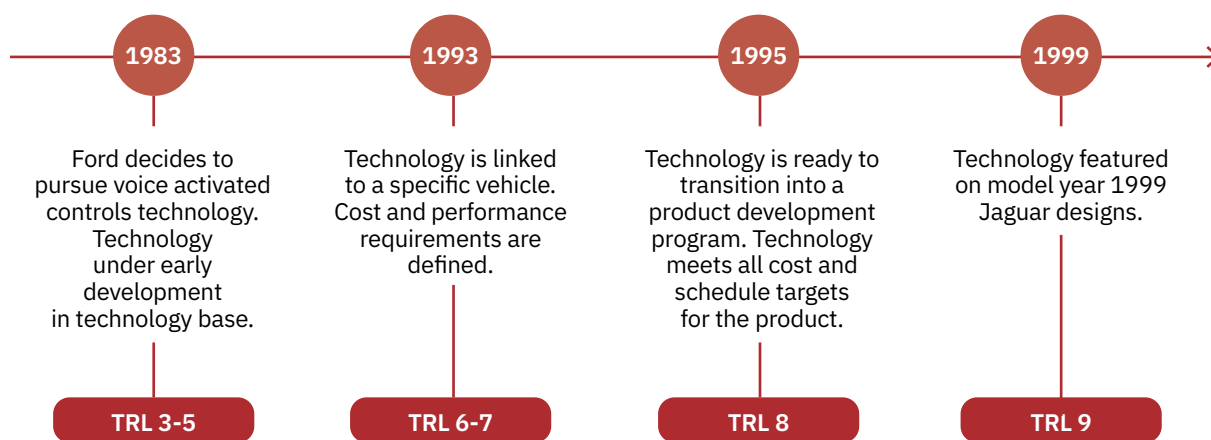


Figure 18: Ford's Voice Activation System Development Timeline

Ford developed the technology's cost and performance requirements between 1993 and 1994 based on conversations with customers. Voice-activated controls were presented as an integrated system suited for Jaguar in September 1995, when Ford permitted the technology to enter the development program for a new Jaguar design. According to Ford representatives, the product achieved all cost and schedule goals established at the start of its development (GAO-NSIAD, 1999).

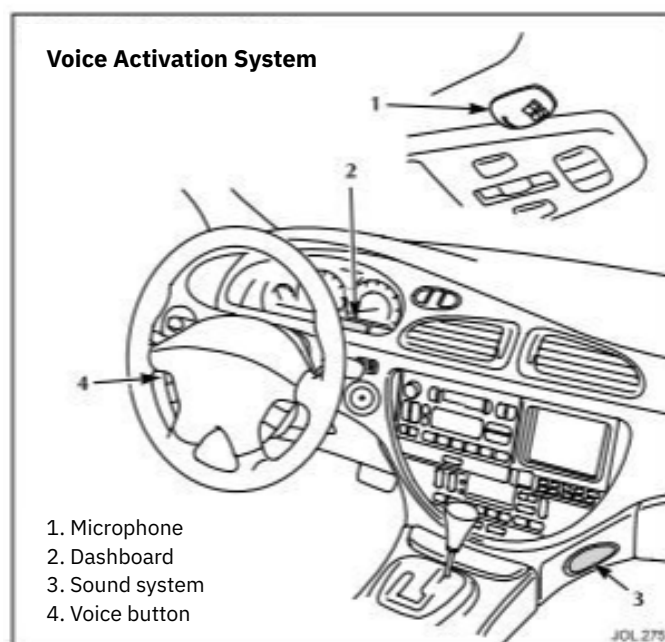


Figure 19: Jaguar S-Type Voice Activation System

4.2. CHEVRON NOZZLE

The Chevron Nozzle project was started by NASA in the early 1980s as a part of a plan to enhance the acoustic performance of jet engines. In the scope of this project, the turbulence produced by the mixture of hot air leaving the engine and bypassing cold air is intended to be divided by a nozzle in the shape of a saw blade in order to lower the sound pressure.

Basic and academic research on nozzle design was conducted during the project's first phase, which also saw the maturation of the technology to TRL2.

Laboratory tests for small-scale nozzle and fin applications were finished in the early 1990s. Model tests for aerodynamics and acoustics were finished between 1995 and 1997, and TRL5 maturity was attained. By completing testing with the system prototype, the technological development phase was finished between 1998 and 2000, and it reached the TRL6 level.

Between 2001 and 2005, the tests of the system prototype in a real working environment were completed and the final design was obtained. In 2005, certification processes were initiated and after a 10-year certification process, Federal Aviation Agency (FAA) certification was obtained in 2015 and the Chevron Nozzle was launched on the market.

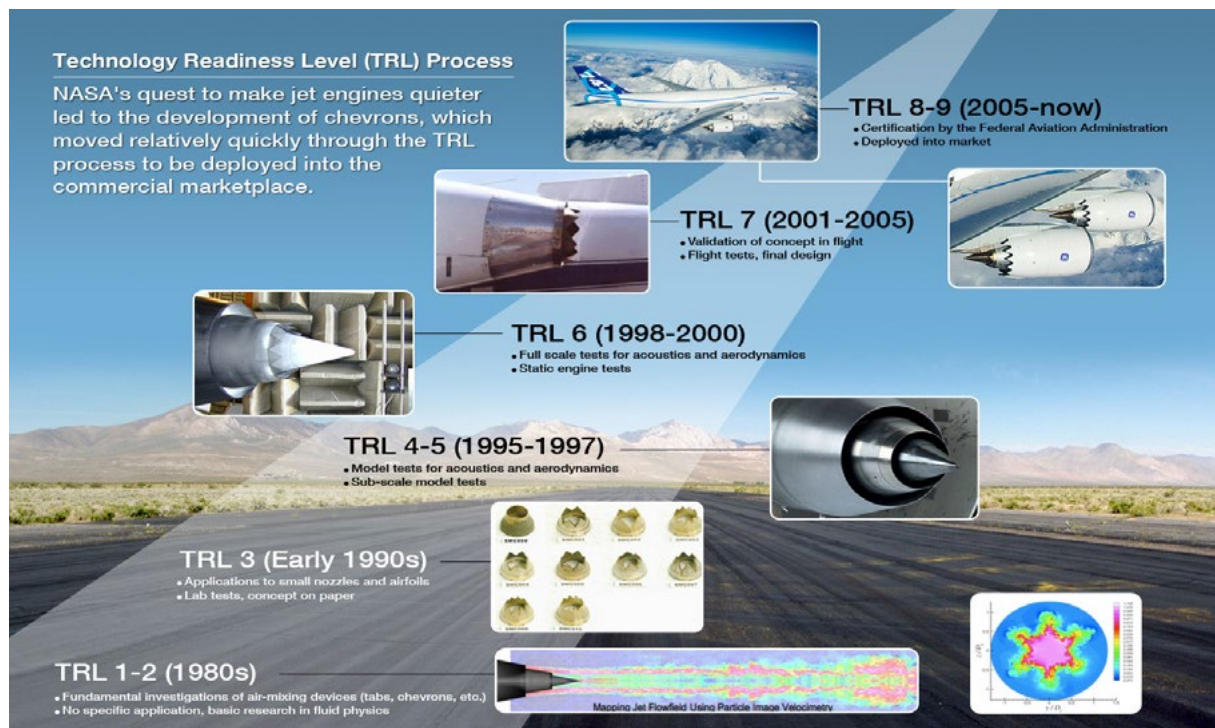


Figure 20: Chevron Nozzle Project TRL Process

5. CONCLUSIONS AND DISCUSSION

It is advised to create a technology roadmap that is parallel to the product roadmap and to identify the technology readiness levels for low-maturity technologies in the subsystems and components of the desired product in order to increase the sustainability of a company's technology management. This way, the technology development work for the desired product in the product roadmap can be finished and engineering and manufacturing development work with high-maturity technologies can commence before the system development work of that product is started.

Today, many businesses evaluate the degree of technology readiness in projects incorporating new technologies using the TRL methodology, a systematic measuring technique. The technology readiness evaluation of the new technology to be utilized before the project plan is carried out by an expert team is advised in order to ensure that the projects meet the intended quality, cost, and project length.

CHAPTER

8

EXPLORE/EXPLOIT BALANCE AND INTERCOMPANY COLLABORATIONS IN THE INNOVATION PROCESS



SERTAÇ ORAL

Sertaç Oral graduated from ITU as an Electronics and Communication Engineer. In the years that followed, he had positions as a project manager at Unilever, a microelectronic designer at Alcatel R&D, and a GSM specialist in Belgium. He finished an MBA program at the European School of Economics in Italy as well as a master's degree in electrical engineering with a focus on laser systems at Gebze Technical University in Türkiye. After that, he spent 15 years at Bosch managing marketing, sales, and business development for the automotive and power tool divisions. He provided innovative contributions that included the creation and global adoption of new business structures and sales channels. With the assistance of "UC Berkeley" and "Grow," he actively participated in corporate entrepreneurship programs over the past two years and developed a focus on lean start-ups. In 2022, he ended his corporate employment and founded the Türkiye office of the Israel-based company Gold Ventures Investment. He now provides start-ups and the ecosystem with guidance on systematic business development, business model innovation, investment, and growth in global markets. He also works with Frank Mattes on Lena Scaleup book and coaching corporates on their corporate innovation programs with this framework. He mentors start-ups at ITU Çekirdek and the Nasdaq Entrepreneurial Center and teaches innovation at the graduate school of Bahçeşehir University.

1.

INTRODUCTION

The complete process of planning, developing, launching, and managing the market position of all different kinds of products and services is included in the collection of procedures known as “product management.” This definition is intended to apply to just one good or service. Product management is one of the most critical management techniques for ensuring that a company is successfully managed and can continue to grow when viewed as the totality of all its goods and services. We will explore the idea of ambidexterity, which has gained attention recently and of which we can observe an increasing number of examples in both literature and practice, in order to manage this process in the most efficient manner.

2.

AMBIDEXTERITY CONCEPT AND ITS PLACE IN THE LITERATURE

Human life expectancy has increased from 31 years in the Middle Ages to about 75 years today as a result of medical advancements and better hygienic surroundings. Companies have life expectancies, just like people do, but these life expectancies are advancing in the opposite direction from that of humans. The “S&P 500” companies’ average lifespan decreased from 32 years in 1965 to 20.7 years in 2021. We get extremely similar figures when we study the identical problem in the “Fortune 500” list.

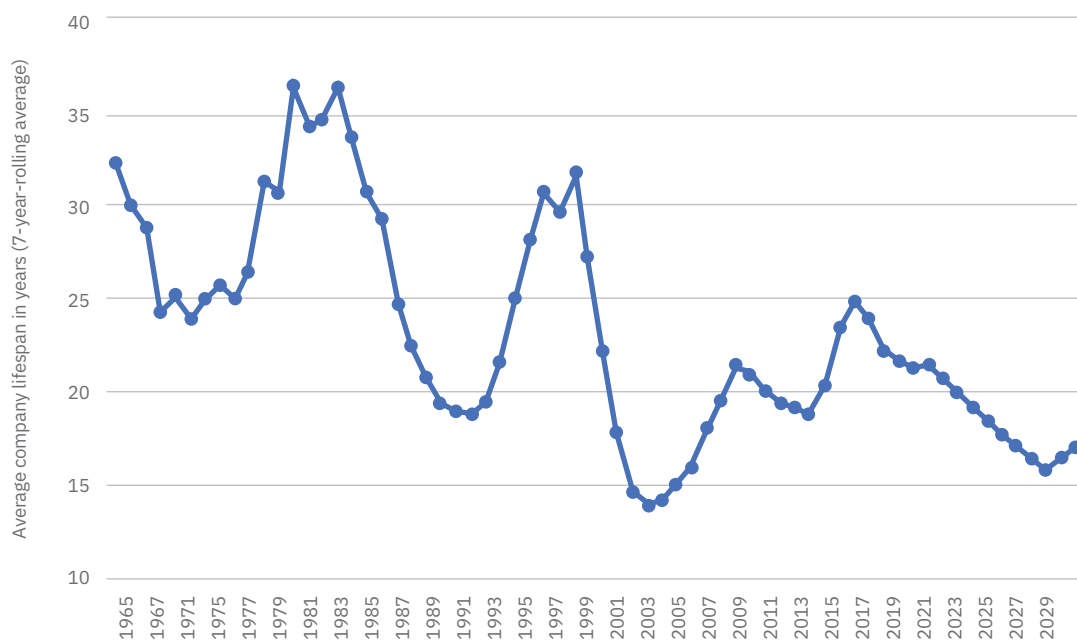


Figure 21: Average Life Expectancy of S&P 500 List Companies in Years Between 1965 and 2030
(Estimated after 2021, Source: Statista)

The English term “ambidexterity,” which is used specifically in the field of archery and refers to using both hands at the same level of competence in a general context, is a very important factor that has come to the fore in recent studies, despite the fact that there are various reasons for this. In order to define the term “ambidexterity,” we must look at the problem from the perspective of innovation. Let’s start by defining the term “innovation.”

“The process of bringing ideas to life in a way that either produces new products or services or enhances ones that already exist.”

Because there are numerous articles that discuss how crucial it is for businesses to incorporate innovation into their operations in order to maintain growth and ensure survival, we will not go into depth. A pair of companies that have effectively emphasized the value of careful handling and use of innovation throughout corporate history are Kodak and Nokia.

2.1. KODAK

Even though it invented the digital camera in its own R&D departments, Kodak, which both pioneered the commercialization of photography and is the largest and most innovative company in the industry for cameras and film, made the decision that “this will have no commercial value, we will focus on our analog camera and film business, and innovate there.” More specifically, Eastman Kodak spent three years developing film sheets and patenting them in 1877 after becoming dissatisfied with the size and complexity of the then-current cameras. After developing a roll film version, he registered Kodak as a trademark in 1888. With the inventions of the first film to be put in daylight, the first film to be used for video, the first film camera to be so useful that it could be called the pocket camera at the time, and 35 mm film, which would become the norm of the photography industry for many years, it started to grow into an industry giant. With advancements like the first color film, the first 8 mm low-cost film camera, and the cartridge-loading camera, it grew over the following years and had a revenue of \$1 billion and 75,000 people in 1962. It created the first digital camera with a resolution of 0.01 megapixels in 1975. In terms of market share, it peaked in 1976. In the US, it accounted for 90% of the film market and 85% of camera sales, according to a 2005 Harvard Business School study. With the introduction of products like Kodacolor VR 100 film, Kodavision 2000 series Beta, and VHS formats of 8mm video film, Kodak Stretch 35, and Foto CD for one-time use, the company continued to lead the industry in the years that followed. In 1996, it won the market with two-thirds of the global market. In the same year, Kodak rose to the fifth-most valuable brand in the world, with a revenue of 16 billion dollars and a business value of 31 billion dollars. The company’s decline in the years that followed began when it was unable to reproduce its success in innovation and failed to replace its largest source of revenue, film, with a new cash-generating product. Despite losing \$60 on each camera it sold, Kodak was the second-largest US camera producer in 2001, after Sony. It is possible to understand how much the loss on each camera sold affected the company’s balance sheet from the standpoint of product management. In the years that followed, Kodak continued to lose market share and revenue, and by 2010, it had fallen to the seventh-place brand in the US market with a 7% market share. After that, Kodak tried a variety of strategies, such as selling its 1,100 image processing patents, but in 2012 it filed for bankruptcy, bringing an end to a 132-year-old industrial giant.

2.2. NOKIA

Nokia, the name that comes to mind when discussing mobile phones, is known for introducing the newest features and has been the undisputed market leader for years. However, Nokia made the decision to ignore touchscreens and smartphones, assuming that people would continue to use push-button phones, and it did not see Apple's invention of the smartphone with the iPhone as a threat to its position in the market. Two instances of how innovation is so important and decisive that, if not handled properly and applied consistently, it can mean the demise of a company are Nokia and Kodak, once the leaders of their industries in terms of both market share and new products. In light of this, we will keep looking at the idea of innovation in connection to how businesses ought to approach product management.

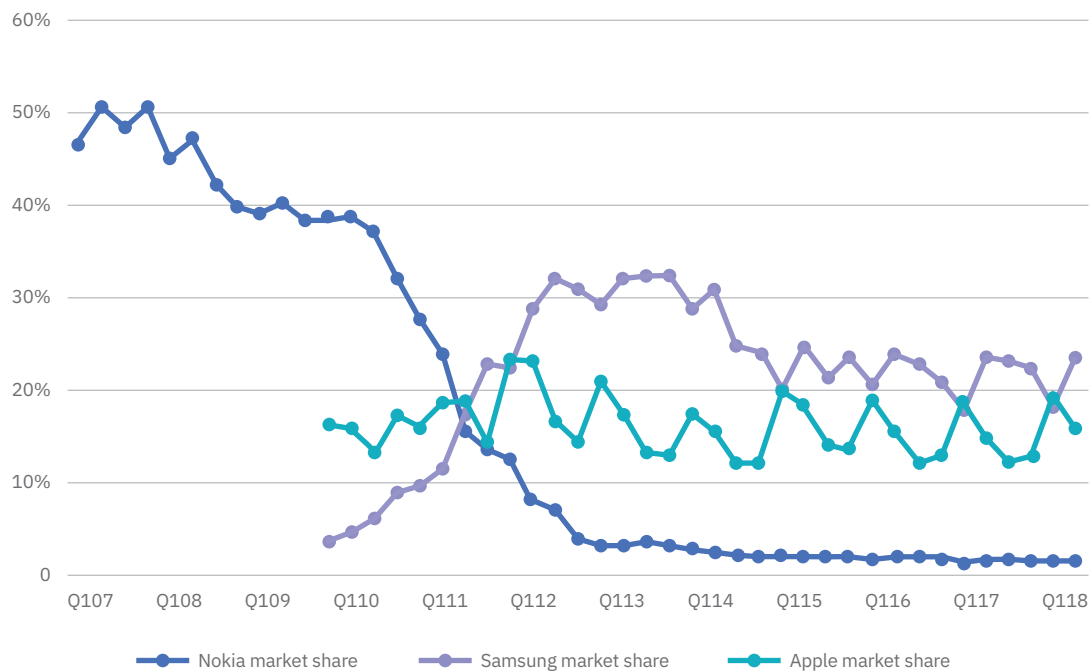


Figure 22: Global Mobile Phone Market Shares (Nokia 2007-2017, Apple and Samsung 2009-2017)
(Statista)

3.

EXPLORE/EXPLOIT BALANCE

When it comes to business and innovation, the capacity to concurrently explore and exploit activities in a balanced and successful manner is referred to as ambidexterity. This is the same concept that we recognize as being able to use both hands well in archery. Exploit should be interpreted as concentrating on the goods and services where the company is already dominant in the market, particularly in those areas where it is strongest in terms of cash and profitability (cash cow), and using this resource judiciously to make sure that it is both the engine of growth and a reliable source of the time and resources required for innovation. The goal of exploration, on the other hand, is to ensure that the business advances more solidly into the future by working intensely on new products, services, business models, markets, collaborations, etc.

“Exploitation pays your salary while exploration pays your pension. Companies that survive, do both.”

Steve Blank

Ambidexterity is a relatively simple idea to explain, but it can be challenging for businesses to put into reality. We will look at the theoretical and practical reasons why this is the case.

First off, each of these subjects naturally calls for a different setting, making it extremely difficult to do each of them well.

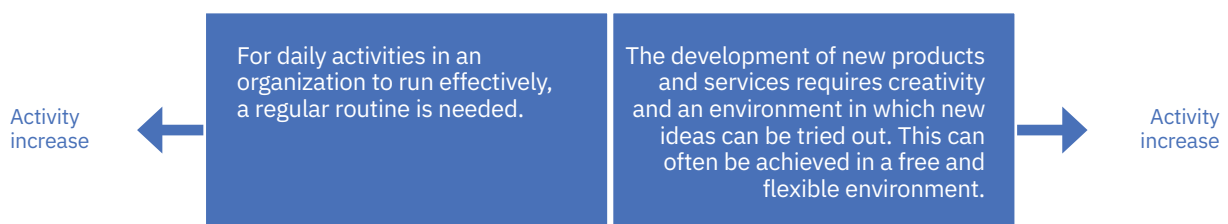


Figure 23: Activity–Creativity Dilemma

The uncertainty map in Pearson’s article “Managing Innovation,” published in 1991, depicts the circumstances that businesses must deal with in this regard (Pearson, A.W. 1991).

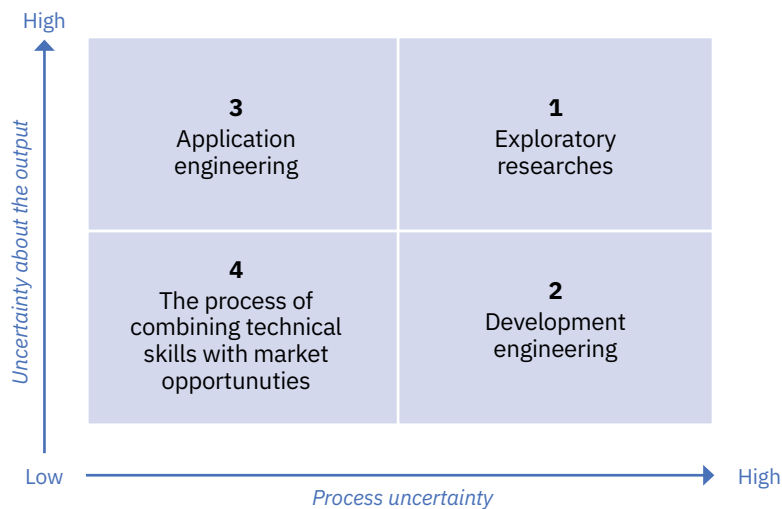


Figure 24: Pearson's Uncertainty Map

In **Zone 1**, the focus is mostly on research into an emerging technology with unpredictable results. There are global firms with R&D budgets that are frequently fairly big in these high-tech fields, which historically have been the focus of universities, as the complexity of the topics being investigated is expanding along with the amount of financial resources needed. There are more and more partnerships with universities and other businesses to handle this level of complexity. One example is Bosch, a side industry company in autonomous driving, and its various partnerships with key industry players, Mercedes Benz and Volkswagen.

Although the final result in **Zone 2** is obvious, there are some circumstances in which it is unclear what technologies will make this possible or how they will be incorporated into the final product. The development of gasoline engines that meet "Euro 6" regulations for internal combustion engines, which are now being superseded by electric vehicles, is a typical illustration of this. It is obvious what performance levels are required from the engine and how low emissions must be to stay inside the appropriate regulation limitations. The engine manufacturer will therefore strive to push the boundaries of the available technology.

Zone 3's final product is unknown, although the technology or materials employed are well recognized. A typical example of this is the application of well-known material to various domains. For instance, ceramics, a substance that has been a part of our lives for a very long time, is being modified for use in a wide range of industrial applications, such as high-performance automobile braking systems.

Activities in **Zone 4** are those that try to improve existing processes, frequently to lower the cost per piece, the quantity of materials used in production, or the amount of time required. An activity that lowers costs but is not engineering-related can be justified as socially responsible. Apple's choice to stop including the iPhone charger and headphones in the package and to link this to environmental awareness is a recent illustration of this. Uncertainty in this case, however, is more about how users will respond to the invention than it is about its outcome or process. In this instance, the business was able to realize numerous advantages simultaneously. In order to reduce the cost of these two products, two accessories were left out of the boxes. Particularly, the charger's bulky dimensions were eliminated from the design, which led to a considerable decrease in the product's box size and a large decrease in transportation as well as storage expenses because more iPhones could be packed onto pallets for shipping. According to calculations, the benefits obtained this way amount to almost \$6.5 billion. Additionally, there were indirect advantages. Users who were unable to utilize the accessories

they had from earlier phones or new users who would be using the iPhone for the first time had to buy them, which increased turnover. The extra volume produced in this manner was calculated to be worth \$293.4 million. Apple's creative product management team boasts that all of these cost savings will prevent 2 million tons of carbon emissions annually, which is the same amount of emissions produced by 500,000 vehicles annually.

Examples of good exploitation and exploration in different sectors can be found below.

3.1. MICROSOFT

Microsoft's Office system is a prominent example of exploitation on the exploit side because it is bringing in more and more money from common, if relatively new, businesses like LinkedIn. On the exploratory side, through GitHub and Azure AI, the company gives numerous businesses, both big and small, a platform to pursue disruptive innovation, and the company itself is still exploring this field. Following Bill Gates' resignation as CEO and Satya Nadella's appointment, this strategy was initiated as a transformation process. Microsoft modified the exploit-based business model for its Office product after entering a period of stagnation and possibly retrenchment. The office became a cloud service that customers could subscribe to on a monthly or yearly basis rather than a one-time purchase, creating ongoing revenue for the business. In this way, an invention in this long-standing industry has revived a growth trend and produced a sizable resource for the business' exploring endeavors. This accomplishment may be seen in the fact that the company's market capitalization, as of March 2022, was 2.099 trillion dollars.

3.2. GOOGLE

As a search engine, Google came into our lives and has since nearly monopolized the market. Although it entered the market before Google, Yahoo is today rarely recognized as a search engine. Excite, Linkstar, Archie, Alta Vista, and Webcrawler might not even be names that are familiar to younger generations. The first place that comes to mind when thinking about online advertising is Google. In this area, which is now categorized as exploit, Google generates significant revenue and takes advantage of the competitive advantage it has gained by establishing a monopoly to achieve turnover rates that are higher than the gross domestic product of some nations with high profitability rates. This is why it uses this resource to its absolute extent and has grown into a corporation with a market capitalization of 1.723 trillion dollars as of March 2022, despite the fact that it faces severe penalties for "abuse of dominant position" in several locations, particularly in EU countries. In this way, the business has gained enough confidence to be able to employ the resources produced by these activities for product development trials across a wide range of industries. The following are some of the products anticipated to be available in 2022: Pixel Fold, Nest Cam, Nest Audio, Nest Thermostat, Nest WiFi Router, Google TV, and Pixel Buds. In addition to these products, which are not particularly cutting-edge in terms of technology, Google can also support research projects in more ground-breaking fields like Google Glass or autonomous driving technologies.

3.3. AMAZON

Another outstanding example is Amazon. Amazon was initially just a bookseller when it was established as an online sales organization, but as time went on, it expanded into other service categories to become the greatest online sales platform in the world. So much so that it eventually created and integrated its own online TV platform, payment system, and delivery company into this system. But despite its scale and market domination, the business was unable to turn a profit. Then, with the introduction of AWS (Amazon Web Services), it forayed into a brand-new market and emerged as one of the leading providers of cloud services. Now, much as it did when it was an online sales channel, it is attempting to expand and make the most of this. By advancing its technology and value offer, such as by shipping with autonomous drones, it maintains its exploratory position. It has a value of \$1.480 trillion as of March 2022. Additionally, it engages in space exploration as a purely exploratory field and has already begun to invest in the technology it will create in this area in the upcoming years as well as the competitive advantage that will result from doing so.

The market values of the companies listed in these examples have grown at a rate unparalleled in history due to their effective product and company management as well as their disruptive breakthroughs in the market, surpassing trillion-dollar thresholds for the first time.

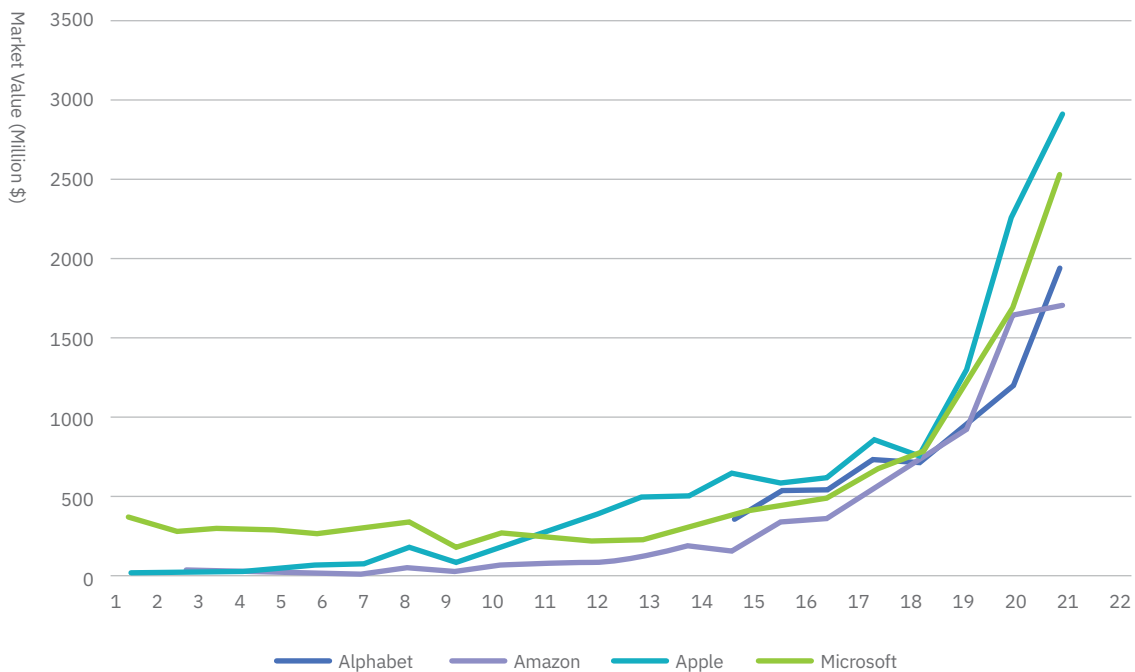


Figure 25: Market Value Changes of Major Technology Companies

3.4.

AN EXAMPLE OF AN ENTREPRENEUR(SHIP): ELON MUSK

Elon Musk has developed over the years into a very good illustration of how the idea of ambidexterity has been realized in business. In this regard, it would be beneficial to look at his entrepreneurial process. He established Zip2 in 1995, and in 1999, he sold it to Compaq for a sum of 307 million dollars. With the money he obtained from this company, he launched online banking services under the X.com brand the same year. In 2000, they joined with Confinity to form PayPal. This business was acquired by e-Bay in 2002 for a price of \$1.5 billion. He started SpaceX the same year. He joined Tesla in 2004 and was named CEO in 2008. He founded SolarCity in 2006, which Tesla later purchased and rebranded as Tesla Energy. He founded OpenAI in 2015. Then, he established Neuralink and Boring Company in 2016. Tesla has taken the lead in the serious transformation of the automotive industry and a process in which well-established automotive companies with more than 100 years of history are struggling, while at the same time taking an exploit position, funding other disruptive innovation companies, and managing disruptive innovation projects. Tesla continues to engage in disruptive innovation while many old companies are experiencing serious difficulties in disruptive innovation. SpaceX, another disruptive innovation-focused corporation, is a further force behind this process. By seriously challenging NASA's long-standing practices, SpaceX has introduced fresh ideas, quickly established itself as the industry leader in a highly specialized and ambitious field and managed to transform its cash flow into a state that will support other disruptive innovation focused businesses, such as Tesla. This is a powerful illustration of how innovation in product management and company management is essential for the long-term success of businesses.

It is helpful to look at some figures and comparisons in order to comprehend the degree of disruptive innovation in the SpaceX scenario. A comparison graph of the costs per kilogram to launch different spacecraft from the 1960s to the present is shown in Figure 26.

In 1969, NASA spent 28 billion dollars on a mission to send astronauts to the moon. After accounting for inflation and updating the currency, we arrive at the staggering sum of \$288 billion. With a \$3 billion bid, SpaceX secured the contract to launch a manned trip to the moon in April 2021. Today, the cost of a SpaceX orbital flight is 97% less expensive than the 1960s-era Russian Soyuz system, which was regarded as being very successful. There have been many technological advancements that have contributed to this significant cost reduction, but the most significant one is that SpaceX's innovative and successful vehicle can be used repeatedly, saving on the cost of many expensive components, especially engines. For years, spacecraft have been one-offs; once launched, they can never be used again. NASA might save more than \$500 million for each rocket by doing this. NASA would be able to complete many more space missions with the same budget if this were the case (Fernholz, T., 2021).

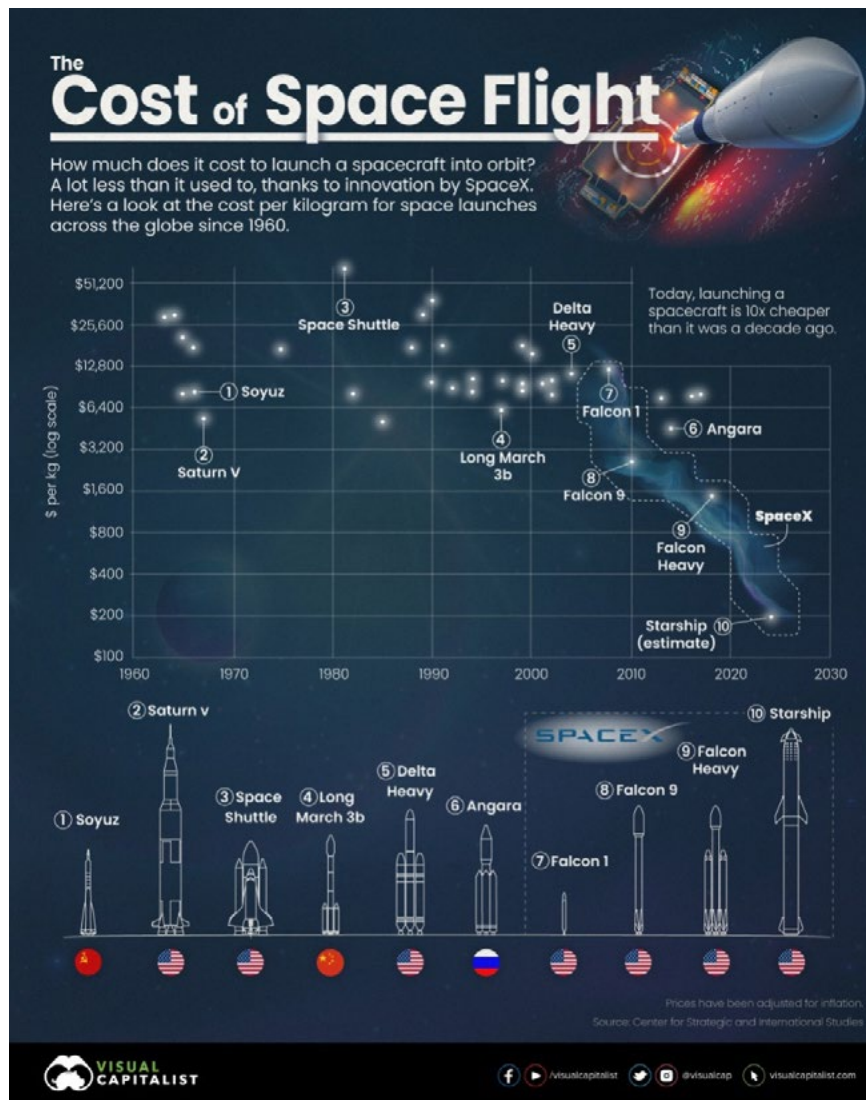


Figure 26: Cost per Kg for Spacecraft to Orbit (Visual Capitalist, 2021)

3.5. THE IMPORTANCE OF A SYSTEMATIC APPROACH IN THE BALANCE OF EXPLORE AND EXPLOIT AND A GOOD PRACTICE EXAMPLE: BOSCH

We have seen examples of businesses that use discovery and exploitation tools properly so far, as well as examples of businesses that do not strike the correct balance. Now, using a corporation as an example, we will look at how a systematic approach might be followed by balancing these two tools.

One of the established businesses mentioned in the article's beginning is Bosch. Bosch was established in Stuttgart, Germany, in 1886, and has since invented a variety of products. It has been allocating an average of 9% of its annual revenue to R&D initiatives for several years. Given that the company's projected 2021 revenue is around 79 billion euros, we can see that its R&D spending exceeds that of some nations. By utilizing the massive R&D resources described above, Bosch, which only got 1,100

patents in 1995, reached a yearly patent count of 5,500 patents in 2020. As of 2020, it had more than 77,000 patents in total.

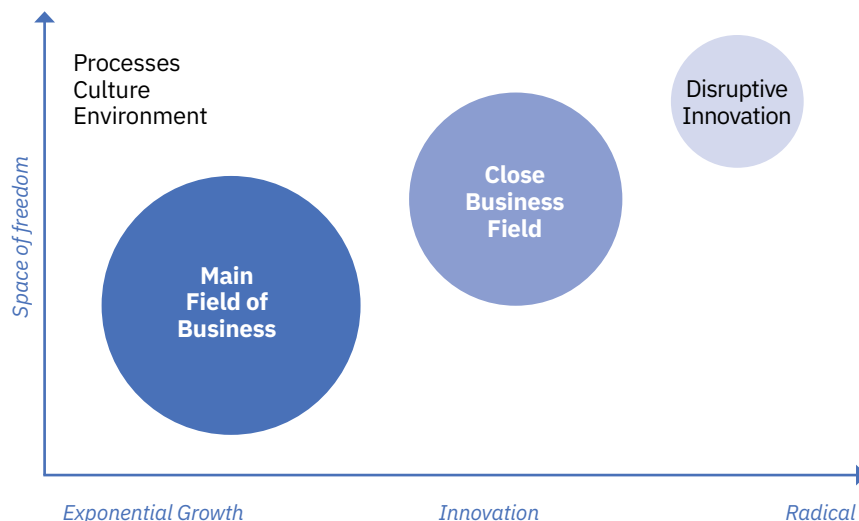


Figure 27: Innovation-Space of Freedom Relationship

As shown in the graph above, innovation and freedom rise as we stray from the primary business. This cannot be thought of independently from the company's procedures, culture, and environment.

Bosch strives to invest in innovation, obtain patents, and enter new markets in order to avoid becoming one of the examples of Nokia and Kodak that we examined in the example. On the one hand, Bosch adopts strategies and product management approaches that will enable it to maintain its leadership in many business lines in which it has achieved industry leadership for more than 100 years and to continue realizing its strategy of exploiting these areas. In order to improve its chances of success, it continues to organize its efforts in these new fields through both internal teams dedicated to the problem and partnerships with businesses like Strategyzer and Gartner that work on innovation outside the organization.

The expertise areas and target markets drastically alter when we move from exploitation to discovery, as shown in the graph below. Naturally, businesses are attempting to manage an equation that is not at all simple as they try to flourish in new markets and consumer groups with new competencies. In order to improve the likelihood of success, it is crucial to track this issue methodically.

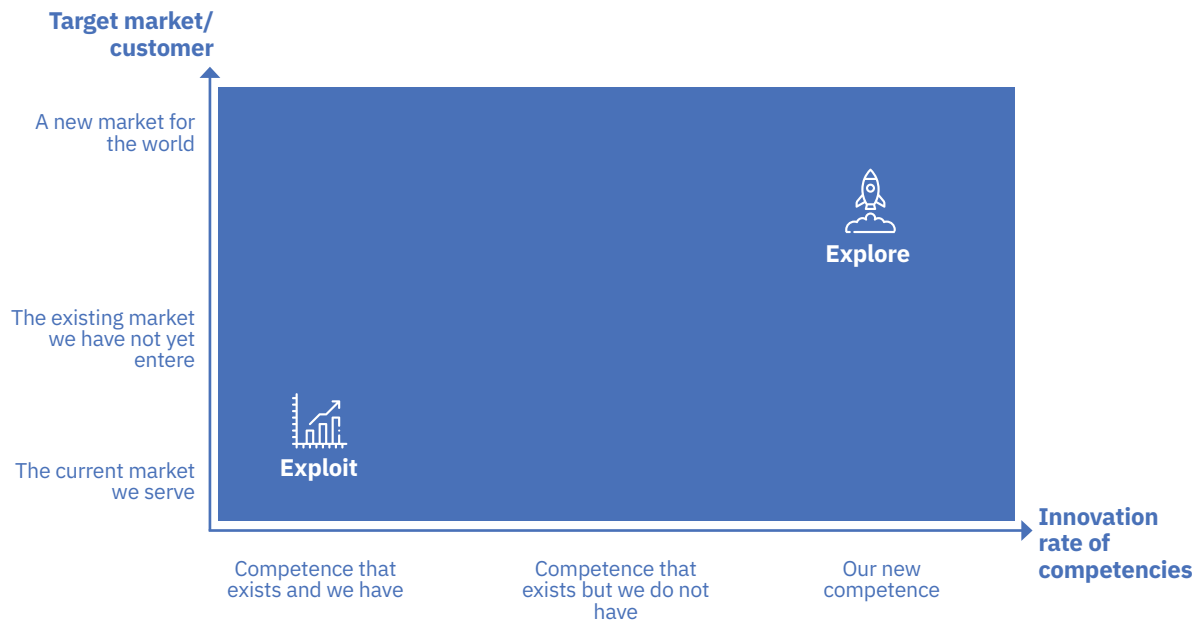


Figure 28: Relationship between Competencies and Target Market

When it comes to success rates, it might be instructive for businesses to look at some data on start-ups. Research from Harvard University indicates that 90% to 95% of new businesses fail. Research from Berkeley University shows that 97% of university-obtained patents are useless, 85% of new packaged goods products fail to become profitable, and 80% of start-up investments fall short of the market's average success. Only 37 of the 511 start-ups enrolled in the start-up accelerator program Y Combinator, which accepts only 5% of applicants, can exit with a valuation of more than \$40 million, according to the program's data. Only 37 of the 511 start-ups enrolled in the start-up accelerator program Y Combinator, which accepts only 5% of applicants, can exit with a valuation of more than \$40 million, according to the program's data. Finally, according to research from the University of Berkeley, less than 1% of new businesses are valued at more than \$1 billion, or at the "unicorn" level. While these statistics demonstrate the value of creating a methodical strategy, they also emphasize how tough it is still to ensure success.

The process Bosch has standardized in order to take advantage of this circumstance is depicted in Figure 29 below. The Bosch Innovation Framework (BIF), a map of the innovation process, states that choosing an area to innovate in line with the company's strategic goals, market changes, and trends is the first step. Then, the area's most pressing difficulties or problems are determined. After that, an idea is prepared in order to develop a framework. Then, the focus is on how to approach the issue and what kind of resolution can be achieved with which concept. The concept is then verified by gathering feedback from all relevant stakeholders. The design thinking methodology has been heavily used up to this point, and the process has been repeatedly iterated with any issues changed in response to user feedback. Prototypes and MVPs (minimal viable products) are created during this step and presented to the user. The incubation period is used to further create prototypes and conduct user interviews in order to prepare ideas that are successful in the validation process for scale. At this stage, planning for things like sales channels, marketing strategies, and budgets starts to grow more specific. While the sales process begins with the first clients and the developments are continuing in light of the initial user feedback, moves toward scalability are also performed. The product or solution then progresses to a stage when standard processes, mass production, and automation are achieved. At this point, it has transitioned from the field of explore to the field of exploit.

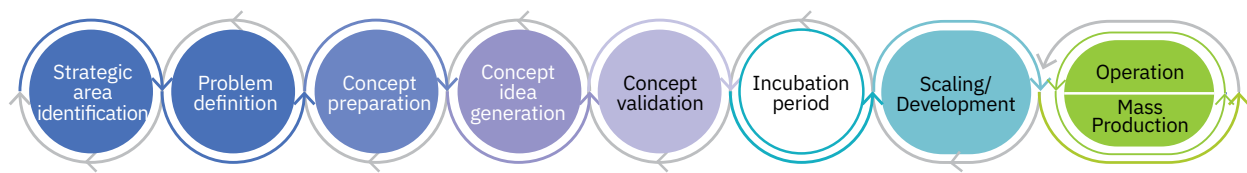


Figure 29: Bosch Innovation Framework

Figure 30 below shows the process as schematized by HPI/Gartner. To enhance the likelihood that the product will be successful, design thinking, lean entrepreneurship, and agile development approaches are employed throughout the process. Iterations are continued until a satisfactory point is reached by continuously gathering customer feedback.

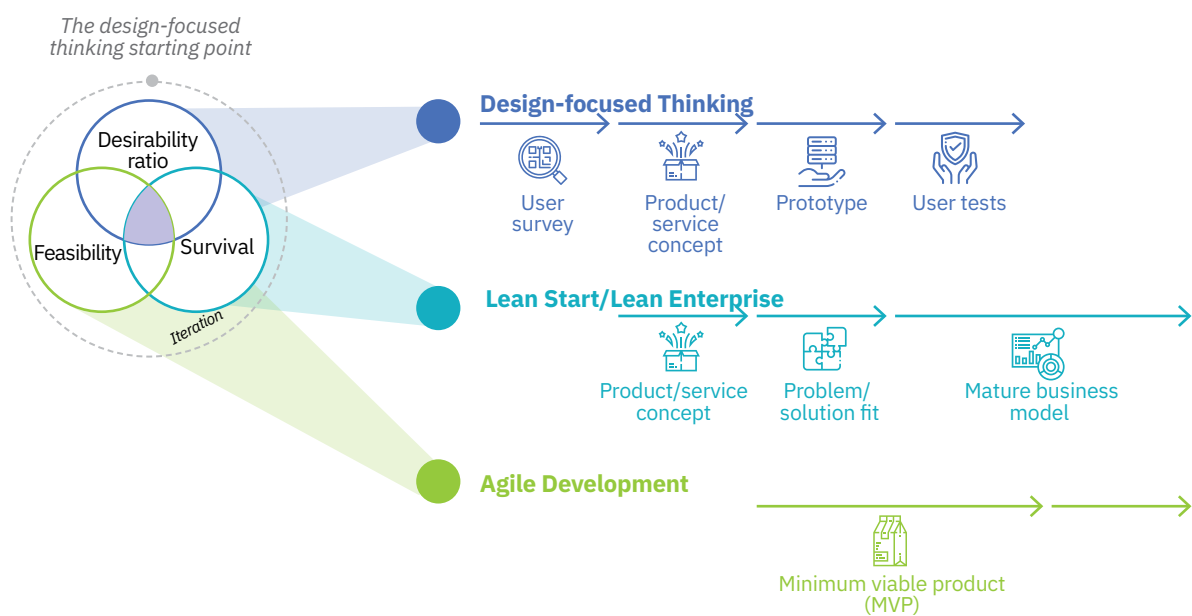


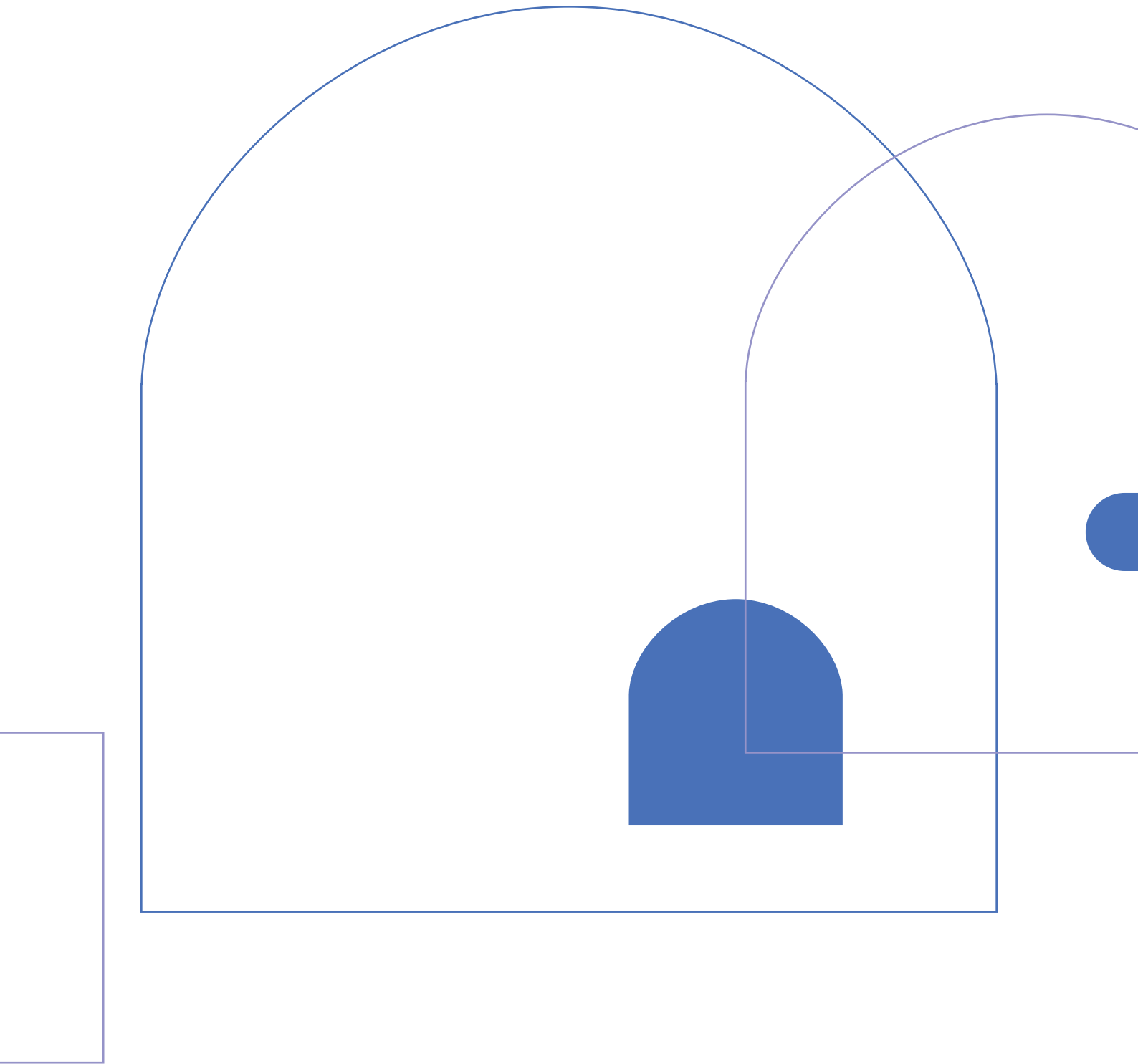
Figure 30: Graphical Representation of Processes and Methods by HPI/Gartner

The need to increase iterations is likely the most crucial and vital part of this process. The likelihood of an idea succeeding is extremely low, as demonstrated by studies from Harvard and Berkeley. The best method to make this situation work to the company's advantage is to try more innovative ideas and to drop those that are deemed to be a failure as soon as feasible. We can see that 800 teams engaged in 9 distinct project groups up until the end of 2020 when we look at the Bosch example in this context. Of these, 219 stayed in the first stage of the validation procedure, which was conducted in two stages, while 242 of them advanced past the preparation phase. Only 19 of them were able to go to the incubation process, while the remaining 69 teams successfully completed the second validation process. Based on the information they receive, the teams decide whether to continue or end the process, in consultation with the mentors who oversee it. This prevents a significant amount of R&D resources, both in terms of human capacity and budget, from being used in inefficient areas and allows these valuable resources to be transferred to projects and teams that appear to have a higher likelihood of success. The following issue must be kept in mind, though: Despite this systematic process, success is not assured, albeit it has considerably increased as a result of these processes.

Even when everything is going well, managerial flaws and poor plan execution can make even concepts and projects with a very high possibility of success fail. These factors include changes in the market, user trends, technology limitations, team skill levels, or even when everything is going well.

4. CONCLUSION

Due to the intensifying competition in the market and the complexity of the obstacles to be overcome, businesses must become more efficient in terms of automation and operations, cut costs, and constantly reinvent themselves by breaking into new markets and industries. They must also allocate enough resources and space to support the flexibility, agility, and creativity needed for innovation. Companies must continue their activities in a balanced manner on both the exploit and explore sides, as we have mentioned above, in order to maintain their leadership in the fields in which they are leaders and to become leaders in new fields that emerge in shifting market conditions, or, ideally, in fields of their own invention. A business that just concentrates on the exploit side will inevitably start to shrink, losing both turnover and margin because its products will not be able to compete in this market. Being only focused on explore is also not sustainable because it will result in a rapid depletion of the funding sources for this process, as we have shown via examples, making the likelihood of success extremely low. Therefore, in order for businesses to continue to appear on the S&P 500 list, which we indicated at the beginning, they must view the balance between these two areas of work as a precarious one, allocate enough resources to both, and go forward with the proper plans.



CHAPTER

9

DISCUSSIONS AND EVALUATIONS ON UNIVERSITY-INDUSTRY COLLABORATIONS IN THE CONTEXT OF NEW PRODUCT DEVELOPMENT



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1.

INTRODUCTION

This study focuses on collaboration between academia and industry within the context of to new product development. Universities and industry, two entities that have become increasingly prominent in recent years, sense the importance of interaction between them. It also looks for a place in the literature on how to create connections for the industry to transfer its practical experiences to academia, in addition to discussing the different perspectives on which branch or branches of the industry the theoretical knowledge gained in academia can be used, it also looks for a place in the literature on how to create connections for the industry to transfer its practical experiences to academia can be used.

On the other hand, commercial competition is becoming more intense every day. For businesses trying to thrive in this cutthroat industry, it is crucial to create innovative products, precisely match customer expectations, and react quickly to market demands. The need for specialist employees has increased as a result of the search for innovation in products and services brought on by quickly evolving technology, the ensuing complexity of products, and the shortening of product lifecycles. Collaboration and creativity are linked, say Carayannis and Alexander (1999), particularly in information-intensive, high-tech industries (p. 198). Collaboration between universities and industry, which is viewed as an entrepreneurial activity, creates the conditions for businesses to use expert ideas from universities to develop new products or improve existing ones, and for universities to use businesses with market expertise to commercialize their ideas.

The post-World War II global advantage that the USA had gained was lost at the end of the 1970s, and the process of economic stagnation and inflation started to be felt. It was predicted during this time that there was a bottleneck in the process of translating academic research into commercial practices, and that commercialization, by addressing this bottleneck, could be a resource that could offer the nation an international competitive advantage. At the same time, it was considered that business may serve as an alternate source of funding for academic research (Turk-Bicakci & Brint, 2005, p. 63).

Technology transfer, industry perspectives on collaboration with universities, university perspectives on collaboration with industry, similar expectations and differences, and the role of the state are all within the purview of this study to support this argument. The significance of technology transfer and company strategy, particularly the assessment of university-industry collaboration in Türkiye and the hurdles to collaboration are among the topics explored in this study to see the subject from various angles. A literature review and related debates are presented in the conclusion to support the topics. The major topic, university-industry collaboration, is reviewed within the context of new product development while the topics of innovation and new product development are briefly covered within the conceptual framework.

2. CONCEPTUAL FRAMEWORK

2.1. INNOVATION

Innovation was first defined by economist and political scientist Joseph Schumpeter as “the driving force of development” (Elçi, Karataylı, and Karaata, 2008, p. 13). A product or procedure that has significantly improved over its prior state is what the OECD refers to as innovative. A concept or technique that has been adopted from a different product market or introduced for the first time within the organization can be considered innovative (OECD, 2018, p. 32). In this context, Koç and Mente defined innovation as “the research, discovery, testing, development, monitoring and adoption of new goods, manufacturing processes, services and systems by improving the old to create the new” (Koç & Mente, 2007).

For many years, it was believed, according to Elçi (2006), that innovation was the end outcome of R&D efforts and that it was accomplished in a linear chain. According to Elçi, this theory holds when either scientific advancements or market demands lead to innovation. This idea, also known as the linear innovation method, states that the innovation activity comes to an end with the product’s introduction to the market. Elçi noted that although this approach reduces the innovation process to a simple process, there is significant feedback at every level of this process as well as complex interactions between people, companies, and their environments (p.26).

The economic structures of today are changing, which affects the ideas and beliefs related to innovation and, as a result, the structure of innovation itself. The fact that the innovation process expands outside of the company as well as within it is the most crucial issue here. As a result, the market’s effective integration of the interaction between universities and public research institutes has become crucial to the innovation process. According to Kuşat (2016), the ability of enterprises to innovate is influenced by how research institutions and universities conduct themselves as well as how these organizations and institutions engage with one another locally, nationally, and internationally (p.168).

2.2. NEW PRODUCT DEVELOPMENT

One of the most common strategies employed by businesses to ensure sustainability is the concept of new product development. The commercial success of businesses operating in a competitive market depends on new product development (NPD), which is the process of turning a market opportunity into a product that is ready to be sold (Frishammar, 2005, p.5). For many companies, the development of new products and the enhancement of current ones are essential. Companies that do not develop new products in a competitive market expose themselves to too many dangers and an unclear future (Logar, Ponzurick, Spears, & France, 2001).

Increased market position (e.g., new products opening up new markets), improved resource utilization (e.g., returns on prior R&D investments), and organizational reform and renewal are some potential advantages of NPD (Frishammar, 2005, p. 5).

The ideal outputs for new product development are thought to be high-performance products that reach predicted market share, boost sales volume, satisfy customers, and meet profit goals. High-performance products are therefore anticipated to give a competitive edge and result in strong financial success

(Frishammar, 2005, p. 5).

2.3. TECHNOLOGY TRANSFER

Technology transfer was defined by Kurt and Yavuz as a broad range of activities entailing several interactions, such as the exchange of information, expertise, and tools between various stakeholders, including the government, businesses, financial institutions, research and education institutions, and non-governmental organizations (Kurt & Yavuz, 2013).

Companies must actively explore innovation if they want to thrive in today's quickly changing economy. Nevertheless, traditional basic/applied research activities conducted in corporate R&D centers are insufficient to cope with the ongoing pressure to shorten time-to-market for new inventions and to meet specific and identifiable customer needs. This frequently leads businesses to outsource technology to increase the scale and scope of operations, enhance their capacity for handling complexity, and distribute costs and risks. Technology outsourcing involves a variety of parties, including suppliers, competitors, companies in other industries, universities, and research institutions. In this context, it may be determined that universities' partner roles in the value chain are becoming more and more significant.

From the private sector perspective, sponsored research is an important opportunity to share responsibility for new product development. University researchers have a duty to conduct studies, and present fresh ideas for products, concepts, and information (Logar et al., 2001). Knowledge sharing across institutional boundaries, which fosters the formation of trust relationships and builds social capital for further collaboration, facilitates this collaboration (Mascarenhas, Ferreira, & Marques, 2018, p. 2).

The dynamics of technology transfer are not considerably impacted by the size of the businesses or the length of their relations, but they are significantly impacted by the companies' proximity to university research facilities. Choosing which partnerships to form or the company's innovation strategies to pursue is so critical (Mascarenhas et al., 2018, p. 2).

It is accepted that when actors with various talents and knowledge pools collaborate, they produce radical new knowledge (Bathelt, Malmberg, & Maskell, 2004, p. 35). Knowledge expansion will result in new economic ventures and economic development.

Diffusion of the technology by the first party and internalization by the second party are the two basic goals of technology transfer. Both parties interact with one another during this process, and because of their interactions, they create a collaborative connection (Da Silva, Kovaleski, & Pagani, 2019, p. 547).

Due to the acceleration of the technological developments, businesses today require outside support to keep up with these technological advancements. Academics and research institutions are capable of providing this support. Technology transfer thus reveals the necessity of collaboration between academia and industry (Varol, 2018, p. 42).

Every business or institution might require technology transfer. The optimal strategy to meet this requirement entails a few acts that call for competence. Technology can be acquired either internally or externally by the demanding agent. When acquisition by producing the technology is not an option, technology transfer might fill the gap. All businesses in the industrial sector will seek to obtain the technology they require, and they will be able to do so through the technology created or to be created by universities. In summary, this acquisition and transfer may be made possible through the collaboration of companies and universities.

Through their research centers, ideas for innovation, scientific publications, conferences and symposiums, and the network they offer, universities—one of the primary institutions producing technology—offer very significant prospects. Symposiums and similar events offer a setting where academics and businesses may learn about what is happening across the world and share and transfer information. By keeping themselves up-to-date, academics are also able to provide the mentorship that businesses require.

Geographically dispersed collaborations present challenges for technology transfer in terms of time, culture, cost, transportation, and communication, but they also present opportunities for knowledge, expertise, product, and market diversity. In these centers, new technological advancements may also be learned about during the information flow and knowledge exchanges. When considered as a partnership between an industry member business and university research, this collaboration between two geographically distant agents can enable these partners to conduct their projects faster and more effectively by sharing their knowledge and technology resources with each other. A wholly new and original product can be produced when a technology from one place is combined with a technology from another that is not available there.

The amount of time spent on the new product development process must be kept to a minimum. When creating a product, businesses use a minimal time strategy. Longer development times indicate that the product will be released later, R&D expenses will persist, the risk of rival companies getting ahead will rise, and as a result, the profit rate will decline. Carrying out scientific researches requires a lot of time. Businesses will not be satisfied if universities take too long to transfer technologies. Cost is the most crucial element for businesses. The acceptability of these costs differs from company to company. Companies with higher cash flows may take on bigger risks, whereas companies with lower cash flows can handle lesser risks. Businesses with more stable finances can devote more resources to their licensing and R&D departments.

2.4. UNIVERSITY-INDUSTRY COLLABORATION

Businesses require the assistance of universities more and more frequently every day in a highly competitive market. Universities have evolved over time from being primarily teaching institutions to becoming institutions that bridge the gap between teaching and research in response to this requirement.

Links between universities and industries are crucial for the growth and dissemination of new technology as well as the production of new products. For some universities, these links constitute a significant source of funding and fresh information (Mascarenhas et al., 2018). To ensure effective resource allocation and motivation in the creation of new knowledge, both groups must strike a synergistic balance (Garcia, Arajo, Mascarini, Santos, & Costa, 2019). They also obtain income by licensing and patenting as a result of their operations. On the other hand, businesses that operate in the market have sought out alternate technical development methods so they can do so while spending less money and taking less risk. Therefore, university-industry collaboration has the potential to play a significant driving factor in the growth of innovation and knowledge in an economy, according to Seppo and Lilles (2012, p. 208).

University-industry collaborations are associations between one or more academic or research institutions and one or more businesses engaged in industrial markets, with a particular emphasis on cooperative R&D activities (Skute, Zalewska-Kurek, Hatak, & de Weerd-Nederhof, 2019).

University-industry collaboration has drawn a lot of attention recently as a source of knowledge creation and technical advances that improve regions' economic and inventive competitiveness (Skute

et al., 2019). According to Ömürbek and Halıcı, in regions where these collaborations takes place, UIC plays a significant role in national and regional development by boosting innovation performance, accelerating economic functioning, and more effective utilization of resources of the region.

Although the idea of university-industry collaboration is not a new concept, it has begun to gain importance, particularly since the 1970s. Governments have begun to acknowledge university-industry collaboration since then. Universities with a strong research emphasis are key producers of knowledge and technologies that are useful for the advancement of industry in many knowledge-intensive economies. The OECD asserts that businesses and governments look for new technologies, skills, and knowledge conduits as economies become more global and knowledge-intensive (OECD, 2007).

On the other hand, the Bayh-Dole Act of 1980, which vests the intellectual property rights resulting from research in universities, and the Stevenson-Wydler Technology Innovation Act of 1980, which requires the institutions in charge of research budgets to allocate 5% of their R&D funds to technology, were passed in order to facilitate university-industry partnerships in the US, to aid economic development, to increase US economic competitiveness, and to increase university R&D budgets (Turk-Bicakci & Brint, 2005, p. 63).

Universities discovered they might expand their resources for research and boost their academic image by creating or strengthening linkages with industry when faced with the issue of dwindling R&D expenditures from US public sources. The amount of basic and applied science research is expanding, but it is taking less time for new scientific findings to be put to use in industry. Government, business, and academic leaders came to an agreement to improve the environment for collaborations between universities and industries (Turk-Bicakci & Brint, 2005, p. 63).

Contrary to conventional innovation strategy/industrial policy, where it was assumed that the private sector would drive innovation, the new emphasis is now on the role of universities and their extended networks in translating research into goods and services. Technology transfer offices (TTOs) offer a crucial illustration of an active supporting structure that raises the potential patent value of industrial partnerships. More R&D contracts and license agreements are often generated by larger technology transfer offices. Experience with previous collaboration is one of the most common factors in determining a partnership. The growth of contract research, consultancy, and collaborative research has been found to be positively impacted by prior collaboration experience, according to researches. Universities and other institutions are more likely to work together in the future the more experience they have.

Universities actively promote product creation and innovation. The exchange of information between businesses and other entities is necessary for the complex process of innovation. Companies can maintain their innovations through this approach by acting not independently but with the assistance of outside parties. This provides companies with a competitive advantage. Businesses that grow quickly in line with the findings of research and concepts created greatly benefit from the innovation process. Universities provide the information flow that businesses cannot develop or obtain within their own enterprises. Chesbrough (2003) asserts that knowledge from external sources is equally as important to the innovation process as the knowledge that a corporation already has or develops internally. The same author claims that this method, which is known as open innovation, is the distinguishing feature of the most inventive businesses (p. 43).

The industry must manage relationships, create legal frameworks, and deal with difficulties related to intellectual property in addition to creating marketable products or services. Universities should be aware of the contribution that business makes to education and how their cooperation fits into the larger goals of business when collaborating with it. Collaborations with universities are also advantageous for businesses because they may help push the boundaries of knowledge.

Through the specialists they produce, the research they conduct, and the application of these activities in the industrial sphere, universities also play a significant role in assisting nations to develop innovative power. They also assist nations in taking actions that will increase their competitiveness thanks to this formation.

Kuşat (2016) asserts that universities and research institutions will provide industrial producers with ready-made technology through the development of new technology and that businesspeople will have the opportunity to make the best use of their resources by devoting their full attention to the development and marketing of this new product (p. 170).

While the individual performances of universities, businesses, and research institutions are important in determining how well an economy performs in terms of innovation, these organizations' membership in a system that produces and uses knowledge, their interactions with one another, and the relationships of their employees with social institutions like values, norms, and legal requirements are also very important factors (Çelik, 2011).

Collaboration between universities and industry is advantageous to both parties in the modern globalized environment. Universities and businesses need to establish long-lasting, mutually beneficial collaborations, according to the Business + Higher Education Roundtable (an organization that represents Canadian firms and higher education institutions). Understanding, influencing, and bettering the connections between the two sectors becomes dependent on strong, high-quality, long-term relationships built on reciprocal commitments of time and money (Fisher, Belcher, Cairney, English, & Harding, 2002). Science gives universities their power, while technology gives the industry its power.

The OECD noted in its report "Industry and University: New Forms of Cooperation and Communication" from 1984 that it is very challenging to analyze the phenomenon of university-industry collaboration due to the disparate goals that businesses and universities have for their collaborative relationships, as well as the complexity and diversity of how these relationships are carried out (Valentin, 2002).

The relationship between universities and businesses can be strengthened by the exchange of knowledge offered by academic institutions and business practices, which can also provide ideas for new joint research initiatives and themes (Garcia et al., 2019). The benefits of interaction will vanish, though, if the cognitive gap between the actors is too wide or their knowledge bases do not match (Bathelt et al., 2004).

2.4.1.

A UNIVERSITY PERSPECTIVE ON COLLABORATION WITH INDUSTRY

Universities are becoming more proactive in their interactions with businesses looking to develop valuable intellectual property to encourage technology transfer. Existing research scenarios have been restructured to promote innovative activities in response to the increased demand for innovation and information. In order to improve the commercialization of research and the transfer of information from universities to industry, many European nations have adopted reforms in their national research systems concurrently with the development of a global knowledge economy. The third mission of universities is now in the spotlight for policymakers. Universities need to contribute to society beyond their primary duties of teaching and research by developing, disseminating, and exchanging information and technologies (Mascarenhas et al., 2018).

Long-standing partnerships between universities and industry make them more likely to work together once more. For higher education institutes, industry is the only place where they can train their graduates with the resources from the industry. For universities, the industry can serve as a laboratory where they can check the validity of their knowledge. The Business Higher Education Forum claims that by collaborating with businesses, universities have access to outside knowledge and financing sources (Business Higher Education Forum, n.d).

Universities naturally have a sense of entrepreneurship. They are managed as corporations. While most universities' general mission is to educate people for society's benefit, this cannot be accomplished without acting like a corporation. Universities must attract in key stakeholders including students, business partners, research partners, and donors. Universities compete with one another for the best faculty, stakeholders, and resources. The industry should be aware of the entrepreneurial role that universities play in the community and how their collaboration fits within that purpose when working with universities. Collaborations with industry are advantageous for the university since they set them apart from other institutions and can attract students. Graduate students involved in such partnerships stand out from the competition since they are "industry ready." Employing such "industry-ready" students will help the industry.

Research output at the university level increases the number of R&D contracts and the money they bring in. This shows that corporations have access to data on research results and that this data is crucial for selecting a partner for collaboration. Even though they are far away, prestigious universities are preferred by more industry partners since they are based on a more subjective evaluation of university excellence by businesses. This might also suggest that collaboration doesn't necessarily require close proximity.

University TTOs operate more effectively when there is a lot of regional R&D activity. A region's general industrial makeup is also important. The likelihood of collaboration and side product creation is positively correlated with high technological intensity.

2.4.2. AN INDUSTRY PERSPECTIVE ON COLLABORATION WITH UNIVERSITIES

To represent their nations in the global market, businesses must become more competitive. One method of doing so is to purchase technologies that will improve or support the products or services being produced, from external sources. Technology acquisition is described as the acquisition and adaption of new technologies (in the form of know-how, hardware, software, design, or production capability) for greater performance and long-term competitiveness (Sharma, 2020).

Experience is crucial when it comes to businesses, and existing agreements for collaboration can promote greater collaboration between businesses. Experience is such a powerful predictor that it has been demonstrated that even prior partnerships that were regarded as failed by businesses were positively connected with the likelihood of re-engaging with universities.

Numerous studies indicate that large companies are more likely than small ones to interact with universities and other public research institutions when it comes to the industrial side of university-industry collaboration.

With a comprehensive R&D strategy comes the ability to absorb and benefit from the knowledge produced in universities. The advantages come in many different forms. Increased R&D productivity in patent applications, new products, and inventive processes is the most obvious benefit. Because

R&D-intensive companies are more inclined than others to share the information they obtain, other companies in the same region as the collaborating company may also profit. The company's employees are also crucial. Establishing connections with universities is more likely to happen for businesses that employ highly qualified and experienced personnel.

The chance of commercializing academic research is expected to improve with personal interactions between academics and the business world. The perceived success of information acquisition has a favorable link with partner familiarity and trust. One way to achieve this form of institutionalization is through staff exchanges between businesses and universities. This can be done through transferring and training individuals.

The possibility of a collaboration with a university is not only related to the inputs to the innovation process but also to the outputs; that is, firms with higher patenting intensity and increasing patent value are more likely to establish a university affiliation.

Controlling the quality of an industry's products is crucial. Higher education institutions might use their expertise to assist the industry in meeting quality requirements. The Business Higher Education Forum claims that the chance to use research resources to obtain inexpensive access to outside sources of expertise is the value of research cooperation for businesses (Business Higher Education Forum, n.d).

2.4.3.

COMMON EXPECTATIONS AND DIFFERENCES IN UNIVERSITY-INDUSTRY COLLABORATION

For the parties concerned, the collaboration between the university and industry has diverse connotations. Academics can access practical expertise through collaboration, incorporate it into the higher education system as research data, and get financing or sponsorship for their studies (Carayol, 2003). Although businesses frequently want to become more competitive in their daily operations, their collaborations with universities can serve a number of objectives. The acquisition of intellectual property rights, possible hiring, and access to current knowledge and experience are a few of these objectives (Tornatzky, Waugaman, & Gray, 1999).

Organizational cultures in universities and in the industry differ in some ways. The actions to be made will result in more productive work and will undoubtedly have a positive impact on the new product development process when these differences are taken into account.

Universities expect these collaborations to help them apply research-derived knowledge and methods, develop new technologies with funding, and establish facilities like technology transfer offices, incubation centers, and technology parks. Universities also expect to develop job possibilities for their students in emerging business sectors and to make sure that they complete their internships in those divisions. Universities place a high value on studies that will benefit the public as one of their primary goals is to benefit the society.

The expectations of the industries from these partnerships are to gain access to self-developed manpower, raise enterprise education levels, establish a presence on the global market, support and benefit from technology renewal for the new product to be produced, increase research activities and performance within the company, and gain access to research opportunities that are not available within the company.

2.4.4.

THE POSITION AND IMPORTANCE OF UNIVERSITY-INDUSTRY-GOVERNMENT COLLABORATION

For innovation to succeed and for the manufacture of innovative products to be efficient, government support is required. Universities, industry, and the government are the three key parties involved in this process. To fully benefit from economic contributions, these three stakeholders should always operate in a dynamic manner. The university will be the organization that conducts research and develops technologies in this three-part framework. In order to ensure that these institutions and industries are developed to a point where they can carry out the needed work and that the requisite systematic studies are carried out, it would be acceptable for the state to provide the infrastructure and possibly the mediation.

The R&D system, which consists of universities conducting basic research and large-size public research laboratories conducting applied research, was viewed by Freeman (1992) as the source of innovation. However, as research on industrial R&D and innovation in Japan, the US, and Europe has progressed, it has become evident that many other factors, in addition to traditional R&D, have a role in innovation success, the rate at which discoveries spread, and the related production gains. Particularly, it has been observed that incremental innovations originate from production-related engineers and technicians, or, to put it another way, from the ground up. This has been found to be highly dependent on the type of business organization, and many advancements in the offered products and services are based on the interaction between the market and firms.

Technoparks

Can (2007) cites “Research Park” in the US and “Science Park” in the UK as examples of technoparks. These locations are known as “Technopolis” in France, “Technopol” in Japan, and “Enterprise Center” or “Innovation Center” in Germany. In our country, these locations are known as “Technology Development Zones” or “Technoparks (p. 27).

According to Civan (2007), technoparks, one of the tools used to implement national innovation systems, are programs that aid technology entrepreneurs financially, academically, and managerially in the development of new and advanced technologies and aid in the commercialization of new goods and technologies (p. 28).

Technoparks offer a number of benefits: Since it is not possible to apply every R&D work produced to production operations, technoparks share and distribute risks associated with R&D activities while also reducing expenses. Technoparks provide a suitable and favorable working environment for the businesses that operate there, which benefits their costs as well. According to Kuşat (Kuşat, 2016, p. 171), the exemptions from company tax and income tax for employees employed in the region and earnings from R&D operations serve as incentives for new investors. Technoparks play a part in uniting businesses that operate in related industries, support and complement one another, manufacture goods and services, and play a part in these businesses adopting a shared energy and objective.

Technology Transfer and Corporate Strategy

Strategic approaches of companies are one of the factors that determine their innovation focus and innovation speed. According to the variances in their strategic approaches, businesses develop various organizational structures and procedures for developing new products (Acur, Kandemir, & Boer, 2012). NPD is currently the single most crucial factor in deciding whether a corporation will succeed or fail

in many industries. New product development (NPD) research has been sparked by the significance of new products in strategic management, engineering, marketing, and other fields. Companies must accomplish two key goals for product development to be successful: meeting customer needs and minimizing time to market. There is mounting evidence that businesses can successfully implement methods to attain these two goals, even though they bring competing demands to the organization. Successful businesses clearly communicate their strategic aims and match their NPD goals in their R&D portfolios with their available resources and capabilities. For a company to succeed, it is also crucial that the new core competencies offered by new technological entry points coincide with the organization's long-term orientation. The acquisition of new technology through strategic alliances can accelerate the development process, but partners must be carefully chosen and supervised. When businesses opt to outsource technologies, they need also consider the value of the internal project learnings and how they will affect the firm's future success. Other crucial elements include the use of parallel development processes (rather than sequential development), which will reduce cycle time while ensuring that the needs of customers and suppliers are better captured in the product or process design; and that projects obtain the necessary resources and organizational commitment so that they can be completed with the support of top executives (Schilling & Hill, 1998).

2.4.5. EVALUATION OF UNIVERSITY-INDUSTRY COLLABORATION IN TÜRKİYE

Universities play an equally significant role in shaping innovation in Türkiye as they do globally. In Türkiye, TTOs, science parks, and R&D facilities participate in initiatives that advance industrial collaboration. The effect of rules and regulations on collaboration is a significant aspect of the organizational dimension. An extreme legal framework is usually viewed as ineffective. This point of view contends that the existence of copyright regulations or the participation of researchers in contract R&D has a detrimental effect on the quantity of such contracts but has no bearing on the amount of money obtained through contracts. While laws on patents and copyrights differ from country to country, Türkiye too has some of these regulations.

No matter how comprehensive a university's curriculum is, Türkiye will benefit far more from the prestige and expertise obtained from working with businesses. It would be preferable for university rectors to take collaboration with industry as a purpose, with a sense of shared solidarity, and to guide themselves accordingly in this situation.

Activities extending beyond academic borders appear to be favorably correlated with university culture. There are several strategies to cultivate an entrepreneurial culture. Through curricular changes in business and law, as well as through explicit incentives that recognize both scientific publications and research done in partnership with industry, institutional incentives could be strengthened in Türkiye.

Universities, academics, and businesses with high status are more likely to work together and be chosen as partners. We see that industry collaboration and professor reputation are highly associated at the individual faculty level. The chance of collaborating with the industry increases with the number of qualified faculty members. Therefore, it is crucial to focus on faculty development in Türkiye.

Political and geographic contexts can affect collaboration. According to researches, governments can use policy tools to promote collaboration in a good way. Collaborations in Türkiye can be distinguished from one another using various government subsidies and directives. If the required assistance is given in this situation, productive partnerships between businesses and universities may develop.

2.4.6.

FACTORS AFFECTING COLLABORATION BETWEEN INDUSTRY AND UNIVERSITIES

Numerous studies and surveys have been conducted on this subject to date, but they have all tended to concentrate on broad issues like operating strategy and profitability. The method followed is for determining the factors that affect the success of the cooperation between these two companies. One of the key elements is resource management. Success might increase with additional resources at hand. Of course, having a lot of resources does not guarantee success, but it is a crucial aspect. These resources might be described as essential components like financial, time, human capital, and equipment.

These bilateral partnerships have certain positive aspects, but they also have some negative aspects that work against them. For instance, conflicts regarding the timing of studies frequently occur (especially in the case of short-term research). Another unfavorable aspect is the hierarchy. Institutions all around the world have generally suffered from the rigidity of the hierarchical structure. The hierarchical structure of universities is stricter than that of industrial companies. One of the key challenges to the effectiveness of university-industry collaboration is the complexity of management structures and the lack of flexibility in job descriptions.

The effectiveness of the interaction between the collaborating institutions is a further consideration. The required actions must be not at an individual or managerial-level but at organizational-level. This is so that interactions, feedback, and information flows on subsequent actions may be more clearly understood at the operational level. A more effective form of communication will be achieved by choosing face-to-face interactions over phone calls or email. Technology and the transfer of knowledge are further crucial issues. The responsibilities of industry and universities in technology transfer vary. While managerial skills are primarily acquired from the industry, technology is primarily transmitted from the university.

2.4.7.

CHALLENGES TO SMOOTH COLLABORATION BETWEEN UNIVERSITY AND INDUSTRY

Hershberg, Nabeshima, and Yusuf (2007) state that there is a need for universities in developing nations to address the difficulties facing their societies' growth, and as a result, pertinent parties are seeking ways to improve university-industry engagement (p. 937). However, there are concerns that imported methods and strategies are being copied and put into use to help emerging nations overcome their development issues without taking into consideration the unique features of the economies in question.

The problem of cultural differences is another obstacle to effective communication between the university and industry. It is asserted that there are significant differences between the cultural and professional norms that govern how universities and businesses operate. Fagerberg et al. (2005) assert that for academic researchers, one's capacity to be acknowledged depends on their capacity to draw attention to the published outcomes of their research in addition to the methods employed. Contrarily, the authors claim that industrial research benefits from the confidentiality of research and information (Fagerberg, Mowery, & Nelson, 2005). Additionally, a major issue, particularly in developing nations, is the lack of a conceptual framework to direct efficient interaction between participants in the innovation process. The triple helix concept is therefore rendered ineffective for developing nations with a declining knowledge base. The triple helix architecture, which promotes efficient communication between government, business, and academia, has only given developed and industrialized nations its attention (World Bank, 2002 & UNDP, 2001 as cited in Saad, M. & Zawdie, 2011; Chandra et al., 2008).

Records show that universities have achieved some success in some developing nations in terms of networking and capacity building, which helps the innovation process, according to Saad, M., and Zawdie (2011). However, the interaction between universities and businesses in wealthy and industrialized nations is analogous to this. Last but not least, Saad, M., and Zawdie (2011) regret that universities in developing countries frequently lack access to the processes that promote development. They argue that this is because universities have evolved through a process of evolution that has its roots firmly planted in culture and belief systems.

3. CONCLUSION

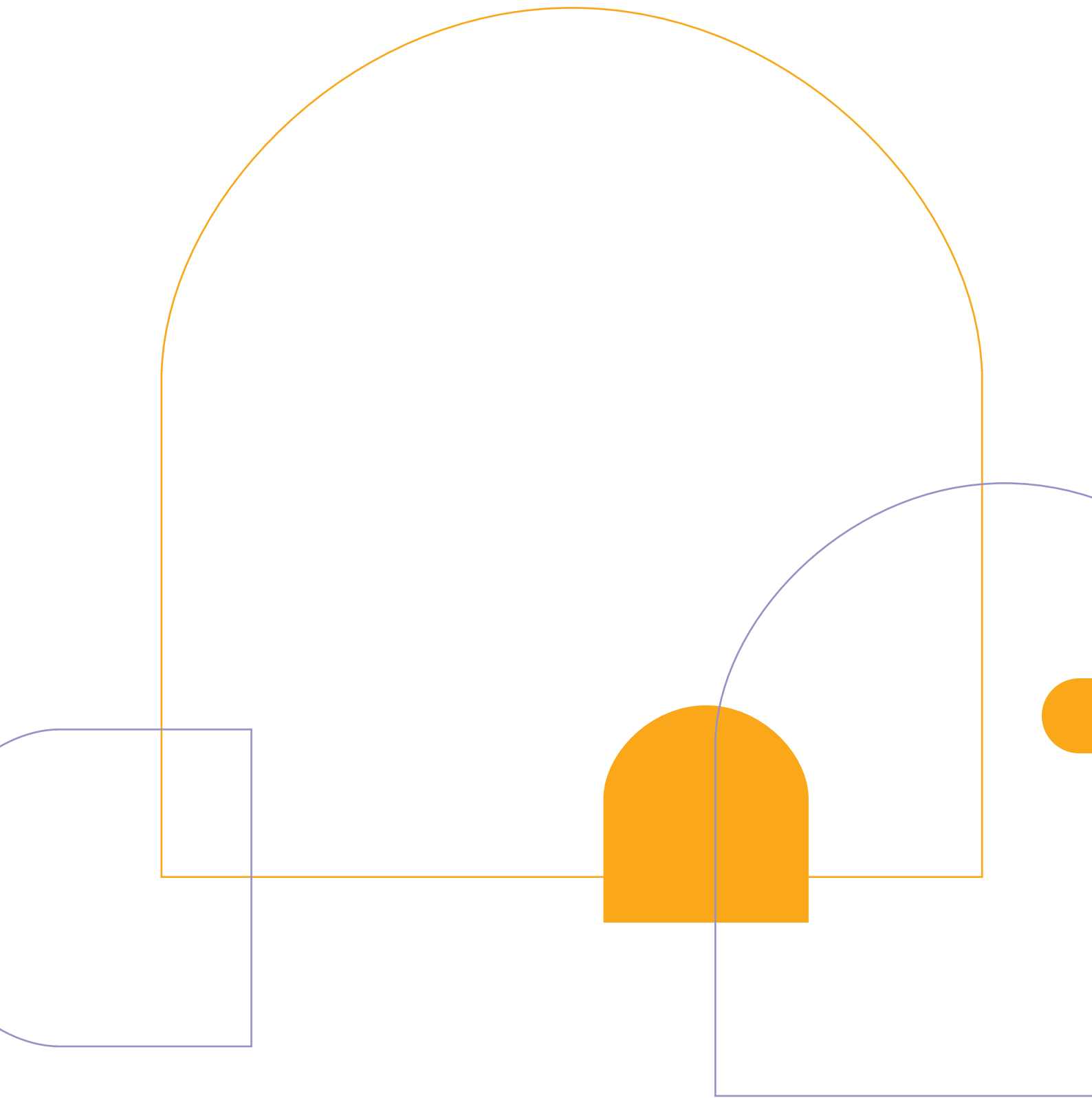
The formation of various investments in the realms of science and technology and the subsequent resource transfers for this purpose have caused corporations to operate more due to the rise in industry competition and the increasing day-by-day efforts to benefit society. The concepts of creativity and innovation have entered our lives as a result of these developments. Stamm (2003) asserts that companies seeking to innovate must come to an agreement that will allow them to combine creativity and applicability (p.1-7). Taşkın and Adal (2004) emphasise Porter's argument on the significance of businesses for international competition, and further the main aspect that provides competitive power to these businesses being the innovations in products and production systems (p. 84-85).

Universities' efforts in partnership with business have brought together academics and business, creating a bridge between two institutions that are fundamentally distinct and allowing for mutually beneficial knowledge exchange as well as continual learning. Meredith and Burkle (2008) claim that while universities actively provide feedback by researching the dynamics of the industry, the industry transfers tangible experiences to them (p. 201). Yücel and Özgül assert that because of this, the collaboration between academia and industry is essential to the daily growth of innovation and knowledge. The same authors claim that a variety of factors influence both successful outcomes and the growth of university-industry collaboration. The authors found that while policies, resources, rules, incentive programs, and faculty member characteristics have an impact on universities, business capabilities related to size, R&D intensity, industry characteristics, and corporate strategy have an impact on businesses (Yücel & Özgül, 2020, p. 76).

Policymakers should also take into account how university-industry collaboration affects the economy of the country and the region. In this context, policymakers should prioritize finding solutions to the bureaucratic challenges faced by SMEs (Çelik, 2011; Varol, 2018), providing entrepreneurs with state incentives for scientific studies in a controlled manner, directing them to sectors with higher potential within the framework of the country and the region (Smirnova, 2016), and more. It is believed that deliberate and properly chosen governmental policies will give industrial organizations the proper direction to collaborate with universities.

The software industry is without a doubt one of the most sought-after sectors in both the present and the future. Universities and industrial organizations will be involved in activities that will bring the greatest advantage to both themselves and their environment if they concentrate on software-related areas such as software creation, adaptation, and implementation. Their profitability will consequently rise.

TUBITAK, the Ministry of Industry and Technology, and foreign research organizations offer numerous incentives and significant support today. Programs that will hold their interest should be implemented for academics to profit from this assistance.



CHAPTER

10

PRODUCT MANAGEMENT AND ITS EXPRESSION IN THE WORLD OF ACADEMIA



KADİR DELİGÖZ

Kadir Deligöz was born in Erzurum in 1989. He holds master's and doctorate degrees from the Department of Production Management and Marketing, Atatürk University. He is currently working as an Assistant Professor at the Faculty of Economics and Administrative Sciences, Atatürk University. Deligöz has published many books, book chapters, articles, and papers. Deligöz is married with a daughter.

1.

INTRODUCTION

Marketing is a universal human activity. Today, marketing is defined as not just generating sales but also addressing customer demands and building and maintaining relationships with customers. Only when a product has been developed can it be sold. Contrarily, marketing begins long before a business has a product, continues through sales, and also covers the post-sale process. Because of this, marketing managers are responsible for determining and measuring consumer demands. The fact that marketing has been a potent activity all over the world since the beginning of trade is one of the most significant reasons for this. Some concepts need to be clarified and defined in order to understand the core nature of such a potent idea. In its broadest sense, marketing includes all of a company's activities that take place before, during, and following sales with the goal of turning a profit. Understanding today's varied consumers and constantly having a management strategy in place are requirements for achieving this fundamental marketing objective. Businesses are also under intense pressure to perform in today's marketplaces, which are becoming more and more competitive. Therefore, companies that want to thrive in this competitive market must develop a profitable product mix and use this marketing mix to satisfy customers. One of the most efficient ways to organize roles, duties, and customers for the marketing of a brand or product is through product management. Planning and creating the optimum product mix and bringing it to market are the ultimate goals of efficient product management. Determining the mix of items to be marketed is one of the many duties of senior management, and it is essential to the survival and success of the company. Product management's primary goal is to make sure that firms sell their brands and products profitably and are effective in their marketing initiatives.

The definitions of products and product management, as well as their historical development, are covered in this article. Product managers are also mentioned, and the faculties that offer "Product Management" courses in the faculties of economics and administrative sciences are examined and recommendations are made.

2.

OVERVIEW OF PRODUCT MANAGEMENT

Since the dawn of time, human people have had to produce continuously in order to survive, and they do so now. While the initial production activities were focused on satisfying personal requirements, later production for the benefit of others also came into question, and this has continued to grow till the present. The economy's lifeblood is production, which is achieved through the efficient utilization of labor and other input resources. Producing benefits is how economists define production. Additionally, the basic definition of production is the creation of value in order to satisfy needs. However, by itself, this definition falls short of providing a complete economic explanation of production. Therefore, we can define production as a group of actions taken to create anything with an economic value. Another definition of production states that it refers to the physical, chemical, and related processes used to convert resources, commodities, raw materials, and natural materials into goods and services better suited to meet human requirements. According to these criteria, an activity must also have a purpose, such as satisfying a person's need, in order to be classified as production (Kancolu, 2012).

The product is the cornerstone of both production and operation. One of the most outputs of production is the product. According to the broadest definition, a product is any good or service sold on the market

to meet the needs of customers and ensure their satisfaction with its features and functions (Pleschak and Sabisch, 1996). The output produced by integrating the production components at the optimal moment, in the ideal setting, and at an affordable price to satisfy human requirements is the product. Production activity in this sense entails including production sectors as inputs, moving through several processes within the organization, and producing something as a byproduct (Palamutçuoğlu, 2014). A physical good, service, concept, idea, person, or location that can provide tangible or intangible attributes that people or organizations accept, as well as any needs that they are willing to exchange, is referred to as a “product” (Brassington and Pettitt, 2006: 268). Businesses currently offer more items than they did in years past, thus they have to alter their organizational structures to accommodate this. The expansion in the number of products available on the market has elevated the level of company competitiveness. The idea of product management has emerged as a result of this competition.

Businesses must plan all of the actions that will be conducted in the processes of differentiating their products for consumers after doing an analysis of these processes. To acquire a competitive advantage over their competitors and sell these items to the market within the parameters of the strategy they have established, companies must develop new product strategies in the current market environment. Because of this, companies’ ability to survive in the marketplace is correlated with how well their product management procedures are doing. Product management includes the activities of outlining product features, specifying the operations of the product, and introducing the product to the market. The product life cycle, which includes steps like the development, planning, verification, forecasting, pricing, promotion, and distribution of products, is what makes up product management (Kürkin & Januska, 2010). According to this definition, product management makes it possible to present the product to the appropriate market in line with the company’s objectives. Businesses can now relocate product management anywhere inside an organization thanks to growing competition and technology advancements. According to the definition of product management, these organizational processes cover the steps taken before the items are received by the consumer. Product management is a type of management that evaluates the business environment in a systematic and regular manner to produce the data standards required for strategic product planning (Gaubinger et al., 2015: 29). To ensure that the company is successful in all marketing endeavors, product management, which is the process of coordinating and planning duties, tasks, and personnel to deliver goods, services, or brands to customers (Hehman, 1984:1). The goal of product management is to significantly contribute to entrepreneurial success by integrating the creation, production, and marketing of goods that match customer needs, according to Niehaus et al. (2005).

Planning, arranging, carrying out, and controlling all tasks associated with a company’s product offerings is referred to as product management. The primary goal of product management in this context, even though it encompasses all management activities, is to support the business by determining the profitability of the continuously planned and managed brands (Coulson, 1985). Product planning and product marketing are two professional disciplines that product management falls under. This is because product planning creates product functionality for the user and product marketing communicates the value of the product to consumers (Steinhardt, 2017). The marketing function seeks to ensure that the product is purchased by the consumer, while the product planning process seeks to coordinate all activities before the product reaching the consumer.

A new product’s development, testing, and launch are all phases in which product management plays a critical role. As a result, the product life cycle needs to be updated to reflect the change in the product management process. Product management is a technique that is adopted and used mostly in customer-oriented firms and is widely regarded as one of the more effective organizational forms for multifarious businesses. Product management, which has historically concentrated on a company’s existing products, also involves the sustainability and final disposal procedures of existing items while conceptualizing, developing, manufacturing, and testing new products (Arntzen et al., 1995).

Basically, product management includes the following activities (Pleschak and Sabisch, 1996):

- **Definition of market and product strategy:** The company's defined aims and strategies put into practice.
- **Definition of product:** This entails the process of creating new products while keeping the company's current products in production. By identifying the key aspects of a product, new product concepts are given concrete form.
- **Product support:** It is concerned with preserving and maximizing the potential of the products that are offered to the market.
- **Market entry:** At this stage, new products are located, supplied with the proper distribution channels, and promoted to prospective buyers.
- **Market monitoring:** This stage focuses on keeping an eye on and evaluating client demographics, current and potential rivals, and market developments.
- **Product control:** This stage involves organizing what must be done to direct the process of product management and monitoring.

The development of a managerial framework for the managers in charge of the marketing of the product or brand is known as product management. The goal of this managerial framework is to successfully complete the marketing tasks necessary for the company's brand or product to be sold at a profit. Product management's primary goals are to conduct new product studies, modify existing goods to better match consumer desires and needs, and remove items that have lost market share or cannot be made to fit into a new market (Bayar, 2007: 6).

Product management aids firms in managing strategically significant ideas like a product image or product positioning in addition to the aforementioned goals. The way that large companies' products are viewed by consumers is particularly crucial. By adhering to the positioning stages, product management enables companies to achieve the appropriate placement. Product management is also the successful execution of marketing activities by business managers (this management staff can include managers responsible for both marketing and managers responsible for product management) that are necessary for the profitable sale of the product or brand (Odabaş, 1995:137).

The fact that product management addresses consumer needs and requirements while also creating a connection to the business model is among its key features. Wohlin and Aurum (2006: 179–200) offered advice on how to abstract the requirements of consumers while highlighting the commercial side of product management. During the elicitation process, they determined the primary motivators for prioritizing customer requirements and adjusting to early business needs. On the other hand, Gorschek et al. (2010) recommend fundamental adjustments to the company's internal operations in order to make optimal product management choices. From a business standpoint, several significant stakeholders are frequently forgotten. In this situation, one of the main issues with product management is not a lack of knowledge of stakeholders, but rather a lack of understanding of interdependencies, responsibilities, and requirement expectations. In order to determine the needs, stakeholders should be engaged, and then specific actions should be made to meet those needs.

Businesses attempted to create organizational plans for mass marketing potential when the concept of product management first emerged. Product management was a strategy for coordinating the several business lines that companies with multiple products or brands aiming at sizable homogeneous markets needed to successfully manage. However, it is now also used by larger businesses and in heterogeneous markets. When product management originally began, it was initially the duty of a single manager (e.g., R&D, marketing, accounting, distribution), and for many businesses today, this is

still the case. However, departmental product management departments now take on this duty (Cosse and Swan, 1983; McDaniel and Gray, 1980).

Flexibility in the organization is provided by managing the day-to-day marketing activities, putting the strategies chosen for the products into practice, catering to the needs of a product from a single center, and representing the management itself. The organization's senior management can then concentrate on long-term objectives rather than the current state of the products. Because a product is frequently at the center of an organization's operations, the outcomes that arise can be managed and forecasted more simply with the adoption of a product management system. Product management involves a broad range of technical issues and tasks, from tactical planning to strategic decision-making. Being aware of the risks and possibilities in the marketplace is part of product management's strategic function. The information required for other units to make decisions in the face of the environment is provided by product management (Baker and Hart, 2007).

Given its historical development, product management companies differ from typical marketing organizations in a few key ways. Product management is an important management process for enterprises. The classic marketing organization is still very much relevant, according to many professionals. However, for the majority of products, especially new ones, a product manager is necessary to coordinate intricate firm functional issues, make long-term plans, and track profitability (Wood and Tandon, 1994: 19). Figure 31 depicts the typical marketing organization, while Figure 32 depicts the product management organization.

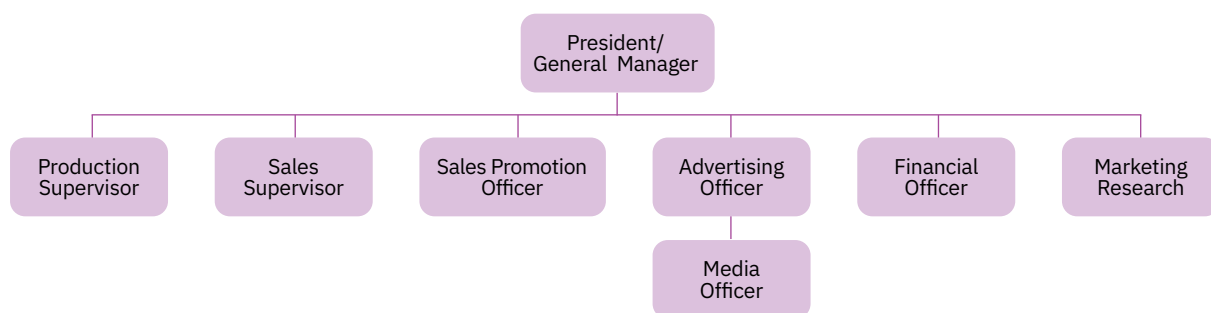


Figure 31: Traditional Marketing Organization

Before product management, businesses producing consumer goods often had far fewer products than they do now. As a result of the convenience of having fewer products, they are structured differently. Positions were categorized using easier and more fundamental distinctions, as seen in Figure 31's organizational chart. Many small firms today, sometimes with few items, use this classic marketing structure (only a few brands).

All significant marketing tasks report directly to the president/general manager, as seen in Figure 31. Neither a marketing officer nor an autonomous marketing unit exists. The president/general manager feels himself to be in charge of marketing decisions. Managers serve as technical consultants and implementers to the president or general manager, who makes decisions. The president or general manager's direct and focused influence is the distinguishing feature of traditional marketing firms. The product management organization is depicted in Figure 32.

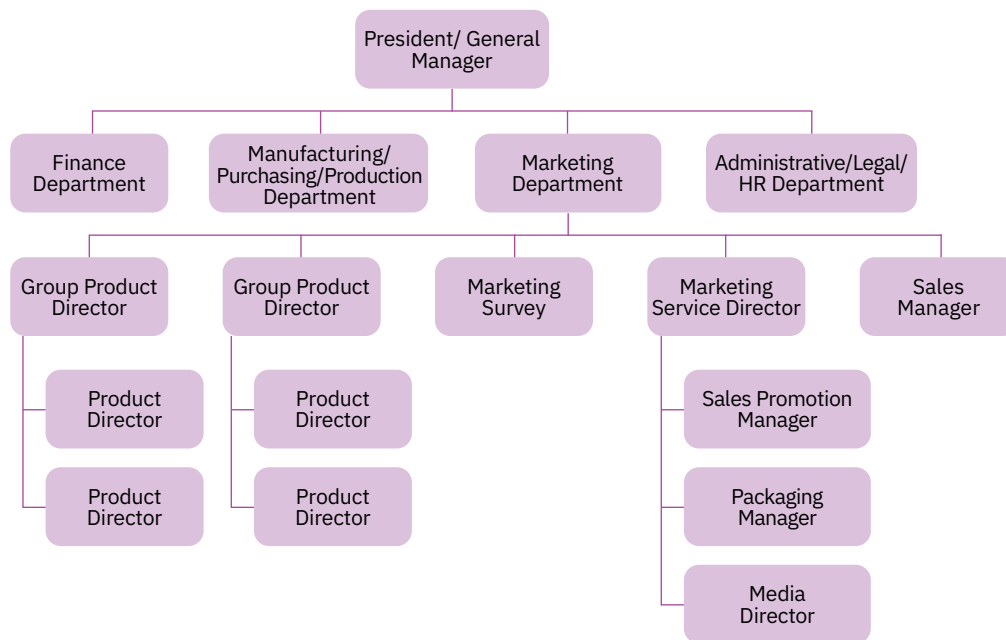


Figure 32: Product Management Organization

When comparing Figures 31 and 32 in terms of product management, it is clear that the product director (manager) is assigned in charge of marketing the product or brand inside the product management organization. The marketing manager oversees a line that carries out marketing operations.

As in a traditional organization, the product manager is in charge of the performance of his product. However, it is important to pay attention to the lines going to the service or personnel departments. A department is not directly under the product manager's control or jurisdiction. When lacking this power, the marketing manager or department serves as a link between the needs of the product and the personnel's skills and limits (Hehman, 1984, 2-4).

The product management system has improved greatly from the past to the present. Product management is largely responsible for the success of numerous large global corporations, including Kraft, General Foods, General Mills, Procter & Gamble, Pillsbury, Heinz, Quaker Oats, Campbell Soup, PepsiCo, and Frito-Lay. Product management has become a more acknowledged and uncontested area of the company as the system has developed (Randolph and Hamilton, 1986: 104-110). Many practitioners and academics have started to doubt the conventional function of product management and therefore product managers, if not the system itself, especially in the last ten years. The development of product management is the primary driver behind this investigation.

Product managers are responsible for overseeing all organizational mobility within the product line to guarantee that product management is carried out correctly. Possessing winning products is crucial in today's competitive markets. The product manager's abilities and skills are crucial to any product's success. Product specifications, release definition, product life cycles, the formation of a successful, multifunctional product promotion team, and, most importantly, the design and implementation of the business case are all under the purview of the product manager (Ebert, 2007:850). Reaching target consumers, marketing, advertising, and representation are just a few of the duties that product managers take on (Argouslidis and Baltaş, 2007). Product management is the equivalent of eschewing mass production and giving consumer-specific goods and brands sufficient market attention so that the

business manager may efficiently coordinate every element of the marketing mix (Murphy and Gorchels, 1996). The intended user base or client portfolio of a product, the items it introduces to the market, and how well the product fits into the business model are just a few of the many things a product manager takes into account. A product manager's responsibilities are strongly correlated with the size of the company. Some product managers may oversee one or more product lines, whereas others may be in charge of a product's minor details or features (Cagan, 2017).

Product management may include the marketing plans of a product or a group of products, pricing, sale, promotion, advertising, packaging, distribution, and product change. The product manager, who participates in every stage of the marketing mix, must work in coordination with the company's other product and brand managers. Product managers must collaborate with other managers to fulfill their responsibilities. For instance, the managers of the accounting department assist the product manager in setting the price of the product by assisting with performance analysis, problem-solving, and opportunities. When changing the product, the production department may be needed (Odabaş, 1995:137). The person in charge of marketing a product or brand is the product manager. His or her job is to create and carry out the essential plans to achieve this aim. He or she is directly accountable for the performance and success of the product or product line. They collaborate with other department managers or experts as they carry out these tasks and responsibilities.

3.

HISTORICAL DEVELOPMENT OF PRODUCT MANAGEMENT

Actually, the birth of product management coincided with the growth of manufacturing. Humans have made an effort to produce in accordance with their requirements and as the circumstances permitted since they have had to do so in order to survive since the beginning of time. Many of the technical advancements of today had their roots established years earlier. Product management is a management concept that has been applied for many years in a variety of industries, most notably the consumer goods industry. The first product manager in history was Meil H. Mc Elroy, who was hired by Procter & Gamble in the USA in 1927 to work full-time on the "Gamay" brand soap, which had dismal sales. Since then, most consumer goods companies and numerous industrial businesses have adopted the idea of product management and product managers. However, the American Marketing Association claims that prior to the early 1960s, the idea of product management was not widely acknowledged (Hehman, 1984: 2). Many consumer products companies encountered previously unheard-of business potential in the early 1960s. Significant increases in consumer discretionary income enhanced competition and sparked a boom in new products and brands during that period of rapid economic growth, rising consumer demand, and the emergence of mass markets and mass media. The development of the contemporary product management system was a response to the complexity of this new environment (Wood and Tandon, 1994: 20).

The first product managers in Türkiye were seen at Unilever in the middle of the 1970s. Roche and Ciba-Geigy were the first product managers in the pharmaceutical sector after 1975. Currently, one of the areas that have embraced product management organization the most is the pharmaceutical industry (Ataman, 2006). The Product Management Türkiye Platform was introduced in 2021 by TTGV in collaboration with the Product Development and Management Association (PDMA) in the areas of product management and new product development, in addition to the initial instances in Türkiye.

Considering the concept of product management's historical development, it is clear that it is one of the crucial concerns that have to be addressed in the academic community. For this reason, the following academic works on product management are provided.

Product Management in the Academic World

The foundation of academic life is undergraduate education. Undergraduates work hard to complete original research projects and learn about their departments' curricula. Undergraduate education is crucial in this regard for both practitioners and nations looking to enter the commercial world.

The design of the fundamental knowledge and abilities that students should master and that are targeted under the direction of the instructor, as well as the outlining of the execution stages, comprise the broadest definition of curriculum. Differentiating between the skills required by society and the individual is a result of the rapid changes and developments in sociocultural life, science, and technology. This differentiation inevitably results in the necessity to update and revise the curriculum to guarantee that students are trained to meet the demands of the modern world (Ministry of National Education, 2017). The course information package serves as the undergraduate and graduate semesters' equivalent of the curriculum. A course information package combines the national credentials established by the Council of Higher Education (YK) and the Bologna Process practices to provide information to all stakeholders (Ders Bilgi Paketi, 2022).

The pattern of attributes that students should possess as successful members of society in the future has altered as a result of sociocultural, scientific, and technical advancements both abroad and in our own country. In the current modern era, students' awareness of how they are learning these things is just as crucial as their basic information, skills, and values. In order to apply the learned traits in various spheres of life, good infrastructure and equipment are also a requirement.

Due to the quick advancement of technology, changes in marketing understanding, and changes in production systems, various undergraduate programs have changed their curricula, particularly in the previous 20 years. Social media, data visualization, content management, mobile apps, virtual and augmented reality, artificial intelligence, and product management are just a few of the new courses that many colleges have introduced to their undergraduate curricula. Universities in Türkiye have begun to provide lectures and courses on product management as a result of the concept's growing significance. A thorough investigation of the curricular materials on product management in the Faculties of Economics and Administrative Sciences was made among the universities listed by the Higher Education Institution.

Türkiye has 204 universities (including state-run and nonprofit). 75 of these institutions are foundation universities, whereas 129 are public universities. Istanbul has 802,131 students and 35,034 faculty members, making it the city with the largest student and faculty density. Ankara, with 311,562 students and 17,615 faculty staff, comes in second place to Istanbul. With 173,611 students and 8,477 faculty members, İzmir comes in third. Additionally, according to higher education statistics for 2021–2022, there are 8,240,997 students enrolled in classes nationwide. In 204 universities, there are 133 faculties of economics and administrative sciences. Other faculties, such as the Faculty of Economics, Administrative and Social Sciences and the Faculty of Economics and Social Sciences, are not included in the data obtained because this study only uses data from the Faculty of Economics and Administrative Sciences (YÖK Bilgi Yönetim Sistemi, 2022).

We may summarize the work done in the academic field of product management by looking at the present curriculum on the websites of universities in our country.

First off, there are five institutions out of 204 that offer a course called “director’s management” in their curricula. It has been noted that most of these universities are public institutions.

Universities have expanded their offerings beyond product management to include courses in product development, fashion product management, strategic product management, product management, and industrial management, and product management and marketing. It has been established that the public and foundation universities at the top of the university rankings are those that provide product management courses in their curricula.

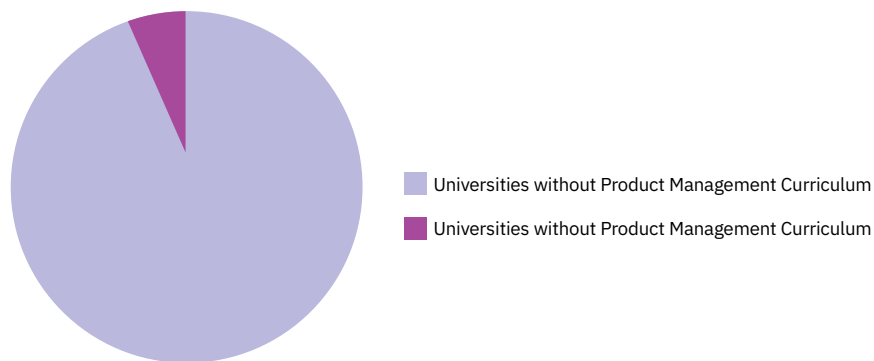


Figure 33: An Academic Investigation of Product

When the aforementioned data are examined, it can be seen that institutions with strong rankings in university rankings by various organizations and faculties of economics and administrative sciences include the product management course in their curricula and support these courses, particularly with a heavy workload (ECTS). In this context, it is anticipated that universities will become more aware of product management, which has the potential to be one of the important professions of the future, and that out of 204 universities, 30% will have product management curricula within the next 10 years, and that number will rise in the years that follow.

CHAPTER

11

THE EFFECTS OF INSTITUTIONALIZATION ON R&D AND NEW PRODUCT DESIGN MANAGEMENT IN SMALL AND MEDIUM-SIZED ENTERPRISES



BERNA ALKAN TUZLAK

N. Berna Alkan Tuzlak earned a degree in business administration from Anadolu University's Department of Business Administration and wrote her thesis for graduation on "The Impact of Corporate Communication and Corporate Image on Businesses." Tuzlak has been working as a trainer, coach, and financial and corporate management consultant since 2011 after spending 22 years as a banker. She shares her skills in the finance field with various industries. The Vocational Qualifications Board supplied her with 100 hours of training, and Sakarya University awarded her a license as a "National Business and Vocational Consultant." In order to boost the brand value of businesses, she has planned and implemented development- and target-oriented training and design initiatives in the areas of competency development and skill management. She is still working on developing a corporate culture, setting up or modifying a management-organization structure, strategic planning, performance evaluation system, and managing sales, marketing, and finances. Her references include conventional and participation banks, pension funds, government agencies, metropolitan and district governments, multinational corporations, and small and medium-sized businesses (SMEs).



GÜRAY GÖZAÇAN

Since 2010, Güray Gözaçan, a mechanical engineering graduate of Uludağ University, has offered consultation services to organizations regarding the management of R&D and investment projects, the use of projects from national and international support programs (TUBITAK, EU Projects, Investment Incentives, etc.), and the development of R&D strategies. Güray Gözaçan has experience establishing more than 100 R&D Centers, more than 300 publicly funded R&D projects, and close to 100 technology-focused investment projects. He is still employed by Etkin Proje as the Company Director in charge of all operations and services and a member of the Board of Directors. Güray Gözaçan has participated in approximately 200 trainings and seminars as a speaker and trainer. He has knowledge in national and international R&D supports, R&D project management, R&D structure, strategic R&D management, and university-industry cooperation.



CAVİT ÇINAR

Cavit Çınar was born and grew up in Samsun. He attended Yıldız Technical University to study photography. At the Faculty of Aeronautics and Astronautics at Istanbul Technical University (ITU), he earned his bachelor's and master's degrees before giving up on his doctorate at the thesis stage. The State Planning Organization-supported first helicopter design project in Türkiye was where he began his professional engineering career at ITU-ROTAM. He developed and oversaw three distinct companies' state-funded R&D facilities after spending five years as an aerodynamic engineer at FORD Otosan and four years as a manager at FİGES Engineering. Since 2020, he has been working in his own company FCM Suda Agriculture and Food, producing in greenhouses with soilless agriculture in Antalya and conducting engineering projects for the spread of this technology in Türkiye.

1.

INTRODUCTION

Rapid advancements in information technology and the globalization of society demonstrate the need for SMEs to be ready for change and transformation in the industries in which they operate. Under the current market conditions, institutionalization and brand positioning initiatives can help SMEs participate in local, national, and international markets and position themselves in a competitive environment. In the context of the overall quality management strategy, together with all sub-departments, it is evident that businesses that have begun or finished institutionalization operations within the organization have enhanced their brand values and boosted their profitability. In our country, SMEs and family-owned businesses that are unable to begin the institutionalization process and cannot advance in this direction accept the continuation of sales and marketing activities with a traditional management approach as a success criterion and are insufficiently successful in the field of R&D, which will determine the future and sustainability of their businesses. Due to this circumstance, their R&D efforts are not yielding the successful, efficient, and effective results they had hoped for. Lack of understanding and knowledge can be inferred from the fact that SMEs are primarily focused on the production phases and that their development only moves in this direction with an understanding of quality standards. SMEs make up 99.8% of the workforce in our country, and the main barrier to SMEs' survival and transmission to subsequent generations is that they view the switch to corporate management as a burden and R&D studies and projects as nothing more than an expense.

The strategic relationship between SMEs' adoption and implementation of a corporate management approach and their capacity to naturally generate a new product design management method as a result of their R&D activities is comprehensively examined in this study. New products developed through R&D are thought to be markers of both strong institutionalization inside the company and of being a long-lasting, dependable company in the market and sector. In order to help SMEs who want to manage this process, it is underlined that development in R&D and new product management rely on a sound corporate management strategy.

2.

THE COMPASS OF BUSINESSES: INVESTORS

Elements created during the foundation phase, such as the name, logo, motto, and slogan, give businesses their unique identities. The background of the investor and/or investors that they have amassed to that point is reflected in this identity's invisible face. The identity card of the newly born enterprise is made up of the investors' expertise, business development and management strategy, and demographic culture throughout the time leading up to its foundation. Companies are also living organisms. The life of SMEs began the minute they were founded, and their brands were created. The next thing to do is to keep the brand alive. The moment a business begins to run, the idea of institutionalization is introduced. Just as the people who are in charge of a child's development from the moment of its birth have an impact on the person the child will become in the future and they put all their important experiences and dreams into action alongside the child, investors put businesses into action both at the start of their activities and afterward. The route that firms take is also decided by investors. This is the very point when institutionalization and brand management begin.

Institutionalization is “the process of an enterprise having rules, standards, and procedures independent of individuals, establishing systems that follow the changing environmental conditions, creating its organizational structure in line with the developments, transforming its unique communication and business methods into a culture, and thus adopting a distinctive identity and system that is different from other enterprises,” according to the definition provided by the University of California, Berkeley. This is the institutionalization process.

Therefore, rather than how many, where, or how enterprises are handled, it is vital how they are positioned and run under the brand name, regardless of the individual. With the culture and image they develop in line with their founding concept, businesses can realize the sustainability of their operations. Business management approaches that are compatible with the geographical and demographic conditions we live in are indicators of an innovative approach, in other words, innovation in changing world conditions. A competitive environment is created by the ongoing development of information technologies and the growing use of digital technology. Corporate management must be organized in a way that will give businesses a competitive advantage going forward if they are to thrive in an environment that is changing quickly.

SMEs (Small and Medium-sized Enterprises) are organizations in Türkiye that have less than 250 employees or an annual revenue of less than TRY 250 million (about €50 million in the EU). These businesses make a significant contribution to the economies of nations by creating income and jobs. Enterprises' corporate management approaches hold the key to boosting growth, enhancing economic efficiency, and instilling trust in investors. Because they can make decisions more quickly than large corporations in our country and around the world, offer flexible production conditions, add value to employment, and continue their operations by adapting to changing circumstances in a crisis environment, SMEs play a significant role in social growth and have a strong value in economic growth. By organizing elements like organizational value, performance management, corporate reputation, and corporate sustainability, SMEs can develop a sense of corporate management. Here, corporate culture can be defined as **“a set of fundamental values, standards, conventions, beliefs, and understandings shared by organizational members”** (Draft, 1983). On the other hand, “Corporate reputation is the outcome of taking into account a perceptual representation of the organization that is based on its prior deeds and anticipated future acts in the context of all stakeholders' perceptions or actions” (Rutha & York, 2004). “Corporate identity, in particular corporate image, has a significant impact on how well a company executes its strategies and how well it performs” (Riel & Balmer, 1997). It is possible to make the case using Aristotelian reasoning that a business with a carefully thought-out corporate identity ought to arouse particular feelings.

We can define such a company as an organization that has the following characteristics, or at least tries to give such an impression:

- Well managed,
- Producing good goods and services,
- Having strong financial management,
- Giving the impression of making long-term investments,
- Utilizing its resources efficiently,
- Responsible for the place where they live and the environment,
- Innovative,
- Employing skilled people.

It is not possible to have a good corporate identity image if one of the eight characteristics of corporate culture mentioned above is not present. It is the purpose of the organization that determines the impact of corporate identity, corporate image, and corporate culture on brand value. The company's vision is embodied in this purpose. **It is the duty of the leader to assume responsibility for creating the vision.** The vision developed by subordinates should include the upper management's vision.

"Institutionalization, in my opinion, refers to the operation of a system in accordance with tried-and-true, reliable, adaptable, and well-known principles. When an institutional reflex has not been formed, desperate reactions in hurry become more prominent. It is evident that it is more rational to act quickly and reflexively in a scenario that appears hazardous to us. According to me, the fundamental idea behind corporate management is to establish a set of guidelines to control our innermost tendencies. Does not society as a whole have the same need for law? Corporate management can be seen as a system put in place by humans to prevent actions within a company from being solely motivated by internal factors or by habit" (Yazgan, 2008). "Businesses produce a wide range of goods and services, bring in tax money, create jobs, (...) manage our savings, and ensure our retirement income. The significance of corporate management is expanding as confidence in the private sector rises globally (Waring & Pierce, 2004). As a result, SMEs' success is measured not only by the profitability they aim for but also by the value they give to the growth and economy of their respective countries. By implementing a corporate management approach that highlights unique differences, SMEs may survive and realize their goals in the most effective and efficient manner in the competitive marketplace under the conditions of a developing and digitalizing world. Businesses with a competitive advantage among SMEs are those that combine a modern management strategy with a strategic leadership approach.

The 2022 Presidency of the Republic Annual Program (Presidency of the Republic of Türkiye Strategy and Budget Directorate) and TUIK statistics show that as of the end of the previous year, SMEs made up 99.8% of all enterprises in terms of the number of employees, 73.9% of employment, 53.1% of added value, and 57.2% of exports. In 2022, it is intended for SMEs to account for 58% of exports and 22% of R&D expenditures.

The data shows that SMEs are among the most valuable resources in our economy because of the significant contribution they provide to balanced and sustainable economic and social growth and because of their adaptable organizational structures.

SMEs are categorized based on both their quantitative and qualitative characteristics. The number of employees, total converter power, energy consumption, capital, turnover, capacity, machinery, total assets, and profit are some of the quantitative characteristics of SMEs. Business ownership, management, funding, marketing, procurement, production capacity, and employee qualities, on the other hand, are examples of qualitative characteristics. By successfully managing their qualitative and quantitative characteristics, SMEs can boost their brand value. They may accomplish their brand roadmap by having a strategic vision. The brand's compass is comprised of its target market, communication activities, advertising, public relations, personal sales, direct marketing, and customer service operations. Only by embracing creative strategies can SMEs maintain their brand value, financing prospects, and their grasp on existing markets that they have acquired via institutionalization. Today, many branded organizations have brand values that are significantly higher than their balance sheet values. The process of branding is the outcome of long-term actions. The value of the brand is increased during this process by the company's consistent production and investment.

2.1.

THE IMPACT OF TOTAL QUALITY MANAGEMENT ON CREATING BRAND VALUE THROUGH INSTITUTIONALIZATION

Total quality management is achieving an open and transparent management system in businesses. The goal of total quality management is to help firm owners, managers, and stakeholders change and grow. The change in question has little to do with paperwork and procedures; rather, it has to do with the evolution of the organization's culture and its knowledge of how to support commercial activity from the individual up.

In total quality management, leaders guide the organization to achieve flexibility and the capacity to operate as an open system, as opposed to the single-manager approach that is typical in SMEs. Businesses that apply total quality management observe an increase in market share and customer satisfaction, a decrease in costs, and a swift perception of innovative change by stakeholders within the parameters of quality and understanding. In order to maintain and grow our market share, total quality management both guarantees and strengthens the confidence of our customers and employees, whom we refer to as internal customers.

2.2.

THE IMPACT OF TOTAL QUALITY MANAGEMENT ON INSTITUTIONALIZING AND BUILDING BRAND EQUITY IN FAMILY-OWNED BUSINESSES

In our nation, family-owned businesses make up about 95% of all businesses. And 99% of SMEs are family-owned businesses. Research shows that worldwide, only 20% of family-owned businesses make it to the second generation and 3.4% to the third generation. The majority of Turkish family-owned businesses, which account for about 95% of the Turkish economy, fail to pass to the second and especially the third generation due to structural issues (lack of institutionalization), and those who pass are few in number, and when they do pass to this stage or are in the process of passing to this stage, the companies are often divided, change owners, or disappear (Alayoğlu, 2003). In SMEs, the management strategy and corporate culture of the companies are shaped by the relationships among family members and by family values. With the total quality management approach, company values and culture are replaced by values and a culture of trust, transparency, and delegation.

Planning, decision-making, communication, organizational hierarchy, human resources, systematic infrastructure, and innovative approaches in systems that depend on individuals are management issues that affect family-owned businesses. Family members are untouchable, thus there is a dearth of reliable information for self-improvement. Family firms that practice total quality management accept the discovery and dissemination of staff know-how in order to enhance operations and performance across the board.

From this point, it is crucial to establish structures like “company constitution” and “company council” at the beginning of the process in terms of institutionalization and corporate management approach for family-owned businesses, which play a significant role in the national economy, to adapt to new economies in a changing world and move from the small business class to the large business class. The implementation of strategic plans is enabled in family businesses that acknowledge their weaknesses and work to overcome them by enhancing their strengths through total quality management. Professional leaders who are transparent, set clear directions, and can effectively communicate these things replace the traditional management approach and classical manager approach in organizations.

2.3

A COMPARISON OF TRADITIONAL MANAGEMENT APPROACH WITH CORPORATE AND INNOVATIVE MANAGEMENT APPROACH IN FAMILY-OWNED BUSINESSES

The answers to “Who controls and manages?” are important.

Sole proprietorships are small-scale businesses that are owned or have a simple capital structure and are run by an entrepreneur or an agency. The original proprietors are in charge of both capital enterprises and conventional family-owned businesses. Family members are also members of the board of directors. The owners of modern multi-owner corporations appoint a general manager, CEO, or proxy to manage the company.

Sole proprietorships and family enterprises are managed traditionally by the owner or other members of the family. However, in modern multi-owner corporations, corporate management is the framework under which supervision is conducted.

Small and medium-sized enterprises (SMEs), which are crucial to the Turkish economy, can boost their brand value and become more effective in both domestic and international markets by using the total quality system as a management system. A robust internal control system is necessary for the preservation of brand value.

Today, in order to secure their long-term growth, SMEs must clearly identify their corporate missions. The business’s purposes, target markets, consumer groups to which its products and services will be offered, as well as which market sector and customer base, are all determined by its mission. Because of this understanding, corporate social responsibility can grow and integrate with business value.

3.

PROBLEMS IN THE INSTITUTIONALIZATION PROCESS IN SMALL AND MEDIUM-SIZED ENTERPRISES

Firms in our geographical region are typically started with an entrepreneurial spirit, and 99 percent of them are still operating as small and medium-sized businesses today.

The entrepreneur who started the company from the standpoint of the boss runs it under the mantra “I founded it, I own it, I manage it.” This approach is a significant barrier to a company’s ability to establish an identity separate from the owner. This issue creates a barrier to the institutionalization of businesses and the sustainability of the brand in terms of the development of brand identity and brand value. Bosses typically hold the position of manager inside the companies they found. In businesses, this understanding leads to a management issue. Companies that are passed down from one generation to the next and/or family-owned businesses have had issues institutionalizing in our country, or have not been institutionalized at all. In short, the management problem is one of the main barriers to institutionalization.

The management understanding affects how the institutionalization process turns out. Every investor wants their company to be managed sustainably, to have a solid financial foundation, and to be able to achieve its objectives. The manager, on the other hand, uses a managerial approach to try to accomplish the investor's aims and objectives. **The control of management risk is the main issue facing SMEs.** The shareholders' or investors' adherence to the decisions made in writing is of high importance. The hierarchy in the organization determines the boundaries of management's authority and establishes the scope of duty. The amount of the management risk is decided by how well the powers and duties assigned in the organizational structure developed by taking into account the field of activity and long-term objectives of the company are used and carried out. **The effectiveness of the execution of management risk and the ratio of measurement and evaluation systems to this effectiveness is an indicator of the enterprise's sustainability when we take into account that delegation of authority is the most crucial element in the institutionalization process.**

It is obvious that the majority of SMEs are family-owned businesses, which poses significant challenges to institutionalization and risk management. Failure to determine duties, authorities, and responsibilities, or even if they are determined, postponement of the needs of the business because of individual practices and pursuit of the interests of the family, maintenance of traditional management approaches, communication problems among family members, unprofessional relations between employees and family members, family members not involving the professional manager or managers in the decision-making process in unusual situations, nepotism, problems in the selection of successors, sensitivity to changes, not acting in accordance with laws and regulations, not receiving expert opinion and support and/or avoiding specialization, assuming that everything is known, and weak leadership approach are the most important problems that family businesses face in their corporate governance approach and are left without solutions.

Another management issue that arises during the institutionalization of SMEs is how business owners view professional managers, the system, and other people. Taking action without adhering to the strategic plan, which is the management's roadmap, is a sign of a lack of professionalism in the process of implementation. Adherence to long-standing practices; inability to adapt to change and a resulting unwillingness to break the routine; avoidance of change; persistent excuses; giving preference to people trained from the cradle rather than working with expert professional staff; as a result of the strategy of working with known and trusted individuals, inability to staff employees who have the competence to support the growth of the business and the implementation of awareness; the owner and/or family members hiring people from their close circle without assessing their competencies and abilities; ignoring the balance of income/expenses in expenditures; not taking into consideration the expenditures of family members; and the lack of harmonious management and operational coordination make it impossible to realize the company's strategy.

One of the most important factors in the development and sustainability of SMEs is decision-making process. In order for the company to realize its targeted growth and profitability and to maintain its current position, it is important to adopt the right management approach in the decision-making process. It is important how indicators in marketing, finance, technology, and R&D/innovation are evaluated. When management makes decisions based on short-term data and using solely its own opinions, experience, and knowledge, strategic planning is not implemented at the desired level. Mismanagement approaches in this process may lead to cause great damage to institutionalization and corporate identity as well.

The organizational structure, or what we might refer to as the systematic structure, is the foundation of the institutionalization process in SMEs. The organizational structure of the company, which is in line with its mission and vision values, makes clear and establishes the company's sphere of activity, purpose, and short, medium, and long-term goals. Only by appropriately regulating authority and responsibilities can the organizational structure's establishment of job and task definitions be made sure. Regulations

for operation, execution, and audit are also created based on work duties and job descriptions. The issue of structuring in the development and use of the organizational chart is brought up by the fact that companies continue to use traditional management understanding in management approaches. The most fundamental issues with the corporate management approach include the lack of written job definitions, hiring people who are familiar and close to the management instead of employing staff in line with the job description, focusing on close supervision, conducting checks individually rather than systematically, and high labor turnover.

Management of human resources is a business's engine. It is accomplished by comprehending how to organize the departments' abilities and competencies inside the organizational structure in line with business management, and how to manage them using a performance management system. SME owners assign tasks rather than delegating to experts, assuming that everyone is capable of performing every task, ignoring professional and personal growth in training and development activities, and refusing to accept that standards and hierarchy are accepted as issues with the corporate management approach.

The management of relationships and communication is one of the most significant issues in the institutionalization of businesses. Because they are social beings, people interact with each other. The outcome of communication management in businesses is the social approach of the employee, his/her performance at work, and compliance of his/her communication approach within the team and outside the organization with the rules and procedures. Among the crucial elements that adversely affect business performance are the manager's or employee's disregard for the organizational hierarchy, failure to accept standards, compliance with written and verbal communication rules, lack of feedback, failure to approach problems with a solution-oriented approach, and magnifying them, attributing errors away from the core of the business, and seeking solutions by attributing them to specific people.

The main issue hindering the growth of SMEs is their difficulty in managing their finances and obtaining funding. Costs rise as a result of fluctuations in the economy and shifting prices from one day to the next. Price increases and reduced profit margins are caused by rising business expenses. To compete in turbulent markets and maintain the turnover/profit balance, SMEs need an effective financial management and reporting system. A barrier to institutionalization can be evident in SMEs' absence or lack of long-term financial resources. The effective utilization of personnel costs, which make up a sizable portion of operational costs, will be made possible through effective performance management methods inside the organization and management systems.

Insufficient capital, a traditional understanding of goods and services, a lack of qualified staff, a lack of interest in innovation, and a failure to give R&D the appropriate priority and time all undermine SMEs' competitive power and prevent them from reaching their full potential. By incorporating the R&D department into its organizational structures and allocating resources for its growth, business management can achieve the innovation perspective to the extent that it is coupled and integrated with its management strategy. The development of businesses can be secured by developing procedures that are determined within total quality requirements and sustainable in the corporate management approach.

3.1.

R&D TECHNICAL COMPETENCIES AND SHORTCOMINGS

Research and development (R&D) is defined as "all creative work carried out on a systematic basis to increase the body of knowledge consisting of human, cultural, and social knowledge and to use this body of knowledge to design new applications and consists of three main headings: basic research, applied research, and experimental development," as stated in the classic Frascati Guidelines (OECD, 2002). The most crucial aspect that will set R&D organizations apart from their competitors and make them stand out in the market is the expansion of R&D departments' talents and skills, as well

as the improvement of their existing technical capabilities. Companies can effectively carry out in R&D activities and efficiently continue them only if they can transform their current capabilities into valuable, up-to-date, and unique capabilities and products.

One of the most crucial instruments for manufacturing SMEs to manufacture high value-added and high-tech goods is R&D activity. The following are some of the challenges that Turkish SMEs face in implementing sustainable R&D initiatives and fostering a corporate R&D culture:

- A corporate management approach and a vision for R&D
- R&D and technology roadmap
- R&D organization, competencies, and infrastructure
- R&D financing

The challenges in R&D management are briefly set out below.

3.1.1.

R&D VISION AND CORPORATE MANAGEMENT STRATEGY

An SME's top management determines whether or not to engage in R&D operations. An SME without R&D in its founding vision funds R&D activities as an expense. R&D is a cost center. Because of this, SMEs in Türkiye, particularly those in conventional sectors, view conducting R&D projects as an endless process and a financial burden until the customer demands it, or, to put it another way, unless there is a high likelihood of direct sales.

Small and medium-sized enterprises (SMEs), which we refer to as technology developers in Türkiye, are born with the mission and challenge of R&D at the establishment stage of the business and are aware that they can only live with R&D.

The senior management's vision and management approach directly influence an SME's capacity to carry out R&D activities on a regular basis and establish an R&D culture. Strategic goals for R&D and innovation are not very widespread in the strategic management plans of Turkish SMEs, according to analysis. The senior management's strategic stance on this problem has a direct association with the development of an R&D culture in SMEs. Otherwise, R&D operations in SMEs are a time and cost drain.

3.1.2.

R&D AND TECHNOLOGY ROADMAP

In Türkiye, SMEs account for 35.7% of commercial sector R&D expenditures, compared to 11% in Germany, 16.8% in the United States, 23.1% in South Korea, and 6.5% in Japan, according to the "Science, Technology and Innovation 2013 Report." These data show that Turkish SMEs account for a sizable portion of the country's total R&D expenditures and are a major source of the country's exports, production, and R&D. Numerous strategic studies created in Türkiye (such as the 11th Development Plan) outlined essential goals like raising the proportion of SMEs working as technology developers and increasing funding for SMEs' R&D and innovation efforts. The capacity to develop better R&D strategies and roadmaps allows the launch of products that will carry the company into the future much more easily in corporate companies that have implemented strategic corporate management. The adoption of strategic corporate management models by senior management and the board of directors' resolution to develop and follow the R&D roadmap are the two factors that are most important in this situation.

A company that has attained a particular level of power in its industry and ecosystem should carefully plan its R&D and technology roadmap by analyzing the local and global trajectory of the industry. The

technology components that the industry will require in the future, as well as the questions of how, when, and with whom these products and technologies will be introduced into the company, should be addressed in a timetable and roadmap as part of the technology acquisition plan. All necessary inputs should also be created. Not only the company, but also the subcontractors and suppliers that the company works with should be aligned, planned, and developed in line with this purpose in the R&D/innovation technical roadmap created. To ensure complete integration, supplier development teams and systems should also be formed. University-industry collaborations should receive special attention within the context of strategic R&D management, and academic outputs (patents, articles, etc.) should be taken into account as a measure of the company's status and success.

3.1.3.

R&D ORGANIZATION, COMPETENCIES, AND INFRASTRUCTURE

The most significant issues with R&D management come from managers' inability to give up traditional managerial techniques, their inability to use technological resources in an integrated way, and their inability to properly coordinate the collaborative activities of employees with various skill sets, despite the fact that the technically highly competent workforce requires a different and innovative management technique (Fidanboy & Sargut, 2021).

"An essential topic is, "What should the internal organizational structure of R&D departments look like?," and McKinsey & Company, a global consulting business, offers the following response: "There is no one right method to organize R&D. However, a set of fundamental organizational principles can give R&D businesses the flexibility they need to outperform their rivals" (Küchler, Hidma, and Sandström, 2020). The following three organizational diagrams for R&D departments have been suggested by McKinsey & Company.

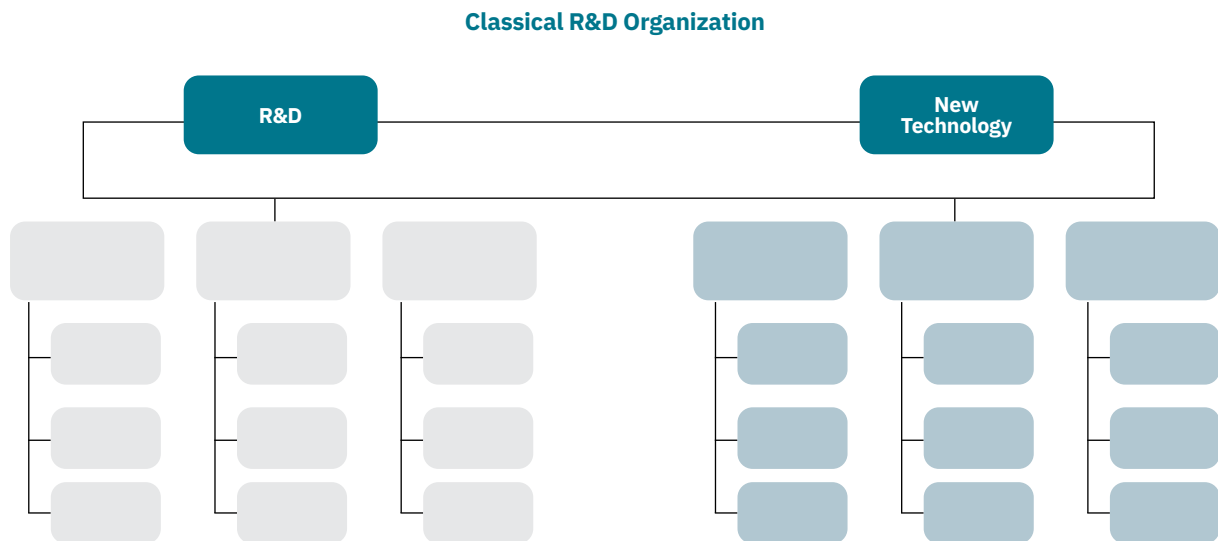


Figure 34: Classical R&D Organization Chart (Hidma, Küchler, & Sandström, 2020)

Organization Where the New Is Separated

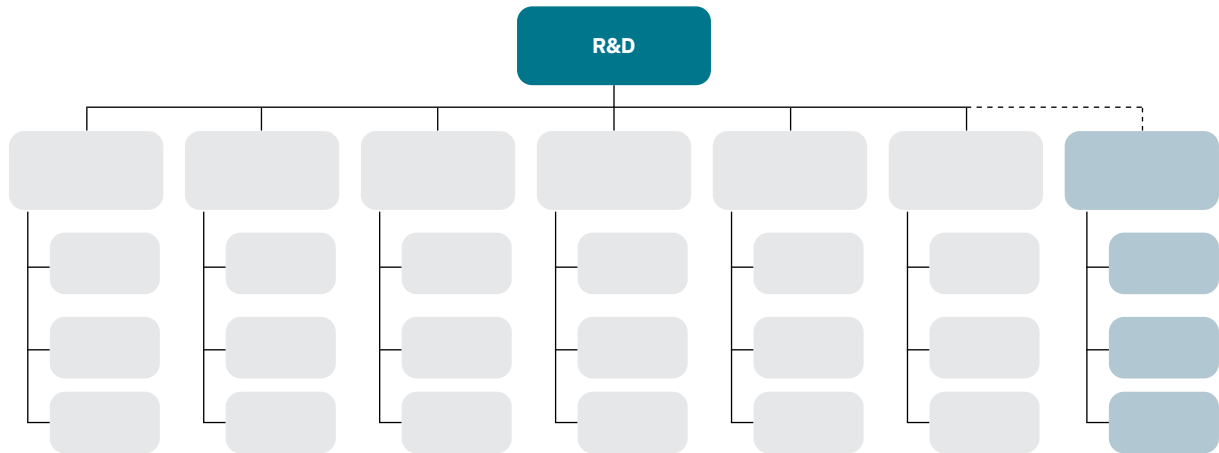


Figure 35: Discrete R&D Organization Chart (Hidma, K  chler, & Sandstr  m, 2020)

Old and New Combined Organization

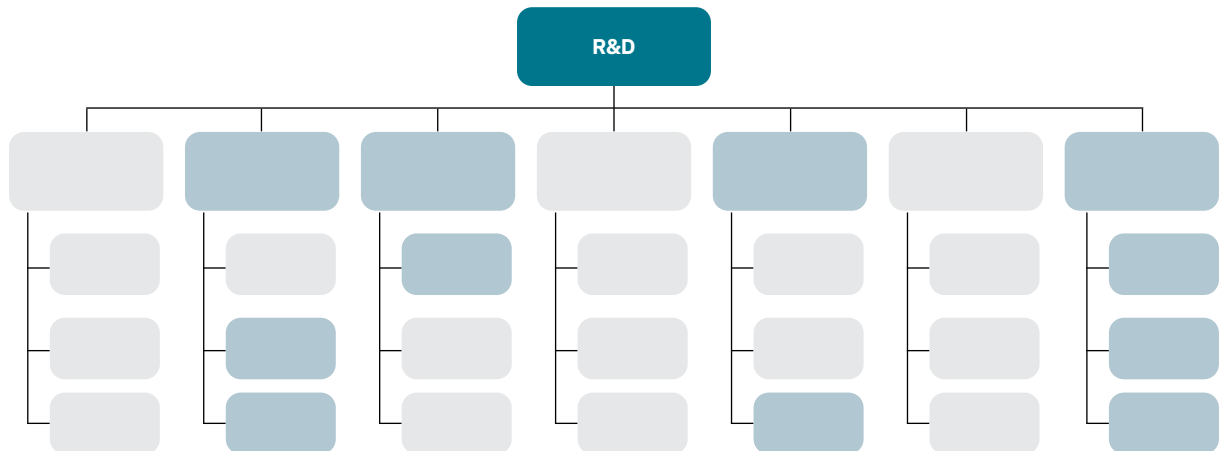


Figure 36: Combined (Hybrid) R&D Organization Chart (Hidma, K  chler, & Sandstr  m, 2020)

McKinsey’s research makes it evident that recommending a single organizational chart for businesses is not always an easy task. This choice is based on the company’s size, sector, and global market objectives. However, according to a study from 2006 (Schwartz, 2006), R&D organizational structures should change based on personnel turnover and headcount (Figure 36). It has become imperative for businesses to transform their R&D organizations into their most crucial divisions in order to keep up with the rapidly changing technology, industry, and customer demands.

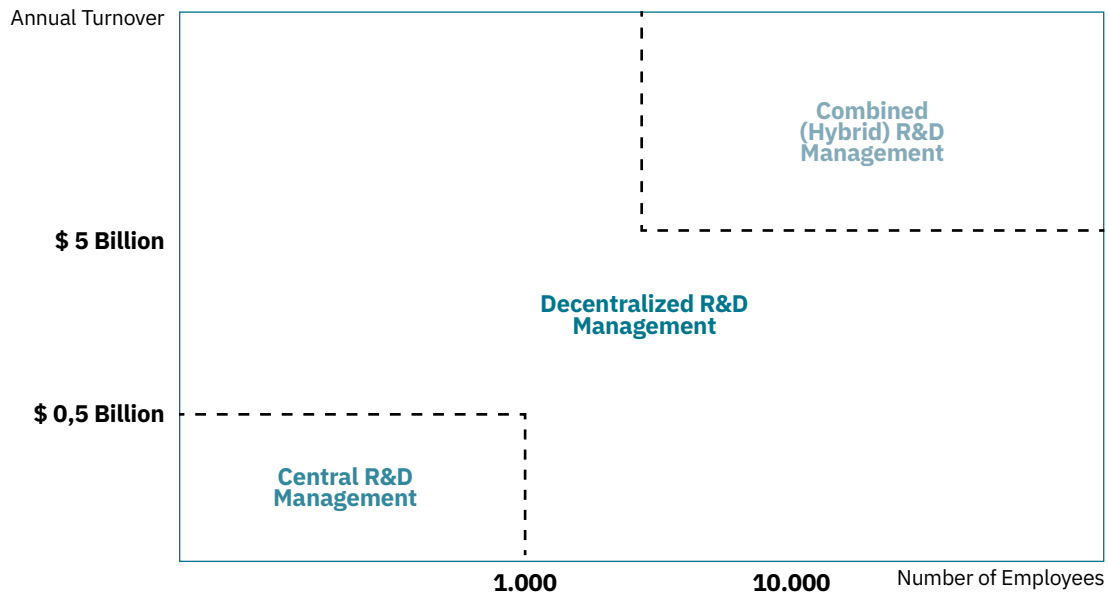


Figure 37: R&D Organizational Structure and Company's Turnover-Number of Employees Relationship (Schwartz, 2006)

Only through improved corporate culture and communication, interdepartmental total quality management implemented in corporate culture, development of the vision and technical skills of human resources working in R&D departments, and optimization of business processes within the department will R&D departments be able to deliver the expected performance that will reflect on the company's competitiveness and brand value.

Products and technologies must be developed in R&D centers in line with business plans, with the involvement and decision-making of other departments including sales, marketing, and production. With an infrastructure that supports and encourages creative ideas and thinking, such a management culture of innovation is feasible. All departments should be involved in and contribute to comprehensive quality management, which should be used to evaluate the commercialization success of R&D products.

Businesses need to be aware that they must first classify these components correctly before thinking about cost performance, quality, and productivity elements because the R&D values anticipated to be created and the performance values produced by the employees will be ensured by the correct management of the internal information by the technology used (Örnek & Arslan, 2019).

3.1.4. R&D FINANCING

The availability of R&D financing is one of the most crucial elements for SMEs to make their R&D efforts sustainable. Although it is a cost center for all businesses, the R&D division creates tomorrow's products. While it may not produce short-term and immediate commercial money like production and sales, it does produce effective effects over the course of a medium to long term. The future revenue-generating goods of companies are designed and prototyped after they are technically and commercially successful. Sadly, there is always a chance that their efforts will be unsuccessful.

The issue of financing R&D and loans is one of the main issues SMEs in Türkiye confront. It is extremely challenging for SMEs to fund significant R&D expenditures when they are already having issues with their primary businesses. R&D incentives in Türkiye are currently a lifeline for SMEs. One of the countries in

the world offering the biggest incentives for R&D activity is Türkiye. Small and medium-sized businesses (SMEs) are eligible to apply for project-based incentives from organizations like TUBITAK, KOSGEB, the Ministry of Industry and Technology, and TTGV, and receive financial support for an average of 75% of their R&D project expenditures. Reading the methods of the incentive-granting institutions correctly and being aware of their aims are the keys to maximizing the benefits of these incentives. In order to achieve sustainable finance by making applications continuous, SMEs must develop incentive roadmaps in place of one-time project applications. These incentives should be viewed as a mechanism to finance a percentage of continuing R&D expenses rather than as a one-time access to substantial funds. These incentives should be arranged as auxiliary financing rather than primary financing because the great majority of incentives are provided through progress payment management. SMEs that engage in these activities can fund at least 50% of their ongoing R&D costs with the correct strategy and planning. With mechanisms in place for more than 20 years, Türkiye has an established framework for encouraging SME R&D. The way that R&D is seen and how it is conducted needs to change. Even the Chinese development model has changed, moving away from the one it had created for many years as part of a strategy and has become the super economic power it is today. It has changed from imitation to innovation.

3.1.5. DESIGNING A NEW PRODUCT IN R&D

Regarding opportunity cost for businesses and avoiding resource waste (capital, time, labor, etc.), it is crucial to decide which goods will be developed and worked on in the R&D departments of companies and which items will move from the prototype stage to mass production. We observe all over the world how quickly institutionalized businesses are developing in this area and how successful they are at bringing the right products to market that will boost their profitability. These businesses have developed company development strategies that have been determined, adopted, and followed step by step by the senior management. As was already mentioned, R&D is a cost center. Here, we have a better foundation around which to develop our sentence: **When done with the incorrect product and approach, R&D is a cost, but when done with the appropriate product and method, it is the most crucial investment component that promotes businesses in the market and boosts their profitability.** So what is the correct product, correct R&D approach, and correct systemic for our companies? Let's take a closer look at this.

Humanity has undergone significant scientific change over the past 300 years, and this change has reached a point where Industry 5.0, robotics, and artificial intelligence are dominant. It is unacceptable for departments like R&D, which were established to design the products of the future and increase the intellectual capital accumulation of companies, to not be impacted by this change and not to try to keep up with this change in this new era where information and communication technologies feed off of each other. Knowledge is to the information society today what financial capital was to the industrial society in the last century. The only distinction is that while in the industrial society power was acquired through capital accumulation, in the knowledge society power is acquired through information sharing. The information society cannot be viewed as a reality created just by information technologies due to its multidimensionality in existence. Information and communication technologies are just the means in information societies, where knowledge is the end purpose (Yeşilorman & Koç, 2014).

Today, the capability of businesses to precisely predict the goods they will generate in their R&D activities, either with government support or with equity money, is a crucial issue that cannot be left to the tasks and responsibilities of a single department. The focus of this essay is institutionalization, total quality management, and innovation management, which may be intelligently articulated on top of all these to provide the correct response to the question, "How will our future product range be shaped?" Current market growth and the future of their businesses can be predicted by organizations that are able to handle knowledge, expertise, diverse perspectives, and creativity both inside and outside the company.

Identifying an issue (product) that will benefit society and receive a response from customers, as well as being able to articulate this problem in its simplest form, are essential for any business, regardless of size. The customer-oriented design approach is the name given to this viewpoint in the literature (Akdemir, 2017).

Particularly in the last 50 years, the accelerated development of new product development methodologies and tools based on information technologies in R&D centers has increased expectations from R&D departments and pressure from businesses that must adapt to shifting customer expectations from the local market to the global market to diversify and accelerate new product development processes.

The answer was found in digitalization, which R&D departments had to adapt and optimize in order to satisfy this demand for their internal organizational structures and product development processes. We can now plainly see that businesses that benefit from agile project management and 3D digital data management, which enable them to plan projects, gather digital data, and provide goods and services to customers using relevant data, may accelerate their growth and profitability rates.

Companies have begun working and restructuring to incorporate technologies such as big data analytics, computer-aided analysis, machine learning, and artificial intelligence into products and services by R&D departments as a result of market and market changes, such as customer-oriented diversification of products and services and digital transformations in marketing and sales. Digital data management is now the key to product management and design across all industries. Companies that thought it was adequate to create and develop products exclusively using CAD (Computer Aided Design) environments 25 years ago today had to adopt new technologies in a far more challenging competitive climate. Both the significance of R&D departments and the pressure on them to provide technologically advanced items quickly have increased as a result of this. Companies increasingly expect from R&D managers and departments products and services that can quickly adapt to the market, are highly technologically advanced, and can outperform the competition. It has become crucial for businesses to take digital twin and digital analysis concepts into account when developing and producing components rather than simply using CAD. The software, automotive, aerospace, and white goods industries all employ the V-model-based design process today. The formation of a common design environment that allows general communication, data analysis, and system verifications between development teams is the main advantage of this model (Sarı, Bulat, Tunçer, & Üçler, 2020).

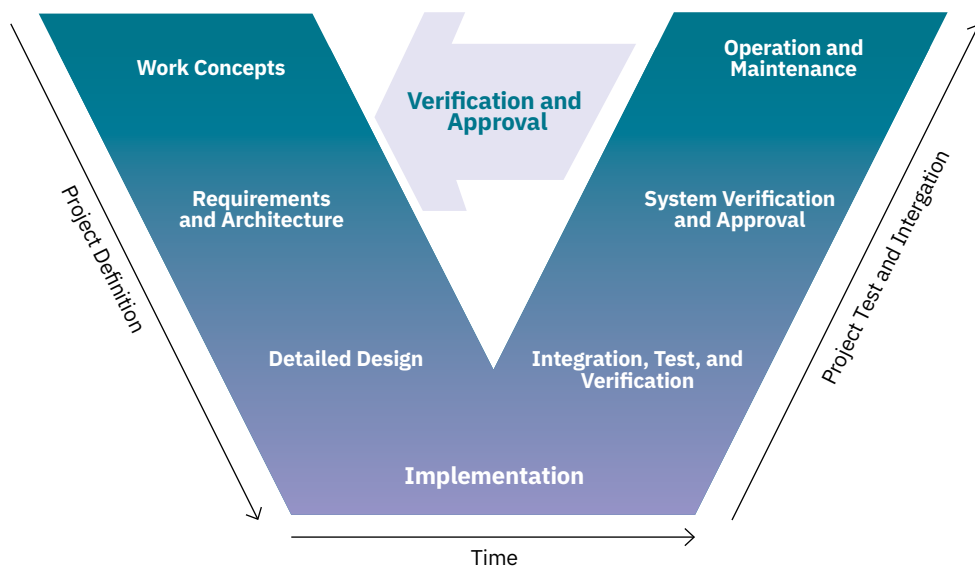


Figure 38: V-Model-Based Design Process (Sarı, Bulat, Tunçer, & Üçler, 2020)

Since they have progressed by verifying the data obtained in 3D digital data management with prototype tests, giant global companies that have internalized and used the V model-based design process for many years have reached the best stage. They have also become clearly aware of the engineering error margins between digital (computer environment) and test environments (real environment). They have begun to decide to close test centers in order to gradually eliminate operational costs by carrying out these procedures in a totally digital environment where they can experience a percentage of error. In line with the idea of a learning company, they have developed detailed written processes for engineering activities, including 3D digital data management and made sure that the data is also manageable and sustainable.

4. CONCLUSION

The main component that helps Türkiye's SMEs, which account for a significant portion of the country's economy, to achieve their objectives of growth, branding, and profitability sustainability is institutionalization.

Institutionalization is a dynamic idea that must be shaped in line with the unique DNA of each company. The idea that SMEs should entirely resemble and imitate major corporations should not be applied to institutionalization. Every business, whether it is a start-up or a medium-scale enterprise, has the potential to have internal operations and organizational structures that will help it grow quickly in the market and institutionalize itself. This particular structure will naturally shift and adapt to meet new needs as the business grows and changes. This is where the magical dynamism of institutionalization lies.

In order to secure their performance with certain methods and practices, businesses can organize their organizational structures by developing a corporate culture and embracing a corporate image, independent of their sector of activity. Institutionalization benefits the company's brand value at the top and the harmony and agility among all business units at the bottom (total quality management). No department (marketing, finance, purchasing, etc.) in an organization that has not finished the institutionalization process can operate sustainably. Of course, the R&D department, which will define the company's future, will likewise benefit from this and continue to fall short of sector and customer expectations for innovation.

Only with effective innovation management and a good R&D organizational structure is a sustainable new product design strategy possible. This results naturally from institutionalization.

Businesses can derive the necessary value from R&D efforts by developing a strategic plan that is decided upon and consistently supported by the company's senior management. The expected value and R&D sustainability cannot be realized even when businesses that do not include R&D in their corporate strategy engage in R&D activities. Instead, these operations follow a structure that is illogical and drifting. Because of this, SMEs must incorporate technological roadmaps and R&D strategies into their corporate strategies. Businesses that successfully complete R&D projects and guarantee their longevity have institutionalized themselves to a certain degree, according to observations. As a result, the level of institutionalization of the company directly affects the development of a sustainable R&D strategy that may help companies construct their futures as well as the transformation of this strategy into an R&D culture.

In the current era, it has been established through knowledge and experience that businesses that

can best and swiftly adapt digitization to institutionalization and business processes have emerged as industry leaders.

Family-owned businesses that operate as SMEs, have a track record of success, and are justifiably proud of this should begin the institutionalization and digitalization processes as soon as possible and should give change management, which can be seen as the first step of institutionalization within the company, more serious consideration. This is a crucial issue for our country's future as well as the future of families, businesses, and other organizations.

CHAPTER

12

PRODUCT MANAGEMENT IN FINANCIAL TECHNOLOGIES



HALUK ALTUNEL

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1. INTRODUCTION

1.1. WHAT IS FINANCE?

Despite the fact that there are numerous definitions and viewpoints about finance, we frequently come across general definitions like the application of economics ideas to the use of money (Fabozzi & Drake, 2009) or value and its determination (Irons, 2019). In this article, the provision of the resources people or organizations need and the usage of the surplus resources they hold will be considered as the value of the resources held by those people or organizations.

1.2. FINANCE FROM PAST TO PRESENT

Despite what many people think, finance is not simply about money. Value is quantified by money. Resources and value are the main focus of finance. Prior to the invention of money, people created exchange and barter systems to get the resources they required. This process, which is still used today, is also known as the barter system (De Miramon, 1982). With this method, needs are addressed by exchanging what is required by both parties. People have learned to value what they have and what they need in situations where bargaining is insufficient or cannot satisfy needs. The Lydian King Alyattes, who governed Anatolia in the 7th century BC, issued money that helped to create the modern financial system, especially with the rise in trade (BBC, 2011). The first banknotes had no paper value and were created in China in the 7th century BC, before the invention of coins, which were made of precious metals like gold and silver. When modern banking first emerged in Florence in the 13th century, more people had access to financial instruments (Davies, 2010). In 1407, Banco di San Giorgio, often regarded as the first bank, began conducting business. Governments formally entered the financial system by establishing central banks to control financial transactions as the number of banks increased. Sveriges Riksbank, the first central bank, was founded in Sweden, a different country in the world, in 1668. In September 1955, the ERMA (Electronic Recording Machine, Accounting) system introduced financial transactions, which would later become widely used (Fischer & McKenney, 1993). The beginning of financial technologies can be dated to 1955. Financial institutions began to transition to the digital world in tandem with the rise in computing power in the ensuing years. With only one touch on the keyboard, transactions that once required hours or even days of human work could now be completed. This revolutionized the entire field of finance. The invention of the Internet made it possible for financial transactions to take place in digital settings all the way to the final customer. Sumitomo Bank in Japan launched the first financial service through the Internet in January 1997. (Wikipedia, 2021). With the increasing usage of mobile phones in the years that followed, telephone access to financial transactions started. Mobile financial applications spread quickly in 2007 after the release of smartphones. Many financial transactions can now be completed swiftly and safely online utilizing a mobile device.

The first formal banking steps in our country were taken in the 19th century. In 1840, Abdülmecit issued the Kaime, commonly referred to as the first banknote, which is a type of treasury bill (Önal, 2019). With the founding of the Republic, the financial system was strengthened and developed with an emphasis on economic independence.

Financial services offered in the digital environment were adjusted without falling behind their international counterparts. Innovations were quickly embraced by sizable client populations. Along with the transition to a digital environment, various technologies began to find extensive applications in the financial sector, and the idea of financial technology began to permeate our lives.

1.3.

WHAT ARE FINANCIAL TECHNOLOGIES?

Financial services are now available online and can be sold as digital products thanks to the quick development of information and communication technologies. The term “fintech” has entered our culture as a result of the fusion of finance and technology. Fintech can be described as the practice of providing or utilizing financial services while utilizing new technologies. A global fintech ecosystem with numerous large and small enterprises has begun to take shape, particularly with the acceleration of communication infrastructures and the widespread use of software technology. By utilizing the opportunities provided by the fintech industry, organizations like traditional banks, insurance companies, capital market institutions, leasing, factoring, portfolio management, etc. have also undergone digital transformation, transformed their operations, and begun to offer a wide range of products and services to their customers in the digital environment. One of the key drives behind technology adaption is the traditional finance sector’s own requirements and internal competition. Another is the merchandise offered by technology-based businesses, which compete with conventional financial institutions and seek to address financial demands in novel ways. The development of new information and communication technologies is accelerating and diversifying these two key drives. Blockchain technology, the Bitcoin concept, and the redefinition of value are three of the best instances of this, and they were first discussed in a 2008 paper (Nakamoto, 2008). The old notions of worth and money as a measure of this value evolved toward an alternative model during the following years under the influence of people who embraced and invested in this idea, and the concept of cryptoassets entered our daily lives. The entire cost of this new model was estimated to reach around \$3 trillion in November 2021 (Brown, 2021). In addition to its many other applications, blockchain technology has cleared the way for the concept of decentralized finance (DeFi), demonstrating its potential to create alternatives to the established financial system.

2.

PRODUCT MANAGEMENT IN FINANCIAL TECHNOLOGIES

Three main aspects can be used to analyze product management in financial technologies. These are business field, technology, and experience. We will have a closer look at each of these aspects.

2.1.

BUSINESS FIELD

In the fintech world, satisfying a financial need is a must for all products. A solid understanding of financial products is required to identify which consumer group has which financial requirement. Different financial products may exist in different continents, nations, cities, and sectors. For instance, a region that relies heavily on agriculture will have financial needs that are focused on funding agriculture.

Agriculture's lifecycle is projected in the financial cycle. The investment period is when it is time to plant since seeds and diesel fuel need to be purchased. This is when farmers need financial resources. They will wish to use credit products to finance their investments during this time. They will need money once more during the transitional seasons to purchase fertilizers and pesticides. Money is more plentiful during harvest seasons, making investment items more alluring. The resources and savings needed by industrial facilities will have a varied lifecycle in a city that has undergone industrialization. The tourism industry and the service industry each have their own cycles. There are countless examples, but the key is understanding the relevant industry's lifecycle and being able to build the appropriate fintech products that are its financial counterpart. Below is a description of the primary fintech product business fields.

2.1.1.

PAYMENT PRODUCTS

It is one of the markets for fintech products that is expanding the quickest globally, driven by the explosive growth of digital wallets that make payments easier. This is best exemplified by Amazon Go stores, which provide a cashier-free shopping experience. Payment methods that do not need waiting in line at the register or pulling out a credit card are quickly gaining popularity.

2.1.2.

MONEY TRANSFER PRODUCTS

The demand for fintech products that make it quick, simple, and affordable for customers to move money amongst each other is global. Products that enable quick and inexpensive money transfers within the country as well as between countries are used here, particularly by immigrants from other countries.

2.1.3.

LOAN PRODUCTS

Particularly, fintech products that provide alternatives to personal loans and can make them available extremely fast are gaining popularity. Products that provide immediate access to the credit needed for purchases are very well-liked. Fintech products that offer the Buy Now Pay Later (BNPL) model have also entered our lives as an extension of these.

2.1.4.

INVESTMENT AND TRADING PRODUCTS

There are more and more products that enable the trading of different investment instruments and monitoring of investment performance, allowing for the most efficient use of savings. Access to investment instruments, including various precious metals, commodities, stocks, foreign exchange, bonds, and bills is attainable with the help of the products in this category.

2.1.5.

PERSONAL FINANCIAL ASSISTANT PRODUCTS

There are assistant products that generate tailored recommendations by doing customized analyses based on consumers' savings and spending patterns. These products are now essential for customers who want to use historical data to analyze future investments or savings decisions. More precise and specialized products will soon be a part of our life, particularly with the advancement of data analysis and machine learning abilities.

2.1.6.

DIGITAL BANK PRODUCTS

This group of products includes those that operate exclusively on smartphones, do not have physical branches, and offer the fundamental services that you would expect from a bank. It is anticipated that it will have a real bank in the background because it comprises banking services. The API (Application Programming Interface) provided by existing banks as a front-end provider can also be used to create digital bank products. Banks may also create their own digital banking products if they so choose. The regulation in this area became effective in our nation on January 1, 2022. (Resmi Gazete, 2021b).

2.1.7.

REGULATION TECHNOLOGY PRODUCTS

It can be categorized as a group of fintech product business areas that are centered on technologies that make it possible to deliver regulatory obligations efficiently and effectively. The British FCA (Financial Conduct Authority) was the first to define it (Butler & O-Biren, 2019). This category includes, for instance, tools for regulatory/regulatory gap analysis in banking supervision, regulatory monitoring, identity verification, management information, transaction reporting, regulatory reporting, and risk management.

2.1.8.

INSURANCE TECHNOLOGY PRODUCTS

Products in this category make advantage of technological advancements to improve the efficiency and reduce costs of the current insurance industry paradigm. A wide number of business sectors are covered by insurance. Insurance kinds are also a necessity of business life in addition to products like life, private pension, health, traffic, car, earthquake, home, and travel insurance. These several insurance categories each represent a distinct business segment where fintech products might be positioned.

There are additional goods that can be employed in the fintech industry in addition to these ones. For example, digital onboarding (DO), customer relationship management (CRM), chatbots, data analytics, robotic process automation (RPA), and enterprise resource planning (ERP). These products can be modified to address a financial issue and turn into fintech products.

Products in the fintech industry can be either business-to-business or business-to-consumer (B2C and B2B respectively). Important issues include technical goods for financial institutions' business demands as well as those between financial institutions and corporations. The first stage in positioning the fintech product that will be the solution is to understand the business needs under these topics. Technology use is the most vital instrument for meeting business field needs.

2.2.

TECHNOLOGY

If you are going to develop a technology product, you need to be aware of the technologies involved, as well as which ones are developing quickly and how they are applied to products. In the realm of fintech, this is also accurate. While the fundamentals of financial transactions have not changed much, technological advancements have brought to the forefront goods that make a difference through improved speed, accessibility, quality, and efficiency. Recently emerging fields with a broad impact on financial goods include mobile technology, data science, blockchain, and cloud technologies.

Due to the growing usage of smartphones, mobile technology is now a must for financial goods. Since 2007, financial products that were first introduced to the internet environment in 1997 have also been available on mobile devices, where they have gained popularity over web-based applications. Smartphone usage is rising in fintech goods, which is mostly due to the quick development of communication infrastructures. This development has been significantly aided by 4G, which after 3G significantly improved the communication speed of mobile devices. Mobile devices may connect at a speed of 10 Gbps while lowering the latency to under 1 ms thanks to 5G technologies, which have begun to be deployed in a number of nations around the world as of 2019. Work on 6G, which promises ten times as much speed as 5G, is moving forward at full tilt (Slalmi et al., 2021).

Advanced data analytics and artificial intelligence have begun to contribute to fintech solutions as a result of developments in data science and the expanding usage of machine learning. The first steps in the process of extracting intelligence from data include gathering, organizing, processing, associating, making predictions, and comprehending comparable models. By examining historical data, it is possible to learn about what occurred, the kind of behaviors end users display and potential future developments. In recent years, products that generate extremely accurate forecasts based on streaming real-time data draw clients and provide quick fixes by identifying immediate needs (Dinmohammadi, 2021).

Blockchain technology is also altering how finance is viewed. As an alternative investment instrument, crypto assets first gained attention. Decentralized finance (DeFi) became a concept with the introduction of smart contracts to the scene. Smart contracts, which start operating automatically when conditions are satisfied and cannot be altered later, are taking the place of contracts and the laws that support them. In this sense, the ability to carry out financial transactions on a digital plane without boundaries and restrictions strengthens the concept of decentralized finance (Chohan, 2021).

Financial items are now being delivered as a service using the XaaS (Anything as a Service) concept, thanks to cloud technologies. This improves the quality of the products provided while lowering the cost of ownership, operation, and maintenance for end users of fintech solutions. Positioning things on the cloud and delivering them simultaneously to customers in various locations across the world are becoming more and more appealing. Around the world, a lot of cloud service providers give various ways to draw fintech goods to their settings. This is how ideas like the financial cloud have gotten into our world.

In a number of nations throughout the world, 5G technology use began in 2019, accelerating the communication infrastructure up to 10 times quicker and lowering latency to less than 1 ms (Hong et al., 2021). Fintech products will have a wider range of applications thanks to 5G and 6G, and these technologies will also open up new opportunities for them to improve user experiences.

2.3. EXPERIENCE

Like any product, experience is one of the most important components of fintech products and is just as important to the product's success as the other two factors. The experience can be thought of as the result of numerous touchpoints, not just when using the device, as Forbes explains (Kurtic, 2021). Due to this, it would be ideal to view the financial product experience as the entire end-to-end process that the consumer goes through. Each experience a consumer has with a product -including the experience of first discovering it, the experience of buying it, the experience of using it, the experience of finding a solution to a problem, and the experience of saying goodbye to the product- is crucial. Any one of the experience steps can have issues, which can cause an excellent fintech product to fail.

When developing a fintech product's user experience, the customer journey map is frequently employed. It demonstrates the relationship between the customer's story and the product. In addition to identifying

the customer's most significant encounters with the financial product, the customer journey map also displays the customer's feelings, motives, and issues. It is beneficial to think even more specifically while creating the customer journey map by imagining and naming the customer as a character. Include the character's life cycle, the issue that develops at this stage, the points at which the product that will remedy the issue is encountered, their thoughts and feelings at the time, and any possibilities.

At the idea stage, the experience that the product will offer to its users should be carefully analyzed, and the factors that will matter should be identified. This should not be restricted to a single point in time, but should also take into account the product's development, customer interactions, expansion through the addition of new features, and how the business sector, technology, and user experience will be shaped and best utilized over the course of the entire product lifecycle.

3.

PRODUCT LIFECYCLE IN FINANCIAL TECHNOLOGIES

Products have lifecycles, much like live beings. Products are also born, grow up, and then expire. The term “product lifecycle” refers to this process (Vernon, 1966). Figure 39 depicts a summary of this lifecycle. The lifecycle of the product is determined by the demand for it.

Determining the product strategy, creating a roadmap to realize this strategy, developing the first version of the product in line with the topics in the roadmap, focusing on the features that will make it loved by customers, and improving the product by considering the competition are all necessary steps in order for the product to have a healthy lifecycle.

The financial ecosystem, and consequently the fintech products that are a part of this ecosystem, should be compliant with the laws of the nations and regions in which they are located, or the laws of the world in general. This is another crucial concern. In addition to all of these, data-driven management based on the information gathered about the product should also be taken into account. We will examine each of these subjects in further detail.

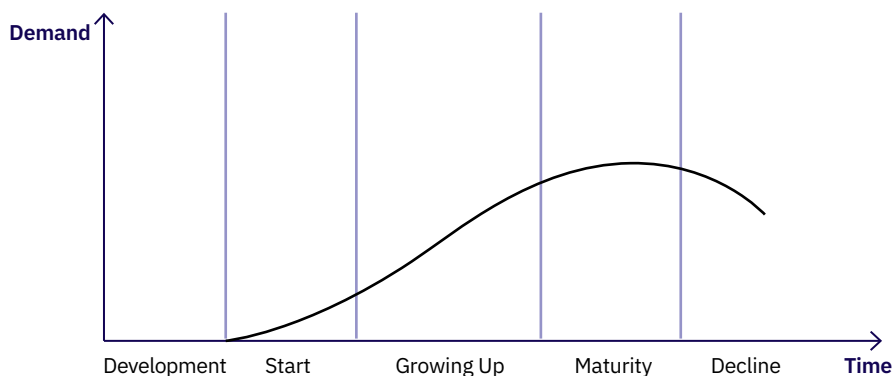


Figure 39: Product Lifecycle

3.1. PRODUCT STRATEGY

An idea develops into the final product. To satisfy the customer, this concept needs to be improved. Here, it is important to fully comprehend the customer requirement that gave rise to the product idea. This approach, which is applicable to fintech products, calls for a clear definition of the product value proposition.

A product value proposition should ideally be stated in a single sentence. If a longer description is required, it should be re-written.

In the fintech world, a value proposition must be simple, understandable, and clear. A vision and mission statement for any product should match its value proposition. This explains the goal the product is trying to accomplish. A product roadmap should be made to carry out the strategy that will be used to get there when it has been decided upon.

3.2. PRODUCT ROADMAP

A product's direction, priorities, and progress are all outlined in this shared high-level strategy. It is an action plan that focuses on the product's short-, medium-, and long-term goals and how they will be attained (Davies, 2022). The product lifecycle should be reflected in the roadmap for fintech products. In order to stand out from the competition and boost consumer satisfaction, a new product must concentrate on its most important aspects while it is still in the development stage. A product roadmap can be produced manually. On the other hand, it can be made using a variety of software tools. The ability to execute the product roadmap while simultaneously updating it is crucial. This may be done by carefully observing the market and customer lifecycles.

3.3. NEW PRODUCT DEVELOPMENT

There are 5 areas to concentrate on initially for a fintech product that is in the idea stage and where the first draft of the roadmap has just been created: These areas are listed below:

- **Product's Scope:** According to the product strategy, the appropriate scope must be chosen, and the product roadmap must be adjusted. In the fintech industry, durable, easily scalable, user-friendly products that concentrate on a single, obvious need are replacing integrated, complicated, large-scale products that strive to address all types of financial needs. Keeping this in mind, one should concentrate on the appropriate scope.
- **Planning and Design:** Because this is a fresh start, it is important to decide how the fintech product roadmap will be realized and which initiatives will be launched in order to achieve it. This calls for careful planning. It is essential to concentrate on the product's technical and user experience design at the same time. The new product's design choices will have an impact throughout the duration of its life. Later changes will be expensive to make.

- **Prototyping:** Developing a new fintech product with all of its features takes time. Therefore, a prototype must be created. It will be sufficient to produce a visual representation of the product, such as by sketching the screens and user flow, in order to create a prototype. If the fintech product also needs hardware, a real-world illustration of this will help. When a consumer views a prototype, they will understand more about the product than they could through numerous publications or presentations.
- **Customers:** It should be clear which customer groups and requirements the product will meet. The product's target market must be precisely the emphasis. This calls for thorough analysis of the market, customer, their needs, and the competitors. The customer with a financial need must be attracted to the product's value proposition. The likelihood of success will be increased by showing the prototyped product to potential customers and soliciting their feedback. This will make it easier to determine whether the customer's expectations are met and how well the value offer is received by them. The product strategy and roadmap can be updated using the lessons learned.
- **Risks and Opportunities:** Excitement and motivation are typically high when developing a new product. On the other side, people are unaware of a lot of risks. Risk management techniques should be used to identify risks and develop reaction strategies because risks are not always obvious at first (Power, 2004). Likewise, there are also untapped opportunities. There may be several opportunities, particularly when introducing the product prototype to the consumer. These could include using the product in various business sectors or using it for various purposes with minor modifications. After careful consideration, the ones that will benefit the product and create value should be chosen and incorporated to the product roadmap.

In addition to the five main headings mentioned above, the first version of fintech products is built by focusing on technical and design-focused sub-topics. A project or projects could start in the meantime. Tests should be carefully planned in new product projects that develop the initial iteration of financial products, even though the project management methodology is essentially the same. To lower the risk of error, the testing should be thorough and include scenarios that customers would face in real life. In this manner, the initial perception of the financial product will be favorable.

Agile software development is frequently used to successfully manage pace and cost while concentrating on work that adds value when creating new fintech products (Agile Alliance, 2022). Large-scale products commonly use a variety of agile techniques, including Scrum, extreme programming, Kanban, Feature-Driven Development (FDD), Scaled Agile Framework (SAFe), and Large-Scale Scrum (LeSS) (Altunel, 2015). Regardless of methodology, the success of the project and the product will increase when agile methods are used in the creation of new financial products to align production with the product lifecycle (Altunel, 2017).

3.4. MINIMUM VIABLE PRODUCT

The minimal viable product is the initial iteration of the product that is customer-ready (MVP). However, just as in many other industries, it is crucial that the first financial product is adored and embraced by potential customers. Meeting the fundamental requirements of the customer should come first for a product that people would adore. Therefore, the most fundamental requirement for a digital wallet product is that its fundamental features be prepared and functional. For a fintech product to suit the needs of the client, two areas need to be prioritized, which are as follows:

- **Distinguishing Feature:** In addition to the fundamental qualities that competitor products also offer, it is vital to add an extra feature for the customer to enjoy in order to satisfy their

needs. This could be a benefit in terms of price, speed, or usability. The customer must have an actual reason to like the product. The likelihood of the product succeeding increases with the quality of this reason's selection.

- **Go-to-Market Strategy:** This should be viewed as a component of the overall strategy, running in a largely parallel fashion to the product concept, and its specifics should be worked out in conjunction with the product's development. The phases in this strategy must be put into practice once the bare minimum viable product is in place. The target market, the marketplace, the price, and the promotion should be identified for this purpose (Kotler et al., 1990). The launch should be organized and the target audience's attention attracted prior to the launch in order to make them aware of the product.

3.5.

COMPETITION AND PRODUCT IMPROVEMENTS

The competitive nature of the financial ecosystem stems from its age and maturity. The ecosystem's fintech products also develop in a competitive context. In order to satisfy customers, businesses must be at least as excellent as their competitors in terms of quality. The product must be continuously monitored and improved in order to survive the competition. Product improvement projects are carried out, and the needs of the evolving product and the product's lifecycle are monitored in order to improve it. Figure 40 provides a summary of this process. The following themes should be emphasized in order for these projects to achieve the intended impact and elevate the final product above the competition:

- **Market and Customer Lifecycle:** It is important to acknowledge that customer expectations change over time and that the market has dynamics just like the product. The most pressing need today might not exist tomorrow. Both internal and external factors can shape market dynamics. For instance, the Covid-19 pandemic, which began in December 2019, spread widely (WHO, 2019). As of March 2020, when the first case was discovered in our country, individuals withdrew into their homes out of social isolation. Shopping habits have rapidly evolved as a natural result, and consumers have turned to online retailers. Fintech goods utilized in electronic trade that are focused on payments and borrowing have also been in high demand.
- **New Functions:** A list of new capabilities that should be included in the product must be made, and this list must be tracked as a product backlog. The high-level headings in the product work list should be linked to the items in the product backlog. Versioning should be used when preparing the product, and the functions that will be included in each version should be prepared. The importance of a function's added value to the customer should be given top priority when choosing new functions, and functions with high added value and low cost should be given preference.
- **Prioritization:** The product backlog should have priority levels assigned to each of the functions, and these levels should be reviewed on a regular basis. It should be understood that priorities may change quickly in fintech products that will operate in a competitive environment in line with market and customer lifecycles.
- **Change Management:** In order to manage change, which is unavoidable for fintech products, efficiently, trends in business, technology, and experience should be regularly watched. New functionalities that will improve the product and provide value should also be developed with the appropriate priority. On the other hand, versioning should be carefully planned and used to advance changes in change management that affect both the product itself and the entire end-to-end experience.

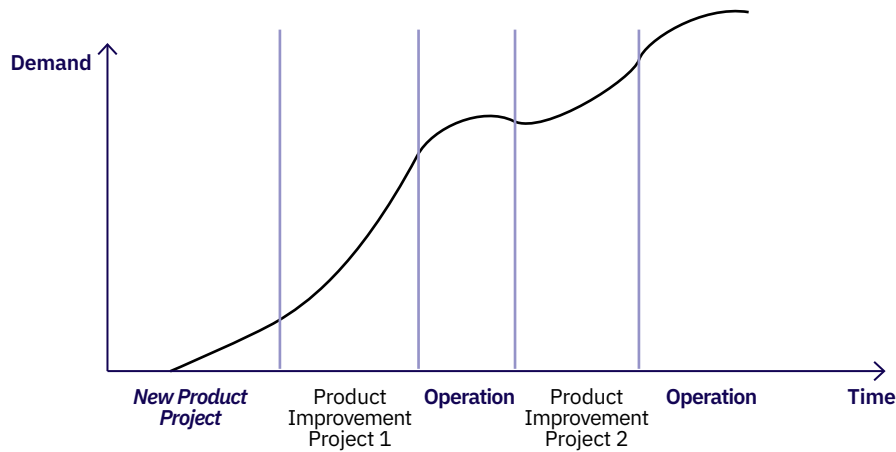


Figure 40: Product Improvement Projects and Product Lifecycle

3.6. COMPLIANCE AND REGULATIONS

Fintech products may have previously considered themselves as outside the financial industry, but today, complete compliance with the laws of the country where the product is based is one of the most important requirements for a fintech product to be accepted by the customer base. A fintech product will not be able to live if it is not in compliance with the regulations. Regulations may apply to the entire country, a specific region, or the entire world, such as the European Union. For instance, all members of the European Union must carefully abide by the General Data Protection Regulation (GDPR), which went into effect in 2018. This includes businesses operating in the fintech industry (GDPR, 2022). To safeguard the fundamental liberties and rights of persons based on the right to privacy, Türkiye's Personal Data Protection Authority and the Law on the Protection of Personal Data (LPPD), which came into effect in 2016, set forth the rules for the processing and sharing of personal data (KVKK, 2022). Taking the appropriate measures in the areas of cyber security, data security, user privacy, anti-money laundering, capital markets and trading, and intellectual property rights, in addition to the requirements relevant to the business sector of fintech products, will prevent potential risks (Primeaux, 2017).

The usage of open-source software in the creation of fintech goods and the incidence of license-related risks while creating commercial products are key additional issues. While adopting open source software (OSS) to develop financial products has advantages in terms of speed and cost, some of the numerous license models it offers may prevent commercial use. Potential compliance risks will be eliminated by thoroughly examining them and utilizing the appropriate license models in fintech products (Open Source Initiative, 2022).

3.7. DATA-DRIVEN PRODUCT MANAGEMENT

Fintech products generate and consume data, just like any other products. Analyzing and utilizing this data is necessary for product management. This management approach is based on evidence-based management, which can be used in a variety of areas in addition to product management (Buck et al., 2021). It is feasible to combine data into metrics, create meaningful indicators from those metrics, and then utilize those indications to analyze data, comprehend trends, and make future predictions. It is

important to concentrate on the product's technical health indicators, customer interaction indicators, and the connections between these two. The crucial indicators are provided below, though one can also utilize other indicators.

- **Availability:** It is the ratio of the time the product is available to the total time. It is calculated by deducting the periods the product cannot be used. This ratio is anticipated to be high for fintech products, such as 99% and higher.
- **Traffic:** Usage information produced by numerous customers utilizing a single product or a single function. Applications that are web- or cloud-based are closely watched for it. The activation of additional capacity is dependent on traffic volume. Traffic data can be tracked in total as well as customer-oriented and session-based. It is possible to track a customer's average session length and frequency of logins.
- **Bounce Rate:** It measures the frequency with which users access a single product page and then leave without taking any further action. If this rate is high or increasing, it is important to look into the issue and come up with a remedy.
- **NPS (Net Promoter Score):** Customer recommendation information is gathered in surveys that focus on specific products with just one question. It has a value between +100 and -100 and is calculated as the difference between those who are likely to recommend and those who will not. Above 70 is typically regarded as being very good. At the start of 2022, this score was 44 in the financial services and goods sector (Gocheva, 2021).
- **Customer Acquisition Cost (CAC):** It is the average per-customer acquisition cost. Costs for marketing and sales are included. The price of product development is not included.
- **Client Retention Rate (CRR):** The proportion of your customers you still have after a certain amount of time. The ideal percentage for products is 100%, however, it is typically lower. This rate is relatively high in the fintech industry at 78%. (Moengage, 2021).
- **Customer Lifetime Value (CLTV):** It is the amount of money a customer brings in over the course of all their interactions with the product. These changes based on the product's location within the fintech industry and the value it provides to customers.
- **Active User Percentage (AUP):** It is the rate of active customers to total customers. It may be measured on a daily, weekly, monthly, or annual basis. However, consumer interest in fintech goods is growing. Also due to the Covid-19 epidemic, the number of active consumers surged by 337% between January 2020 and August 2021 (VentureBeat, 2022).
- **Recurring Revenue (RR):** It is the recurring income a product will produce as a percentage of overall sales in the future. Annual or monthly subscription-based licensing arrangements are increasingly popular in fintech products instead of perpetual licensing in order to boost recurring revenue. These models all share the goal of reaching customers at more appealing rates by lowering the price of the product and increasing its recurring revenue.

4.

FUTURE OF PRODUCTS IN FINANCIAL TECHNOLOGIES

Every day, people's lifestyles, needs, and expectations change. The future of fintech products will differ from the present in line with this broad change. We can say that in the future, five key areas will stand out. These are as follows:

- **Ecosystems and Platform Products:** Ecosystems are settings where products interact or complement one another and where consumer demands can be fully met as opposed to partially satisfied. Ecosystems may consist of a sizable main product and supporting products. There are platform business models at work here. The platform business model focuses on making it easier for different players to engage (Rahman & Thelen, 2019). Fintech products that exist independently will have a challenging lifecycle. It will be more and more challenging for them to compete with ecosystem-related items.
- **Open Banking Products:** Open banking links banks with fintech solutions, enabling them to exchange customer data in an easy and secure manner. This rule on data sharing for Turkish payment systems went into effect on December 1, 2021 (Resmi Gazete, 2021a). Customers that use open banking can examine all of their bank accounts, loans, mortgages, and credit cards in one location. Customers will be able to choose the best offers and financial services thanks to this.
- **Invisible Fintech Products:** These are also known as embedded finance or invisible finance. Partially, Bill Gates' 1994 remark that "banking is required, banks are not" is coming to pass. Fintech products will get invisible as financial transactions get simpler. This could even imply that financial services will not always be provided as a standalone fintech offering. They will instead be incorporated into other products' user interfaces. It may even change into Finance as a Service or become a component of another platform product already in existence. A couple of examples of embedded financial products include Apple Card and Facebook Pay.
- **Sustainable Fintech Products:** In the near future, there will be a rise in the number of fintech products that are sustainability-focused or that center on sustainability issues and take this into account in financial transactions. Although the first thing that comes to mind when it comes to sustainability is fintech products focused on climate change and carbon emissions, each of the 17 distinct areas covered by the United Nations Sustainable Development Goals is significant and has the potential to inspire a wide range of fintech products (UN, 2015).
- **Decentralized Finance (DeFi) Products:** The decentralized finance ecosystem, which places smart contracts in place of current financial institutions, and the products that arise there are candidates to revolutionize how finance is regarded. Money can be transferred within this ecosystem without restriction by working hours or distance. This motivates us to forget what we already know about fintech, relearn, and develop entirely new things.

As a result, customers are put at the center and helped with quick, simple, and affordable solutions via fintech products, which are the intersection of finance and technology. Fintech goods change due to evolving technology, shifting consumer needs, and fresh trends. Fintech solutions will be one step closer to success if they are driven by product managers that have a solid grasp of change and a strong command of business, technology, and experience.

CHAPTER

13

CURRENT TRENDS IN THE AIR CONDITIONING AND REFRIGERATION INDUSTRY FROM A PRODUCT PORTFOLIO MANAGEMENT PERSPECTIVE



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Hasan Acül graduated from Yıldız Technical University's Department of Mechanical Engineering in 1999. He completed his master's degree at Gebze Technical University's Department of Science and Technology Strategies. Hasan Acül's areas of expertise are new product development, refrigeration, air conditioning, and software development. Hasan Acül holds International Product Development and Management Association (PDMA) New Product Development Professional (NPDP), TUBITAK/Tüside R&D Specialist, and Regional Environmental Center Corporate Sustainability certificates. The CO2 natural refrigerant cooling system project carried out by Hasan Acül as engineering manager was awarded the Istanbul Chamber of Industry 2010 Sustainable Environmentally Friendly Product First Prize. In addition to this award, Chiller Performance and Energy Efficiency Simulation Software development project won the third prize in the 2014 Air Conditioning Sector Design and Application Competition organized by the Air Conditioning Industry Exporters Association (ISIB.) Hasan Acül still continues his management and engineering duties at İKLİMSOFT, where he is the founder.

1.

INTRODUCTION

Today's business leaders are primarily focused on two comprehensive goals when developing new products. The primary goal is to increase business growth through investment in new products. This calls for increased revenues and profits brought on by a constant stream of new products. The second goal is to strengthen the company's competitiveness both today and in the future through the development of new products (Marvin, 2005, p.46). Modern businesses need new products to succeed in the long run and compete with their competitors. Effective new product development processes have become a top strategic priority for businesses due to the circumstances brought on by rapidly evolving technology, market globalization, rising local and global competitiveness, and similar reasons (Cooper, Edgett & Kleinschmidt, 2001, p.1).

How businesses can manage their research and new product development resources in the most effective and efficient way in line with their goals is the most critical question in the new product development process. Finding a solution to this crucial question and enabling businesses to achieve their corporate goals through the effective use and management of their resources in the new product process are the key goals of product portfolio management (Cooper et al., 2001, p.1).

Product portfolio management and its significance in the new product process are addressed in this study titled Current Trends in the Air Conditioning and Refrigeration Industry from the Perspective of Product Portfolio Management. The study uses the air conditioning and refrigeration industry as an example industry, and current industrial trends that are believed to aid businesses in developing technology and product roadmaps during the portfolio planning process are provided in an effort to make the topic more concrete.

2.

PRODUCT PORTFOLIO MANAGEMENT AND ITS IMPORTANCE IN THE NEW PRODUCT PROCESS

Referring to the totality of all investment or financial assets, including stocks, bonds, real estate, mutual funds, and other securities frequently used in the financial sector, the term "portfolio" (Benson, 2021, p. 1) has been adopted as "product portfolio" in the literature on product development. A product portfolio is the collection of goods and services that a business sells, seen in its broadest sense (Tolonen, Shahmarichatghieh, Harkonen, & Haapasalo, 2015, p.468).

Portfolio depth and breadth are the two main characteristics used to characterize the product portfolio. Portfolio depth refers to the number of product types grouped inside a product line, whereas portfolio breadth refers to the number of primary product lines in a company's product range. A class of products with slight deviations from a typical type or norm is known as a product range. In this context, product types are variations of the same product that businesses create to appeal to customers with various needs. The strategic and tactical approach is taken into consideration while developing a product portfolio in order to define the breadth and depth of the portfolio. The strategic approach deals with product portfolio breadth through activities such as increasing the number of main product groups in

the product range, diversification, removing one of the existing lines, etc., whereas the tactical approach is related to portfolio depth through activities, such as expanding, differentiating, and removing the product variety within the main product groups (Riesenera, Döllea, Schuha, Laufa, & Janka, 2019, p.726).

Product portfolio management is defined as a dynamic decision-making process in which ongoing new product (and development) initiatives are regularly updated and revised to guarantee that businesses get the most out of their product portfolios. New projects are evaluated, chosen, and prioritized in this process, while current projects can be sped up, canceled, reprioritized, and resource allocation reevaluated (Cooper, Edgett & Kleinschmidt, 1999, p.335).

Studies on innovation, new product development, and project management have addressed the problem of how to allocate resources to new product projects since the 1960s (Archer & Ghasemzadeh, 1999, p.207; Weissenberger-Eibl & Teufel, 2011, p.51). Product portfolio management helps managers allocate limited resources to project concepts that are believed to generate the best return, use them effectively, and create priorities in order to enable business strategy, optimize resources, reduce risks, and accelerate time to market (Jacobs & Swink, 2011, p.677). In other words, product portfolio management is about completing the proper projects rather than effective project management, interdisciplinary teams, the voice of the consumer, etc (Cooper, Edgett & Kleinschmidt, 2002, p.331).

The concept of the product (lifecycle) management is frequently used in connection with product portfolio management in the literature. Although product portfolio management and product management are essential components of an effective new product process, they have different primary objectives. Product portfolio management is more broadly connected to managing a portfolio of numerous products, resources, risks, investments, and budgets. Product management, on the other hand, is related to the process that encompasses all operations from the launch of a product through its removal from the market (Grischenko, 2016, p.1).

Product portfolio managers are responsible for managing the businesses' product portfolios. Product portfolio managers have a more strategic role than product managers. The success of multiple products from various departments within the company, their contribution to company goals, ensuring that the product portfolio is well aligned with the organizational strategy, allocating resources to the right projects in the most efficient way, and managing processes are all the responsibilities of product portfolio managers, whereas product managers are only in charge of one specific product (Product Plan, 2022, p.1).

Portfolio management is a management technique that enables businesses to institutionalize and enhance the selection of new product development projects and assure their alignment with corporate strategy, according to The Aberdeen Group's 2006 Product Portfolio Management Benchmarking Report (Aberdeen Group, 2006, p.13). Portfolio planning, when properly implemented, enables businesses to concentrate their efforts on the items that will provide the greatest value while reducing the risk and uncertainty involved in the introduction of new products.

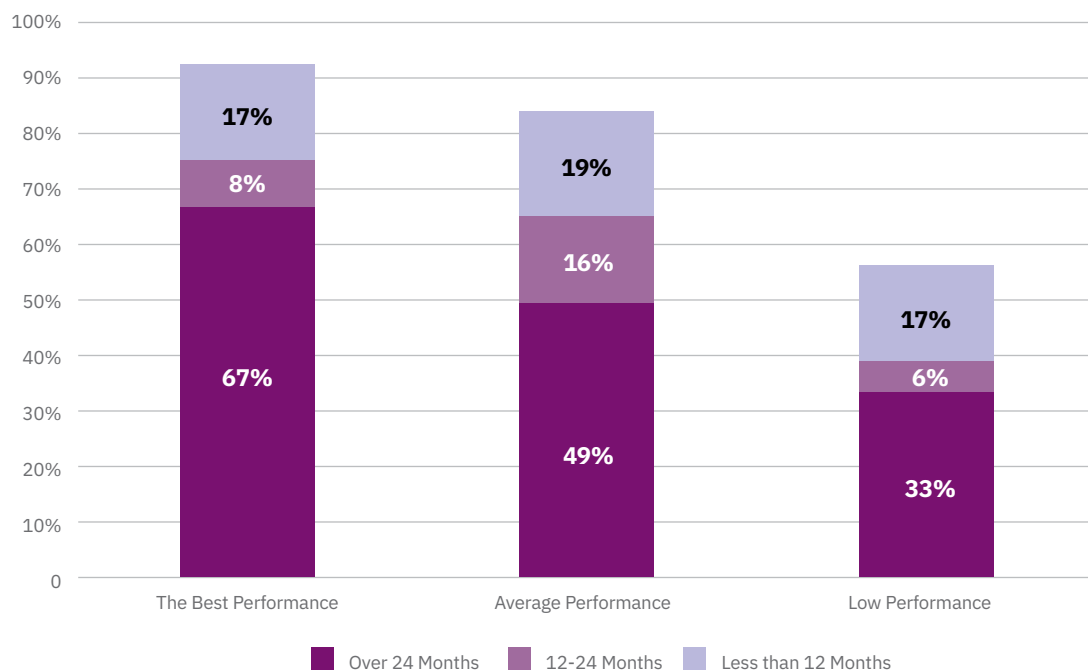


Figure 41: Product Portfolio Management Implementation Time Comparison Graph (AberdeenGroup, 2006, p.13)

According to the Product Portfolio Management Benchmarking Report, high-performing companies have been using portfolio management for longer and are more likely to have standardized portfolio management procedures and portfolio management techniques than low-performing companies (see Figure 41).

Portfolio management is crucial for businesses for the following reasons, per the findings of Cooper et al's study dated 1998 on Best R&D Portfolio Management Practices (Cooper, Edgett & Kleinschmidt, 2002, p.333):

- Maximizing return on investment and attaining financial goals;
- Increasing the efficiency of product development;
- Maintaining the competitive position of the business;
- Increase sales and market share;
- Allocating scarce resources appropriately and efficiently;
- Establishing the link between project selection and organizational strategy;
- Focusing on projects with high returns rather than a large number of low-return projects with limited resources;
- Better managing priorities within the organization, both vertically and horizontally;
- Ensuring balance between projects, objectivity in project selection, and eliminate inappropriate projects.

Best Practices in Product Innovation, a 2003 study by Cooper, Edgett, and Kleinschmidt, concluded that companies with effective and methodical product portfolio management have better new product development success (Cooper & Edgett, 2006, p.12). According to the findings of this study, high-performing businesses have more product projects in their portfolios that will add significant value to their operations, apply the project evaluation and prioritization process more frequently, have a more balanced portfolio structure, better manage project resources, and carry out systematic portfolio management and project selection processes much more successfully (See Figure 42).

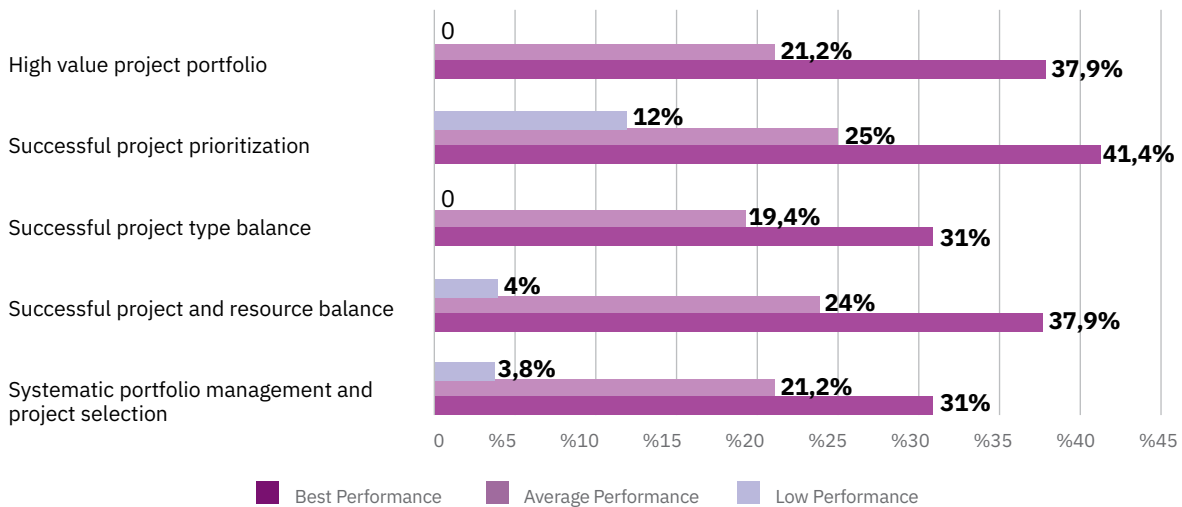


Figure 42: Effect of Product Portfolio Management on New Product Development Performance Graph (Cooper & Edgett, 2006, s.12).

Another topic covered in the literature is the connection between product portfolio management and company strategy. Following their development efforts, businesses will produce a variety of products, and these products' innovation categories are directly tied to the strategies of the company. One of the most crucial prerequisites for a successful product is a clear new product strategy (Cooper, 2001, p.57). The processes leading from product idea to market launch are impacted by the new product strategies that businesses employ to attain their objectives (Cooper & Kleinschmidt, 1986, p.74; Tzokas et al., 2004, p.620). Through new product portfolio management, the new product development process is connected to product strategy. To choose which new product concepts to evaluate and their relative priority, this dynamic decision process considers strategy implementation difficulties (McNally, Durmuşoğlu, Calantone, Harmancioglu, 2009, 127). The relationship between product portfolio management and strategic planning is shown in Figure 43. (Marvin, 2005, p.47).

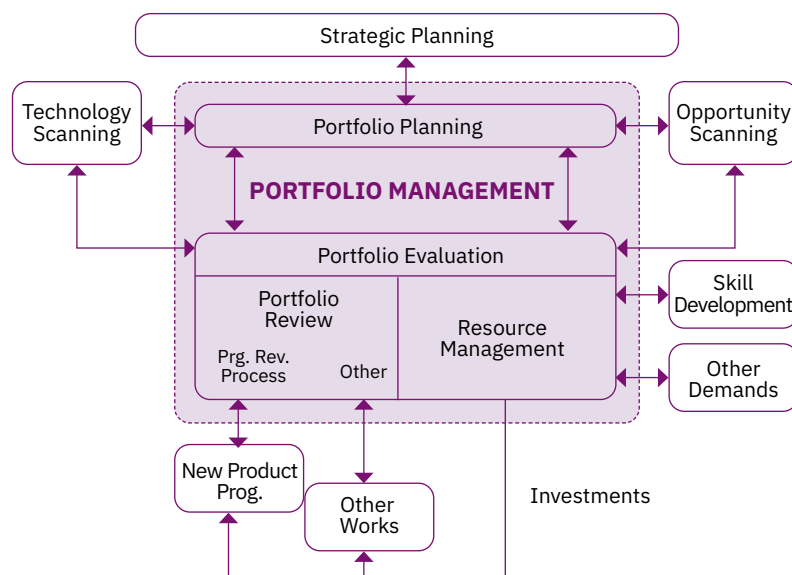


Figure 43: General Framework of the Product Portfolio Management Process (Marvin, 2005, s.47)

Product portfolio management, according to Marvin (2005, p. 57), is supported by organizational functions and activities such as strategic planning, technology monitoring, opportunity monitoring, skill development, and others.

During the **portfolio assessment process**, it is determined whether existing investments in new products and technologies have produced the anticipated return, to what extent the investments have steered the business in the desired strategic direction, and whether the current resources are being utilized as effectively as possible while accounting for shifting market conditions (Marvin, 2005, p.49). Resources allocated to projects for currently available items, priorities, and products that should be added to or withdrawn from the portfolio are assessed during this phase (Sanandres, 2022, p.1).

The assessment process makes use of a variety of analysis techniques. The GE-McKinsey Matrix (see Figure 45), which examines the product portfolio in terms of industrial competition and attractiveness, and the Boston Consulting Group (BCG) Portfolio Matrix (see Figure 44), which assesses the product portfolio in terms of market growth rate and relative market share, are two well-known analysis techniques (Henderson, 1970, p.3; Subhash, 2004, pp.250-259).

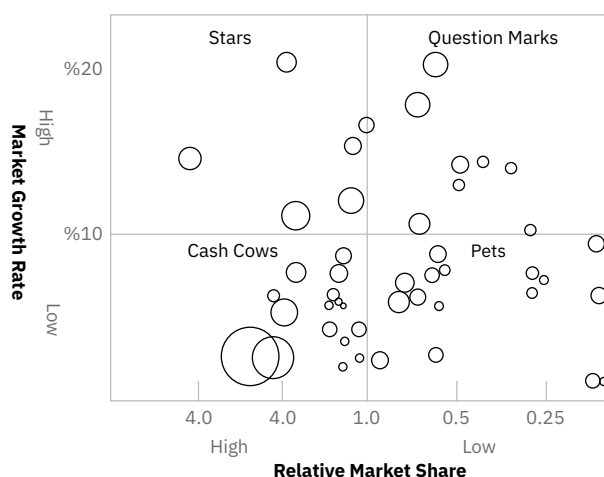


Figure 44: Boston Consulting Group's (BCG) Portfolio Matrix (Subhash, 2004, s.250).
(Note: Circles represent turnover.)

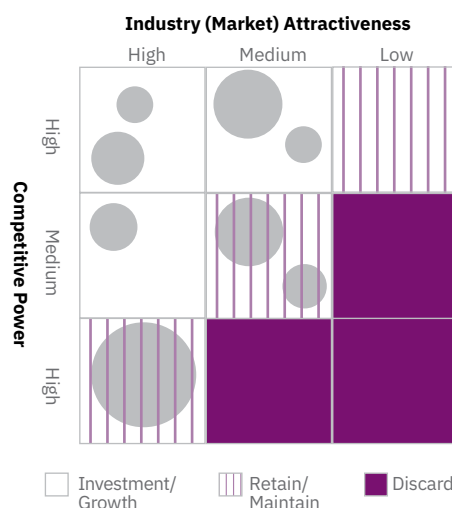


Figure 45: GE-McKinsey's Matrix (Subhash, 2004, s.260).
(Note: Circles represent turnover.)

According to the Boston Consulting Group (BCG) Portfolio Matrix, “star” products are those that have a large market share and rapid growth rates and will lead the company into the future. The development of “question mark” products, which are likely to become star products in the future, is fueled by so-called “cash cows.” Pets are products that have reached the end of their lifespan (Henderson, 1970, p.3).

Utilizing two axes -industrial attractiveness (market attractiveness) and product (business unit) competitiveness- the GE-McKinsey Matrix assesses the product portfolio. There are three levels on each evaluation axis (low, medium, and high). The three top sections of the matrix indicate products and services that should be invested in or expanded, where market attractiveness and competitiveness are high; the three middle sections of the matrix indicate products and services that should be maintained, where market attractiveness and competitiveness are in balance; and the three bottom sections of the matrix indicate products and services that should be divested or disinvested in, where market attractiveness and market attractiveness are low (Subhash, 2004, p. 260).

Market size and growth rate, profit margin, market diversity, steady demand, competitive structure, industrial profitability, inflation vulnerability, value-added, capital intensity, raw material availability, technological role, energy impact, social and environmental impact, legal impact, human resources, and similar factors are used to determine industrial attractiveness (market attractiveness).

Market share, product sales growth rate, product range, sales/distribution efficiency, price competition, advertising and promotion efficiency, facility location and innovation, capacity and productivity, value-added, investment utilization, raw material cost, product quality, R&D, cash position, corporate synergy, company image, and similar factors are used to evaluate a product's (or business unit's) competitiveness.

Depending on how the companies are structured, the **portfolio review process** may be done on a monthly, quarterly, or annual basis. Within the parameters of the techniques employed by businesses in the new product development process, such as stage threshold, etc., it can also occur at various times. The state of product investments matching expectations, the balance between projects, project performances, resource availability, priorities depending on the changing scenario, strategy compatibility, etc. are examined during the portfolio review process (Marvin, 2005, p.50; Cooper et al., 2002, p.333).

Resource management is the efficient allocation and management of internal and external resources, including money, people, technology, time, equipment, hardware, etc. to the appropriate product projects in order to accomplish the goals of the product portfolio. Fundamentally, effective resource management necessitates a thorough comprehension of the workload generated by the current portfolio, the burden that will be generated by upcoming product developments, and the inherent ability to complete the tasks (Pennypacker, 2005, p.39).

Portfolio planning is a process used by organizations to decide which product projects to fund, staff, and prioritize in order to achieve their objectives. It also helps organizations balance their product portfolio. The corporate strategy benefits from portfolio planning and optimization by helping to make wise investment choices, maximize portfolio value, and allocate resources as effectively as possible (Sopheon Partners, 2022, p.1; Marvin, 2005, p.48).

In response to the company's overall business strategy, the process' goal is to develop a strategic plan for new goods and technology. This plan establishes the direction the company will take its future product and technological investments. Roadmaps for upcoming technology, product, and service investments are made throughout this process. The three broad goals of product portfolio management -portfolio maximization, strategic alignment, and portfolio balance- are taken into consideration during the portfolio planning process (Cooper, Edgett & Kleinschmidt, 2001, p.247; Wilyard, 1987, p.14; Marvin, 2005, p.48).

- *Portfolio maximization* aims to maximize portfolio value by allocating resources to the appropriate product projects (McNally et al., 2009, p.130). In terms of long-term profitability, economic value added, return on investment, success probability, and related goals, projects are chosen to maximize the portfolio total. In order to accomplish this, a variety of techniques can be used, including financial models like net present value (NPV), expected commercial value (ECV), return on investment (ROI), productivity index (PI), etc., as well as scoring models that take into account factors like strategic fit, product advantage, market attractiveness, strengthening of core competencies, technical viability, return versus risk, etc (Cooper et al, 2001, p.29).
- *Strategic alignment's* goal is to translate company strategy into efficient and targeted new product investments. By investing in new goods and services, the company should transform its operations from their current situation to one that will be strategically advantageous

(McNally et al., 2009, p.127). Providing strategic direction for the growth of capabilities such as educating the current workforce, hiring new personnel, obtaining new tools, creating new business procedures, boosting production capabilities, establishing new strategic partnerships, etc. is another goal of strategic alignment (Marvin, 2005, p.48).

- *Product portfolio balance* refers to the mix and balance of the products in the portfolio in terms of product innovation levels (high, medium, low), project durations (long, medium, short), risk levels (high, medium, low), return on risks, return on investment, market share, product categories, technologies, and a variety of other factors. The balanced distribution of the items that make up the portfolio in terms of these and comparable criteria should be considered during portfolio design (Eggers, 2012, p.315; Cooper et al, 2001, p.73).

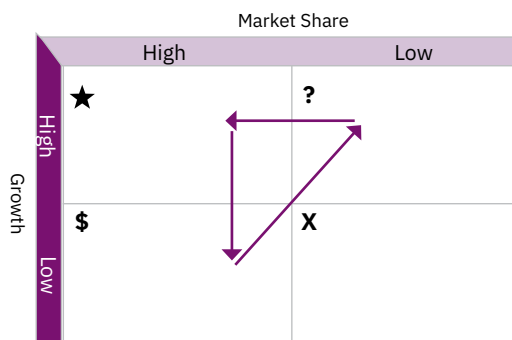


Figure 46: Successful Cash Flow
(Henderson, 1970, s.3)

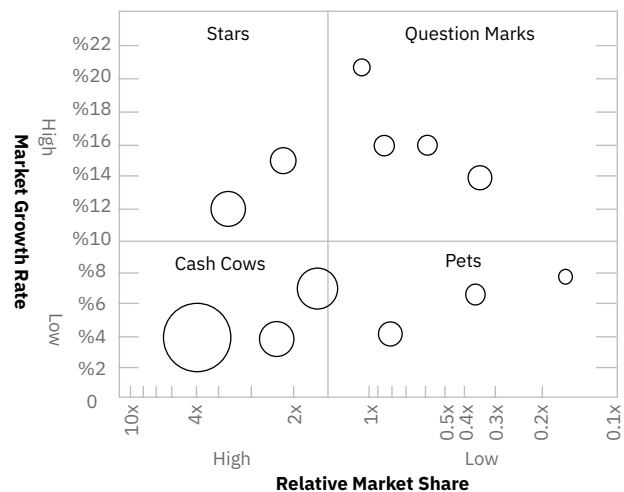


Figure 47: Balanced Product Portfolio Chart
(Subhash, 2004, s.257) (Note: Circles represent turnover.)

As an illustration of the various product project types that should be balanced in a company's portfolio, Figure 48 provides a map of product development projects created by Wheelwright and Clark (1992, p.92). The degree of change in the product and the degree of change in the manufacturing process are the two main classification dimensions. The level of innovation is higher and resource-intensive initiatives are needed the more drastic the shift is in both dimensions. The balance of each project type is essential for the competitiveness of the organization because each has a distinct function to play.

As an illustration of the various product project types that should be balanced in a company's portfolio, Figure 48 provides a map of product development projects created by Wheelwright and Clark (1992, p.92). In this section, the air conditioning and refrigeration industry, which covers air conditioning, refrigeration, heating and ventilation machinery, equipment and systems, is taken as an example and current sectoral information is presented to help companies develop technology and product roadmaps in the portfolio planning process.

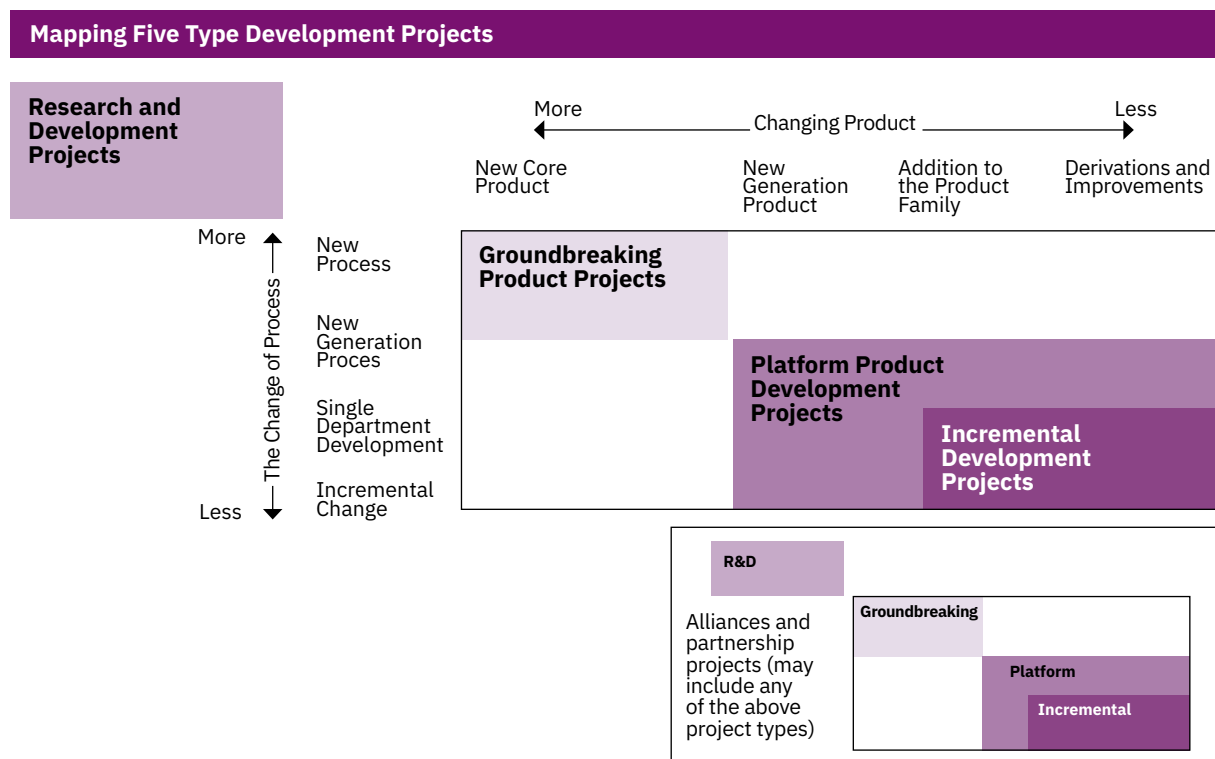


Figure 48: Mapping Different Type Development Projects (Wheelwright & Clark, 1992, p.93)

3. CURRENT TRENDS THAT COMPANIES IN THE AIR CONDITIONING AND REFRIGERATION INDUSTRY SHOULD TAKE INTO ACCOUNT IN PRODUCT PORTFOLIO PLANNING

As an illustration of the various product project types that should be balanced in a company's portfolio, Figure 48 provides a map of product development projects created by Wheelwright and Clark (1992, p.92). In this section, the air conditioning and refrigeration industry, which covers air conditioning, refrigeration, heating and ventilation machinery, equipment and systems, is taken as an example and current sectoral information is presented to help companies develop technology and product roadmaps in the portfolio planning process.

Strategic documents that depict the stages of product development and product roadmaps are crucial tools that offer direction and consistency in the product development process (Münch et al., 2020, p.1). A product roadmap's major objective is to connect the product's vision with the company's commercial goals. The roadmaps outline the overarching goals for the product as well as the management plan. Important details like product vision, strategy, goals, features, requirements, deadlines, and so forth are typically included in product roadmaps (Münch et al., 2020, p. 1; Altexsoft blog, 2022, p. 1).

Technology roadmaps are needs-driven planning techniques for developing new technologies that can be

used to address a variety of product needs. They offer data to pinpoint important technologies and gaps in technology. Teams of specialists frequently come together to compile crucial technology planning data and create a framework for creating technology roadmaps (Garcia & Bray, 1997, p.3-4).

The Member Views Report for the Research Strategic Plan was written and released by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Research Advisory Board in 2009. Companies in the refrigeration and air conditioning industries can utilize the information in the report to create product and technology roadmaps. To examine, review, and reconfigure their product portfolios through product and technology roadmaps, sector companies can use the concerns presented in the research as relevant data and trends.

Through a questionnaire, the opinions of close to 400 industry experts were gathered for the report. The experts were mostly questioned about their projections for the air conditioning and refrigeration sector's next 20 years. The majority of the experts questioned for the report believe that energy, sustainability, and indoor air quality are the three most significant concerns that the air conditioning and refrigeration sector will focus on in the next twenty years. Changes in codes and standards, operation and maintenance, software, control, and training come next after these three crucial challenges (ASHRAE, 2009, p.1). The subtopics for the energy, sustainability, and IAQ issues are in Table 10, and the weights and prioritization of the issues are shown in Figure 49.

Table 10: Energy, Sustainability, and Indoor Air Quality Subtopics (ASHRAE, 2009, pp.7-12)

Energy	Sustainability	Indoor Air Quality
Energy efficiency	Sustainability	Indoor air quality
Energy saving	Climate change	Comfort
Alternative energy/ Green	Environmental issues	Air movement
Energy consumption/	Reducing carbon footprint	Ventilation
Energy cost	Refrigerants	Air cleaning/Hygiene
Energy resources	Efficiency	Filtering
Energy analysis/monitoring	Water saving / Water recovery	Humidity control
Net-zero energy buildings	Recycling	Pollutants

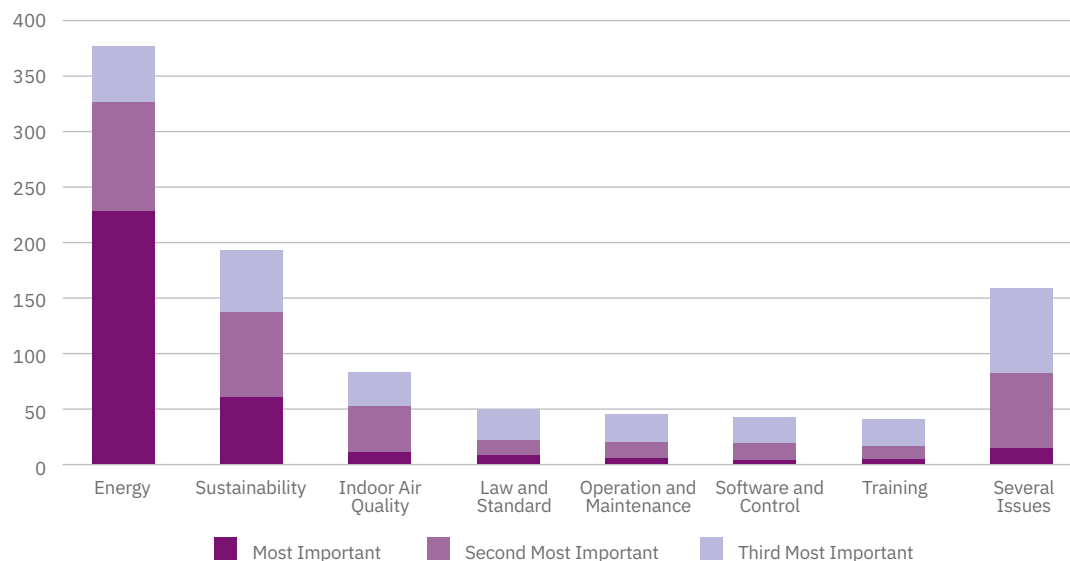


Figure 49: Industry's Most Important Issues in the Next 20 Years (ASHRAE, 2009, p.3) [Note: Y-axis values indicate the weight score of the subjects.]

The primary energy use in residential and commercial buildings in the US in 2014 is shown in Table 11. (DOE, 2015, p.5). 50.8% of all energy is needed for heating, air conditioning, water heating, cooling, and ventilation. For Europe, the scenario is pretty similar. Heating and cooling accounted for 51% of Europe's overall energy demand in 2012. (European Commission, 2006, p.6).

Table 11: US 2014 Residential and Commercial Building Primary Energy Use (DOE, 2015, s.5)

Areas	Energy Use (Quadrillion Btu)	Rate (%)
Heating	8,0	20,8%
Air conditioning	3,84	10,0%
Water heating	3,54	9,2%
Cooling	2,55	6,6%
Ventilation	1,61	4,2%
Industry total	19,54	50,8%
Other	11,58	30,1%
Lighting	4,35	11,3%
Computer and electronics	2,35	6,1%
Drying	0,68	1,8%
Other Industries' Total	18,96	49,2%

The US Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) has established the Building Technologies Office (BTO) with the goal of reducing building-related primary energy consumption by 50% by 2030 compared to consumption in 2010. BTO has a primary energy savings objective of 12% by 2020 and 24% by 2030, particularly for concerns about the air conditioning and refrigeration sector (Goetzler, Guernsey&Young, 2014, p.vii).

The importance of sector companies focusing on products, systems, and technologies with high energy efficiency (efficiency ratios and classes), low consumption, low loss, and energy recovery in their product portfolios becomes clear when the energy perspective in the ASHRAE report, BTO's targets, and energy use data are combined.

Sustainability is listed in the ASHRAE report as the second most important and linked concern after energy. Due to their high energy consumption, air conditioning and cooling systems are crucial for sustainability goals in many facilities. Another crucial component of the decarbonization policy is reducing energy demand for air conditioning and cooling systems (European Commission, 2012, p.7).

One of the key options for increasing sustainability is the use of heating and cooling technologies that make use of renewable energy sources in air conditioning and cooling systems. Examples of environmentally friendly and renewable technologies used in air conditioning and cooling systems include desiccant heating, cooling, and ventilation, evaporative cooling, natural cooling, solar heating and cooling systems, geothermal heating and cooling systems, biomass heating and cooling technologies, heat pumps, and heat recovery systems (Asim et al., 2022, p.2).

In terms of sustainability, it is critical and becoming more prevalent to utilize in air conditioning and cooling systems natural and alternative refrigerants (R717, R744, R290, R600, etc.) that have little or no global warming potential (GWP) and ozone depletion potential (ODP). To combat climate change, numerous countries are establishing legislative frameworks that prohibit or restrict the use of fluorinated greenhouse gases. The most significant legislative regulations in this area are the

Mobile Air Conditioning Systems (MAC) Directive (2006), the Montreal Protocol (2016-Kigali), and the European Union F-gas Regulation (2014). The Montreal Protocol's (2016-Kigali) and European F-gas laws' phase-down program for hydrofluorocarbon (HFC) usage is depicted in Figure 50.

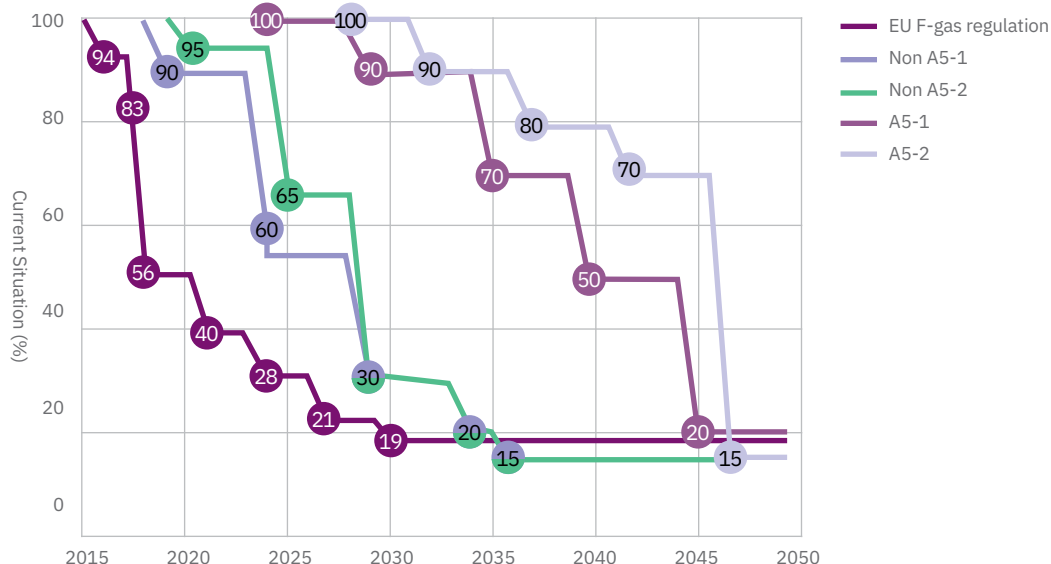


Figure 50: Montreal Protocol (2016-Kigali) and European F-gas Regulations HFC Consumption Reduction Program (Danfoss, 2022, p.5)

Indoor air quality is another significant issue for the industry. Acceptable indoor air quality is characterized by the absence of known pollutants and the lack of complaints from 80% or more of those exposed, according to the ANSI/ASHRAE 62.1 Standard (ANSI/ASHRAE 62.1, 2010, p. 3). The most crucial function in guaranteeing indoor air quality, which takes into account elements like temperature, humidity, airflow, and cleanliness, is played by air conditioning and refrigeration systems. Systems that are inadequately designed or operated have the potential to develop a wide range of microbial contaminations, contain them, and pose a major risk to human health.

Controlling the spread of microbial contamination in air conditioning and refrigeration systems is crucial, considering recent serious pandemics like COVID-19, SARS, MERS, and H7N9 (Asim et al., 2022, p.6). Numerous sectoral organizations that work closely on this issue include ASHRAE, the Federation of European Heating, Ventilation and Air Conditioning Associations (REHVA), the Chartered Institution of Building Services Engineers (CIBSE), EUROVENT, and many others. They direct the industry by developing standards, regulations, certifications, application guides, trainings, etc. In the REHVA COVID-19 Guidance Document, which REHVA published in 2020, one of the topics covered by the system operation to lower the risk of infection during an outbreak is shown in Figure 51.

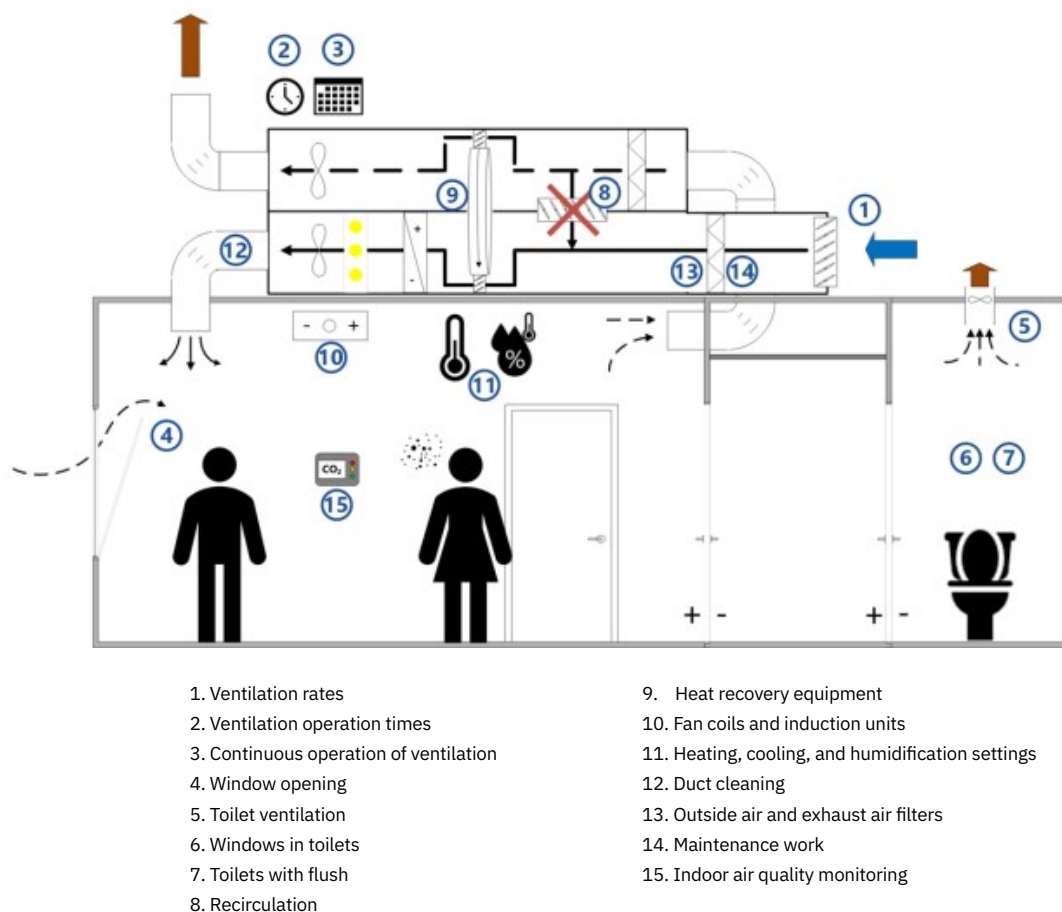


Figure 51: Air Conditioning Systems Indoor Environment COVID-19 Infection Prevention Points (REHVA, 2020, p.8)

Software, BIM (building information modeling), simulation, control devices and systems, sensor technology, internet of things, direct current (DC) powered systems, renewal, alternative materials, low initial investment and operating costs, health, safety, reliability, quality, and durability are additional issues that the air conditioning and refrigeration sector should pay importance to in the future and take into account when planning their product portfolios (Asim et al., 2022, p.2-12; ASHRAE, 2009, p.2-29).

4. CONCLUSION

In this article, the concept of product portfolio management and its significance for businesses are set out through various studies and examples from the literature, and to help concretize and better understand the issue, the air conditioning and refrigeration industry is used as an example. The article includes current technological advances that are believed to aid businesses in their procedures for developing their product portfolios, as well as reports, opinions, and data from top sectoral organizations. In order to compete in the long run, it is obvious that it is crucial for the sector companies to develop a portfolio of goods, systems, and technologies that will address energy, sustainability, new refrigerants, indoor air quality, and other issues described above.

CHAPTER

14

‘REAL’ DEMAND-DRIVEN PRODUCT MANAGEMENT AND GLOBAL INNOVATION IN THE SMALL HOME APPLIANCES SECTOR



DR. MURAT KADAL

Born in 1986 in Istanbul, Murat Kadal received his bachelor's degree in 2009 and master's degree in 2011 from Yıldız Technical University's Mechanical Engineering Department and worked in the R&D department of Arçelik A.Ş. during the same period. In 2011, he led the team that won the "World's Most Energy Efficient Oven" award at the IFA trade fair. Between 2011-2013, Kadal worked as a product development engineer at Ford Otomotiv Sanayi A.Ş. and managed the entire process of the Eu6 exhaust system. He also pursued his doctoral studies within the same period. After serving as a reserve officer in the Coast Guard Black Sea Region Command for one year, he worked as a manager at Eksen Makine for 4.5 years. During the same period, he participated in international standardization meetings and received an award from Mustafa Varank, our Minister of Industry and Technology, on October 17, 2018. He is currently working as Supply Chain and Product Development Director for Goldmaster and is a member of the TSE National Mirror Committee. Mr. Kadal received his doctor of philosophy degree in 2023 from Yıldız Technical University's Mechanical Engineering Department. Mr. Kadal holds 4 international patents, is married, has a daughter, and speaks English fluently.

1.

INTRODUCTION

The increasing trend toward the usage of tiny household appliances in recent years in the small household appliances industry in the world and in our country has become a socially accepted fact. The proper use of the sector's potential is as crucial as its potential itself. It is vital to be aware that there should be a basis to understand the importance of the studies conducted and that this criterion should be taken into consideration in all studies in order for today's potential to continue in the future.

2.

DEFINITION OF REAL DEMAND

The ability to assess consumer needs and foresee potential changes in short-, medium-, and long-term demands while taking into account existing needs forms the basis of product management. Listening to the consumer is important, but it is insufficient on its own. Due to the habits they have that are specific to the relevant product, consumers may believe that some problems are insurmountable. To define the real demand, product management must use its knowledge efficiently.

Basis of product management = f (Ability to observe, ability to anticipate)

Walsh (2017) quotes Henry Ford as saying, "If I asked people what they wanted, they would reply faster horses," which is a well-known but rather dubious quotation.

Real demand is a straightforward fact that balances the functions that customers might ask for in the triangle of quality, cost, and time while taking into account the global context of the product's use in the immediate, short-term, and medium-term. Any additional costs that are not in the interests of the consumer should not be included in a real demand.

3.

IDENTIFYING THE REAL DEMAND

The roadmap to be followed in order to identify the real demand requirement is as follows:

- Analyzing the structure creating the product demand
- Conducting market research
- Listening to the consumer and simultaneously observing their behavior
- Identifying the basic needs of the product
- The product needing different demands in different countries and/or regions
- Patent and utility model research on the product
- Examination of the current and pending standard status for the product

An obvious and straightforward need should be identified as a result of the optimization to be made for the pertinent components. The fundamental standard for the following steps -and ultimately the success of the product- is determined by the examination of the leading structure that generates the demand for the product. The level of organizational capability and competency of the driving structure that generates demand directly relates to the degree of success that can be attained. Many hidden details, especially how much potential the industry has, should be exposed throughout the market research while examining the existing situation regarding product demand. Important data should also be acquired to support the conclusion in the evaluation. The people who will handle the main organization of the work in terms of awareness and internalization should listen to consumers while also observing their behavior. It should be kept in mind, however, that communication errors that arise as a result of increasing the number of people will seriously harm the project's success. The major concern is observation, and listening and observation should be presented in a blended manner when the likelihood that socio-economic structure may affect the data to be gathered during consumer listening is examined. In order for consumers to absorb the circumstance that they are exposed to, watching rather than listening to the sequential steps that a consumer who uses a tea maker should undertake when cleaning the strainer in the teapot can be treated as an important life example. A fair observation of the consumer's interaction with the relevant product as they clean the dust container should be taken into consideration as the criterion sought in the vacuum cleaner product, which is said to have strong suction power. In general, improperly appraising the product is the primary cause of products that do not achieve the desired success in the market. Internalizing this item is the only effective approach to convert the costs associated with producing the product into benefits.

Communication with consumers = f (Listening to consumers, Observing consumer behavior)

The challenges that occur in light of the first three items should be taken into consideration while determining the fundamental needs of the product. Common usage of the facilities that have previously been provided should be guaranteed as much as practicable while setting the basic needs. It should be understood that the potential substantial risks associated with assuring sustainable quality, along with stock and operation management, should be taken into account in the case of generating an additional variety. The description of basic needs identifies common features that must exist regardless of the geographic areas where the product will be introduced. For instance, there are differences between EN/IEC and UL standards for the reported voltage, frequency, and power values of the heater utilized in the tea maker. The fundamental criterion that must be agreed upon in this situation -which varies depending on geographical conditions- is the acceptance of dimensional characteristics that do not prevent the production of finished and semi-finished products with other components that the heater interacts with and do not call for additional diversity. The possibility that the product will need different demands in other countries and/or regions should be acknowledged as a crucial issue that will influence the design of the product and should be taken into account at the outset of the project. Robot vacuum cleaners should be specifically investigated under this criterion as they have lately established themselves as a distinct product category and are showing a daily increase in sales statistics. The cleaning product groups, which account for around 50% of the yearly sales of the small household appliances industry globally and in Türkiye in particular, are of paramount importance and stand in for the fundamental need of humanity. There is a significant advantage to thoroughly examining the primary causes of robot vacuum cleaners' quick market entry, their instant popularity, and the viability of this success. People's desire to spend more time on themselves, the fact that the environment is not disturbed by the high sound power at specific times of the day (especially in the morning and evening), and the capability of remote control and operation even while at work or outside during the day can all be regarded as crucial factors in the robot vacuum cleaner's quick entry into the market. How closely consumer perception of the robot vacuum cleaner and the level of cleaning that the appliance should actually achieve related to our perception and sensitivity to cleanliness, which is said to be part of our culture, is still up for debate.

The mapping process should take into account cultural presumptions specific to the Turkish culture, such as the desire to constantly change furniture, the design of items that are close to one another and crowded, and the high regard for cleanliness (bottom corner cleaning).

The strategy should then be developed and standardized in line with these cultural assumptions. Experts should conduct thorough patent and utility model study on the product, taking into account the countries where the product is intended to be marketed. Within a framework that is familiar with and adept at assimilating the kitchen of the business, patent and utility model research is conducted in a very fun manner. The study material is successful in identifying the product life curve, which is crucial in order to recognize the area where the competition limits you in a product category that you wish to advance strategically and to disclose the risks and opportunities accordingly. Gaining exemption from taxes, etc. is also beneficial in stimulating investigations, depending on the nation where the patent and utility model are employed.

The following formula can be used to determine the financing value that the company must allocate per unit product for the appropriate product group and project:

$$\text{Financing} = \text{Mold cost} - \text{Tax exemption depending on the patent(s)}$$

The tax exemption given by patent work carried out in connection with the appropriate product area can be used to decrease or eliminate the issue of mold depreciation, which occupies an important place in the product parts and cost list in a new project. Focusing on patent studies should be regarded as significant planning material, especially in key product categories where the profit rate is high and competition is relatively low.

It should be remembered that a true definition is necessary and continues as a sequential process while conducting patent and utility model studies. In order to accurately assess the patent and utility model application, consumers must be contacted and their data must be analyzed. When analyzing prior studies, it is crucial to be suspicious from a scientific standpoint and to face the problems with courage. For instance, it is crucial to understand that the ability to detect what is invisible is crucial when studying the competition.

In order to closely monitor the standards by which the product will be evaluated and with which it must abide throughout the product lifecycle, it is essential to examine the product's current and current standard status. Standards must be updated in line with evolving technology, real-world circumstances, and potential modifications because they are living documents. The basis for the work is closely following the agendas of commission meetings, such as the European Union, and actively participating in National Mirror Committee meetings, in addition to the periodic meetings held twice a year in EN/IEC committees. Standards are used to frame the structure of the job, and minimum standards are established. The investments and finance position in product design may be at risk if a standard update that has not yet been published but is in the process of publication is not known since changes in the standardization committee meetings take place in a specific procedure.

Kotler's stages of the product lifecycle should be considered when evaluating the potential standard status, and a risk assessment for potential upgrades should be prepared (Kotler, 2012). The ability to predict assessments relating to standard updates that may be relevant throughout the maturation period, the penultimate stage of the product lifecycle, should be included in all studies conducted as part of the product development process. As an interactive definition that needs to be part of the project's content, the following two questions should be taken into consideration:

- How many years/months is the product lifecycle envisaged?

- To what extent could possible standard updates during the product lifecycle affect the design?

The importance of actively participating in standard committee meetings is growing. While designs are being created, it is important to closely monitor the standard's guidelines, which outline the minimum requirements. It is also important to ensure active participation in the standard committee meetings, which are held twice a year, and to offer suggestions before the law is passed.

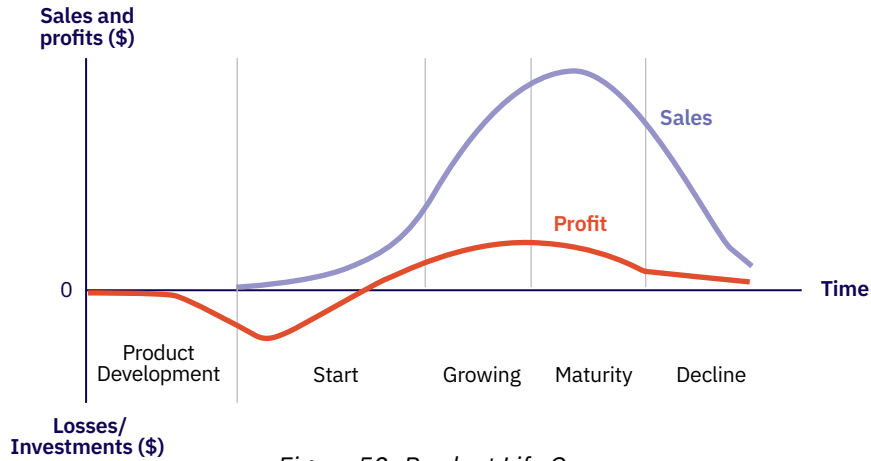


Figure 52: Product Life Curve

The requirement to extend the growth, maturity, and decline phases of the product lifecycle and to ensure that they continue as planned should be taken into account as a crucial evaluation factor for the company's strategic action plan. The article by Yıldırım titled "Uzun Ömürlü Olmak İsteyen Şirketler İçin Çare Yamyamlıkta" (Cannibalism is the Solution for Companies That Want to Be Long-Lasting) should be examined in the context of products whose market share has decreased over time. According to the article, corporate cannibalism occurs when a company introduces a new product while seeing a loss in the sales or market share of one of its existing products. Corporate cannibalization can make outdated company models obsolete by investing in technology and procedures, as in the Netflix example. For some businesses, the long-term penalty of not doing so is extinction. Because he took the risk of turning his own company into a cannibal, Reed Hastings, CEO of Netflix, was awarded the Business Person of the Year by Fortune.

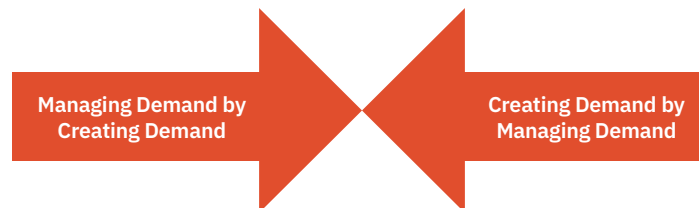


Figure 53: Demand Management in Product Management

We should definitely associate Cüceloğlu's quote "Opportunity comes to those who are ready" with the above-written issues, and we should direct our work knowing that foresight and correct analysis are at the beginning of everything (Cüceloğlu, 2009).

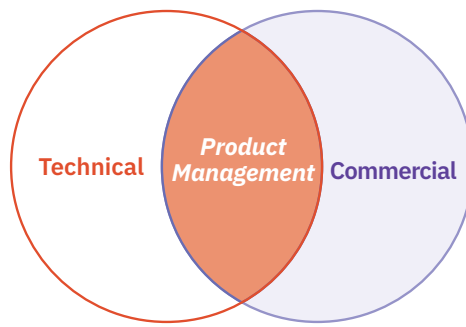


Figure 54: Optimization of Product Management

Product management refers to the intersection where commercial and technical issues are optimized, as seen in Figure 54. As demonstrated in Figure 53, demand may be produced by managing demand, and demand can be managed by creating demand in order to appropriately organize product management. It is vital to act following a set of rules that will allow the product to be delivered in the proper way rather than taking the approach of deploying the product no matter what. It should be understood that planning errors will result in subsequent problems that cannot be fixed.

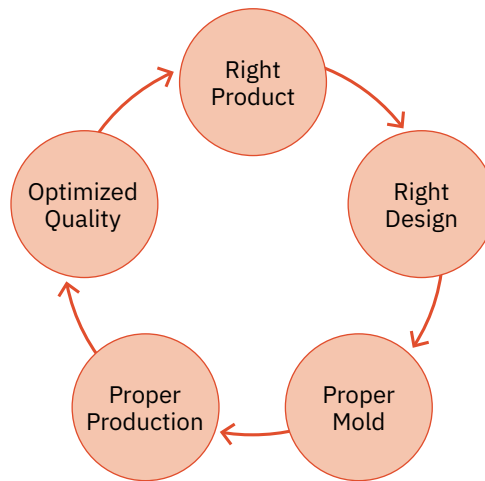


Figure 55: Marketable and Sellable Product Cycle

The right product should be commissioned with the right design, mold making in line with the design, proper production in terms of efficiency and waste, and optimized quality that will bring the brand value to its proper place, as shown in the marketable and saleable product cycle in Figure 55. In order to commission sellable products and generate sustainable sales, it is crucial to internalize and complete these stages in accordance with the strategic action plan. The wastage rate for a product with a high sales volume aim should be less than 1%. First and foremost, it is important to be aware that the current task should have the best flow that can be achieved, and a quantifiable system should be built for the determined flow.

4.

AN APPROACH TO GLOBAL INNOVATION

Global innovation can be defined as optimizing the solution to a problem by taking a global viewpoint in a way to uncover hidden knowledge. This term is widely used in terms of the new generation business model and will permeate our lives in the next century.

It is obvious that it is possible to get the manufacturing and sales cost data of any product given that everything in the developing world is accessible, understandable, and evaluable. Given this knowledge, it is clear that new products must be created with creative solutions and a framework that will produce added value by cutting out any unnecessary costs.

Supply chain management has undergone the most noticeable change in manufacturing and technology companies as the world and our nation country transitioned to the new order.

It is now essential to create a new generation of business models with a global view at the core of the path from the inception of the project idea to the ultimate customer. These models must also generate profit through innovative supply chain management.

The operational execution of the work and services to be standardized by setting the strategy, as in the new generation business model depicted in Figure 56, is only achievable with the proper supply chain management that knows the complete process and is updated simultaneously.

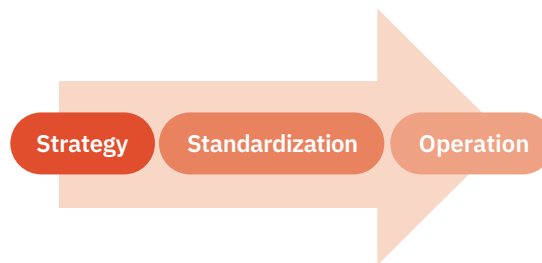


Figure 56: Next Generation Work Model

5.

THE IMPORTANCE OF VISION IN GLOBAL INNOVATION

The vision is first and foremost the basis and source of sustainable success. Only for businesses that have accurately identified their strategic goals and the processes that will get them there can the next steps make sense. The highest level of success that a business can achieve is determined by its board of directors' vision. A company's or brand's vision is not only a collection of ideas presented orally or in writing; rather, it is a set of feelings that the relevant company or brand makes its employees, suppliers, and customers feel.

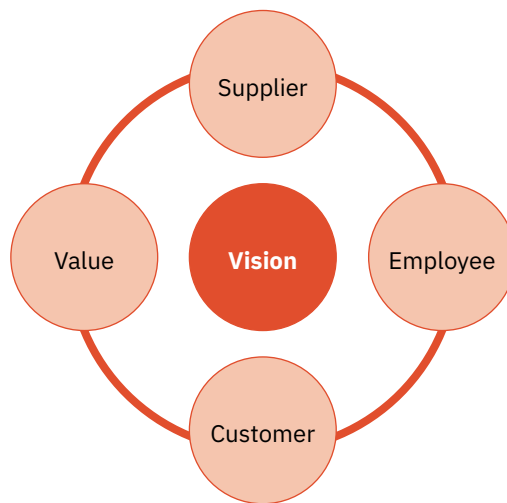


Figure 57: Building Blocks of a Vision, a Set of Values

The weakest link should always be strengthened and the entire team should be improved to take into account the building block with the highest speed in a group of values that need to be in sync with one another so that the flow does not end.

Mathematically speaking, as seen in Figure 58, the origin of everything is the vision, and all other issues can only make sense if there is a vision.

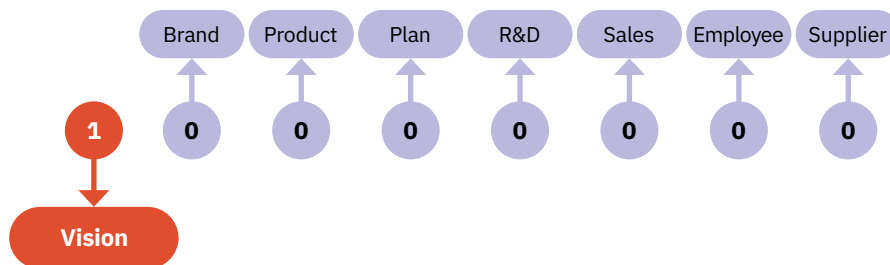


Figure 58: Mathematical Relation of Vision to Other Subjects

Building trust with all parties it engages with is essential for the vision to survive and have a sustainable structure. The board of directors of the company must create the right setting for everyone involved in the interaction to continue working on creative solutions. In other words, the board of directors' primary responsibility is to ensure the establishment of a structure that will enable the team responsible for creating the future to collaborate effectively, come up with novel solutions, be content, and succeed. Real, proactive leaders are required for global innovation. Leaders must stay ahead of and manage change.

In order to ensure the integration of different generations, perspective has become more crucial. The board of directors should embrace the vision and make strategic action plans in line with it. Current employees should be informed that they will be working with at least two new generations. Since every generation has a distinct structure of its own, adaptation needs to be a top concern for sustainable innovation. A unique organizational design that will combine the talents of team members from many cultures and give a structure with innovation at its core is specifically needed to shape and crown the vision.

Two of the key components required for global innovation are the perspective toward engineering and the drive to succeed.

Global innovation = f (Perspective towards engineering, desire to succeed)

6. SETTING UP THE ORGANIZATIONAL STRUCTURE

Realizing and sustaining global innovation requires awareness. “If you know others and yourself, you will not be in danger if you fight a hundred times,” writes Tzu (2001) in his book. “If you do not know others and know yourself, you win and lose; if you know neither yourself nor others, you are in danger in every battle.” Falling into the expectation of success in any work done without being aware of it or without determining the strategy is considered as a rule mistake that can be made. It is possible to create a structure with a plan, program, and organization that can gather around a table and on a common ground after ensuring our own awareness.

The company must now switch back to an interactive structure that produces profit rather than the turnover in order to use the next-generation business management. The board of directors, which should consist of people who believe in innovative solutions, should build the entire organization from the design, which starts as an idea, to the after-sales part, which shows that the product has met with the customer, has been accepted, and brings with it some demands. This organization should be able to create innovative solutions quickly and with the greatest quality and appropriateness.

The organization of global innovation should always remain a system that is always improving, given that it is continuously changing and resembles a relay race.

Colleagues who can interact with the rest of the world and meet on common ground when necessary are crucial for meeting the talent demand, which is one of the most crucial concerns in terms of continuity and is a prerequisite for global innovation. The likelihood of including individuals with innovation talents who are likely to become your competitors in the future should be assessed as the most crucial factor in this situation. Creating an organization that is always learning will surely have a big impact on laying the groundwork for the small home appliance industry’s future.

The importance and potential of the market for small household appliances have recently been recognized by the world. Despite the fact that the fundamental concepts are the same, the four primary challenges in this market that must be digitalized with interactive interaction and be specific to the company and brand are as follows:

1. Supply
2. Service
3. Marketing
4. Sale

The data required by the organization to proceed while considering customer sensitivity might be formulated as follows:

The inner voice of the customer = The data we need for innovation

An organization that is built and grows by paying attention to the inner voice of the customer has the foundation necessary to achieve long-term success. For instance, the first step for a company that wants to design a decent tea machine and create an innovative solution is to speak with experts who can accurately assess the tea's flavor, offer feedback, and shed light on the works. The research done by thoroughly examining tea brewing technology can also be creatively diversified with features that will enable various usage, like tea bags, etc., and benefits can be attained. Internalization of the various tea varieties in the markets where the product is being marketed involves paying attention to the customer's inner voice, which reveals their level of satisfaction. The following formula can be used to determine the innovative solution's success while considering the maximum case:

$$\text{Innovative solution index}[\%] = \frac{\text{The taste of the tea in the tea}}{\text{The original taste of the tea leaves}} \times 100$$

The requirement of a quality structure and team that will simultaneously bring the problem and the solution suggestions together with the problem is one of the most crucial issues in global innovation. The minimum level of connection between the problem and the suggested solutions is provided in global innovation.

$$\text{Number of suggested solutions in global innovation} = \text{Number of problems} + 1$$

7. TREND SECTOR MONITORING AND INTERACTIVE INTERACTION

The construction sector should be taken into account as the trend sector that determines the potential of the small home appliance sector, which is a dynamic sector and is beginning to get meaningful in the eyes of users every day. The design of the product must take into account the area of the home or office spaces as established in line with the construction sector and socio-economic structure if it is to be successful when it is initially launched to the market.

Capturing the changes in the area where the product will be located and used over time is another factor that is equally significant as taking into account the product usage standards in the geographic regions where the product will be launched.



Figure 59: View of the Coffee Machine on the Kitchen Counter

The coffee machine on the kitchen counter, as shown in Figure 59, should be assessed for size, functionality, and ergonomics. The organization that designs the product should unquestionably use the product as a consumer, and this should be done at home or at the office where the product will be used, not in the laboratories of the companies.

Within the realm of strategic business development, there is a contact grill product that is appropriate for cooking requirements. To start a new trend, the name of this device, which is mistakenly categorized as a toaster in Türkiye, should be altered. Additionally, its design should consider the needs of the younger generations and provide an inventive response to the demand for cooking. The product designed to satisfy cooking requirements ought to be more functionally beneficial than the area it takes up. With work done so that the value determined using the volumetric functional efficiency calculation below is greater than 5, advantageous products can be offered to customers.

$$\text{Volumetric functional efficiency} = \frac{\text{How many different functions the product can be used for}}{\text{Total volume occupied by the product (m}^3\text{)} \times 100}$$

For innovative products that are in favor of the customer and that address all of their problems, the number of possible uses should be +1. For instance, the function that oversees the algorithm that determines the shelf where the tray is placed and activates the heater accordingly is added as +1 to the number of functions of the product in smart oven applications. It is recommended to choose appropriate and effective heaters, keeping in mind ECO design and EU energy efficiency research. Design work that assures hygiene, health, and food compatibility should be done in light of the pandemic conditions.



Figure 60: Functionality of Cooking Appliances on the Kitchen Counter

As seen in Figure 60, it is critical to take into account the concerns of increasing the frequency of usage and appealing to all or a sizable portion of society at the design stage when examining the functionality of cooking gadgets on the kitchen counter. In the development process, a variety of products, including contact grills, ovens, fryers, toasters, etc., should be taken into consideration as cooking appliances. By adding apparatus to a fixed device in question, a structure that increases usage frequency, reduces the space it takes up, and increases the number of functions should be provided.

Studies should be done to develop simple features that will save the customer time cleaning, taking into account the use of oil pans and other similar objects.

People must save time for themselves in the new global order, and products should be made to save time. The manner in which the products are used should be enjoyable for the customers.

8. MARKETING IN GLOBAL INNOVATION

The necessity to act sustainably in all steps taken to develop the finished product, notably the resources utilized in production, will become more important as the generations shift. Soon, goods cartons will feature the carbon footprint left by low-carbon production as a marketing argument.

Even though people have not paid attention to the content of the wet painting, which enables people to create a visually harmonious set with other products on the outer surface of the products, in areas such as kitchens, the use of water-based paint instead of solvent-based paint has started to increase today.

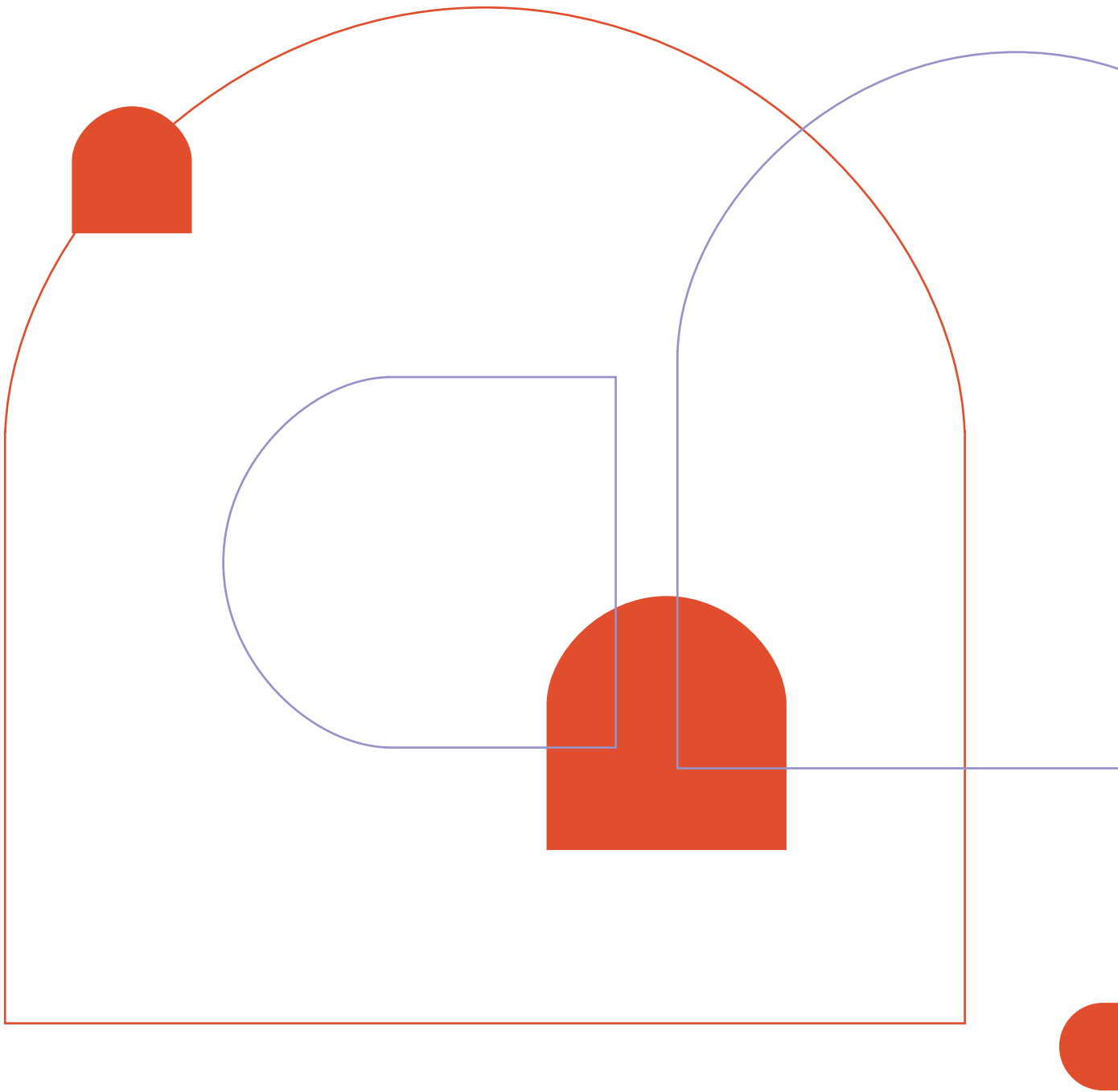
As the most crucial area of marketing, concerns about environmental awareness and leaving a sustainable world for future generations will be prioritized.

According to Levitt, adopting customer-focused strategies, making strategic plans by continuously monitoring technological advancements, and long-term adjusting to changes are all necessary to overcome marketing myopia (Levitt, 2004).

In the current generation of corporate management, logistics operations are now at a vital point. While an order placed in China typically takes 8 months to arrive in Türkiye, if production is done in Türkiye, it will take significantly less time to go to Europe. In the new generation of supply chain management, we must remember that marketing must also take into account logistics as a factor.

The country's young population can be viewed as a force that can have a substantial impact on global innovation. Additionally, Türkiye will handle substantial design, production, and logistical tasks in the future due to its extensive technical know-how and infrastructure, which are integrated throughout several sectors from metal to plastic, from painting to diverse sectors.

Innovation is a constant, not a passing trend. We must educate the consumer and adopt a long-term perspective. Based on the idea that learning is the most important thing, we should shed light on our work.



CHAPTER

15

HAUTE COUTURE INNOVATION AND THE ENERGY SECTOR EXAMPLES



AHMET KEREM KÖSEOĞLU

Mr. Köseoğlu earned his bachelor's degree from Istanbul Technical University's Electrical Engineering Department in 2009, where he also got his master's degree in 2017. At the Cantabria University's Transformer Research Center in Spain, he is currently pursuing his PhD. He began his career at Best A.S. as a tendering engineer and is still employed there as R&D Manager. He is the organization's youngest manager ever. According to data from 2021, BEST A.Ş. R&D Center is both the first and largest R&D center in the industry. He received the Refik Üreyen Innovation Award from TTGV in 2018. He is also the Vice Chairman of the Executive Board of the Cigre Türkiye Mirror Committee, Chairman of the A2 Transformers and Reactors Technical Committee, and Chairman of the Next Generation Network Committee, a company technical committee member in IEC and TSE, as well as the business representative on the faculty advisory boards of several universities. He is married with one child.

1.

INTRODUCTION

89% of the Fortune 500 companies from 1995 no longer exist (Murat Kansu, 2019). Maybe Compaq, Netscape, Saab, Kodak, Pontiac, Polaroid, Blockbuster, Borders, etc. will remind you of something. We have started to hear more news from these companies recently compared to previous years since they are now pressuring themselves to innovate.

It is feasible to argue that haute couture innovation is the innovation model for the new era, despite the fact that it is perceived differently. This is primarily because tailor-made production genuinely benefits from customer-specific solutions, concepts like quick differentiation and agile production, which have gotten even simpler with Industry 4.0. In summary, innovation leads companies to haute couture solutions.

Unfortunately, innovation is not something that we can do just with money. It is a labor- and vision-intensive procedure that takes a long time. Although many businesses learned the value of innovation through observation, some were able to act while others could only observe. In the long term, those which in some way initiated these processes became the winners. Innovation topic, which has gained a lot of popularity recently, is actually based on R&D. In recent years, innovation has replaced the concept of R&D, which for some reason was particularly important in the 2000s. It was because R&D is seen as development with investment and no expectation of output. On the other hand, innovation is viewed as result-oriented development activities. Regardless of the name, all businesses strive to develop their goods and services in the current market environment.

Actually, the situation today is not all that different from 1995. If we look at the number of companies, we can observe that many more are entering the world of technology and leaving it at the same pace. Large corporations focus on product development by making significant investments. Some others, on the other hand, opt for an alternative, more expensive but comparatively simpler method of expediting the method so they may concentrate on product development. With too many name changes and copied services, this may be a little confusing for users. As they grow, brands become more powerful as they go from being specialized to being able to conduct business in all industries. And they are all saying the same word: innovation.

2.

INNOVATION

“The only unchanging thing is the change itself,” said Heraclitus long ago (500 BC). However, other people -including some futurists- have stated the opposite and been mistaken over the course of the preceding hundreds and even millennia. Below are some examples of these people along with what they claimed and why it was incorrect.

After US Patent Office employee Charles H. Duell declared in 1899 that “all that can be invented has been invented,” there was a 5-fold increase in patent applications and a more than 6-fold increase in approvals.

It is obvious that they could not have predicted how quickly information technology would develop, when Ken Olsen, founder of Digital Equipment Corporation (DEC), said in 1977, “There is no reason for any

individual to have a computer in his home,” or when IBM General Manager Thomas Watson said in 1943, “I think there’s a world market for about five computers.”

When it comes to humanity, one should not have too high of an expectation. Bill Gates, the creator of Microsoft, may have miscalculated the speed at which spam technology would develop after his technology when he said, “Two years from now, spam will be solved,” in 2004.

So, how can one realize that innovation is necessary? There are a few models to use for that (Henderson, 2017). When a company’s turnover starts to fall, its market share and profitability diminish, in other words, when things are not going well, it notices this need and starts to rethink its processes. A crucial question that businesses should ask themselves even before this stage is:

“Are my processes defined?”

It is normal that if the answer to this question is no, the company does not notice the need for innovation. When things are not going well, there are several internal and external factors to blame, including the economy, the new generation, political concerns, etc. The company can measure its performance and determine the innovations it needs by looking at the processes with the outcomes stripped of these factors or delayed. Companies should first ask question zero, which is even more important now:

“Am I collecting, measuring, and assessing data?”

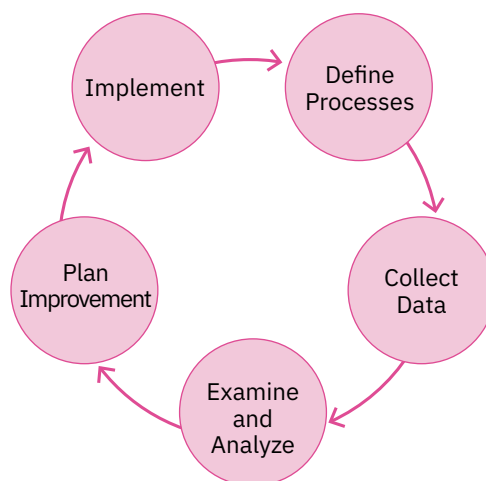


Figure 61: The Most Basic Process Improvement Cycle

Compare the human body to a factory, remove the organs that automatically monitor many of our activities for us, and imagine how challenging it would be to process the thousands of pieces of data that our sensory organs collect every second: “I need to get some water first because I’m thirsty. Is it getting cold, am I cold? I should not forget to breathe. Why is my right hand getting hot, is it burning?” Therefore, we need to turn our data into results as autonomously as possible. Likewise, companies should begin automatically collecting all available data, attempt to evaluate it using statistical analysis, and derive conclusions from it.

If we have problems at the stages of data collection and analysis, it can be much more difficult to recognize our current situation.

3. CHANGE

Basically, companies must adapt to a changing environment. More quickly than ever before, they must alter the features of their products and services to meet the needs of customers. Innovation becomes necessary as a result of the need for change. The priority of changes to make and the change roadmap should be established using the measurements and process analysis previously indicated. The key to motivation is to prioritize the right projects based on the effort needed and to launch the adventure with innovative initiatives of quality.

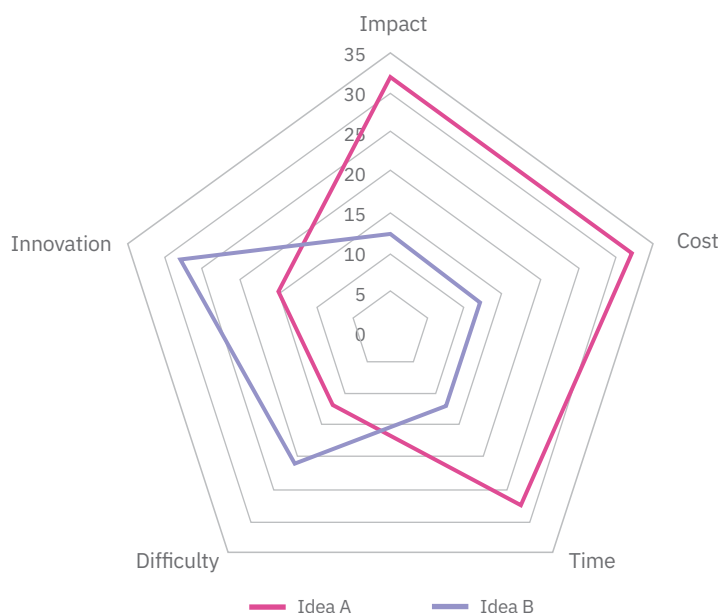


Figure 62: Evaluation and Prioritization of Multiple Ideas Measured against Certain Parameters

There was a time when projects' R&D qualities were determined by the source and amount of incentives. Your project was a good one if it got EU support. Today, this measurement is evolving to be a little more result-oriented and to concentrate on the product and its potential for commercialization. In other words, we can see a shift in incentive mechanisms from R&D to innovation. The same should apply to innovation; efforts should be started with a focus on maximizing benefits and in a result-oriented way.

All that is required for change once the anticipated outcomes and the plan are in place is a trigger. This might be an Olympic flame that makes a louder noise or just a spark. A group of responses to the question "How can we initiate innovation?" constitutes the concept of an innovation trigger. Like every process, innovation is tried to be based on some rules. The following steps and components sums up the majority of the innovation process, despite various sources emphasizing different aspects (Campbell, 2015).

3.1.

IDENTIFYING THE NEED FOR CHANGE

This first step, which is simple to state but challenging to implement, calls for awareness. The foundation of this stage is adopting this mindset through measuring and accepting ongoing development. Companies will not get much of an impact if they pick one department or individual and say, “Let’s make the innovation.” Training is the only way to develop a culture that accepts the need for change and is open to ongoing change.

3.2.

A STRONG TEAM

Even though a strong team is required for any business, as it is a bit more important in innovation, innovation leaders must be extremely intrinsically motivated, spend the majority of their time persuading others, never give up, and have faith in the process. In these positions, those with enthusiasm, vision, and a solid grasp of organizational procedures will fare better.

3.3.

PLANNING AND TIME MANAGEMENT

The innovation process, which needs a strategy just like any other project, should be composed of small projects with well-defined outputs. Serious time management is required to prevent R&D processes from becoming endless projects. The innovation team can be motivated and stressed out effectively with the support of strict deadlines and demanding consumers.

3.4.

VISION MANAGEMENT

Projects can have significant deviations, dead ends, or inconclusive processes when it comes to innovation. Constant communication and the use of modern tools that make it simpler to manage work can both be helpful in preventing this.

In 1962, US President J. F. Kennedy’s remark, “Let’s go to the moon in this age!” was enough to ignite the fire and drive the vision of a generation and a nation toward innovation (de Jong et al., 2015). Even though getting to the moon may not seem like a worthwhile goal, it is obvious that the technology developed to achieve this objective have propelled America in science.

3.4.

SIMPLIFYING

Zack Brown, CEO of McLaren F1, has a very good and simple vision statement: “Will this change make us faster?” With this as their motto, they monitor their development by measuring or estimating the impacts of each change on speed. Easy, is not it? Although becoming faster may be the primary objective in F1, today’s companies have quite different objectives. Targeting the problem’s input and output is the golden rule of innovation. Being easily understandable is more important than anything else. With long names and elaborate titles, some businesses attempt to innovate in the opposite direction.

3.5. GATHERING MORE INTEREST WITH SMALL GAINS

Innovation output goals can and should be big. However, nobody should expect to reinvent the wheel. Small improvements added together can have a significant impact. Considering this, maintaining shareholder satisfaction and boosting interest may result in an avalanche effect. The time to run will undoubtedly come after a lofty objective is set and small moves in that direction are made.

3.6. MEASURING IMPROVEMENTS AND INCREASING THE AMOUNT OF CHANGE

If innovation is built on a foundation of continuous improvement, the innovation process itself must also be improved constantly. Processes and plans should be periodically reviewed, and the elements that can be improved should be assessed before they get into a chicken-and-egg situation. Through this procedure, the innovation culture will become more firmly established.

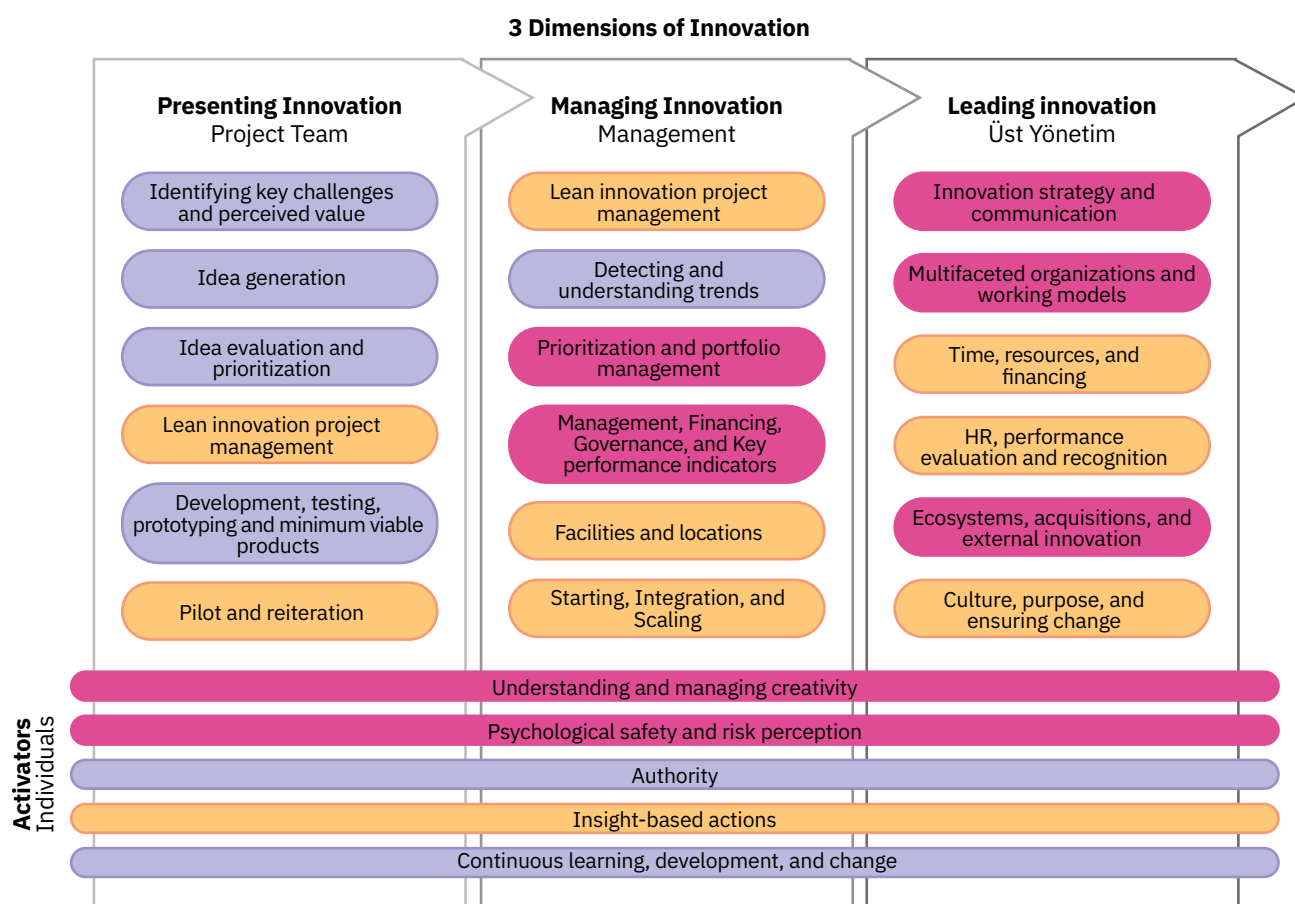


Figure 63: Innovation Maturity Assessment Matrix (Skillicorn, 2019).

4.

SIZE AND FORM OF INNOVATION

An investor may seek to always maximize profit as soon as possible while getting the best value for their money. However, even though this is not always possible for investments in innovation, expectations do not need to be diminished. The success of innovation projects will greatly increase if they concentrate on major objectives, outputs, and objectives that are divided into smaller parts. Even though the primary objectives are major, the innovation team should start with modest improvements and progress forward. Larger improvements eventually result from small ones. Although there is a great body of literature on innovation, the lack of a universal formula is what stands out most about it. The budget and duration should be chosen based on the output, and the scale of the innovation should be adjusted in line with the size of the company and its business model. It is important to stay patient and constantly make improvements.

The interaction of a few basic, interconnected building elements is what drives the innovation ecosystem's or cluster's continuous motion. The innovative efforts of public universities and the efforts of the private sector to produce new products constitute the foundation of this concept, also named the transformation circle. Despite the lack of financial gain, universities, whose goal is to develop science, occasionally perform research to advance technology. Following these studies, the private sector or organizations like the Technology Transfer Office look for funding or private sector businesses to turn the information generated into innovation. We can say that there is a bit of a chicken-and-egg relationship here. Companies expect universities to bring their ideas and patent proposals, whereas universities expect companies to bring their problems. Innovation happens when the cycle is somehow disrupted.

5.

INNOVATION IN THE ENERGY SECTOR

Our product in the energy sector is energy, which is something we cannot see with our eyes but which we need constantly. Although it is feasible to discuss various energies depending on the source, I will concentrate more on electrical energy and power systems in this section.

The energy industry makes significant investments in product development. These investments are made via clusters that gain from incentives, particularly through international agreements, EU calls, and similar mechanisms. Some of the themes are clean energy, energy transformation, grid integration of renewable energy, and storage technologies. The funds provided to encourage innovation in this sector are particularly alluring to businesses with good ideas. Applications for these calls exist in this field in our country as well. A significant number of bilateral partnerships are involved in through TUBITAK. For those who have projects involving energy issues, which are also among the Ministry of Industry's priority areas, there are numerous incentives available. Our distribution companies also participate in R&D projects with EMRA financing. On the EMRA website, accepted projects are listed.

The sector is always coming out with both service and product innovations. I will discuss some of the research on the sector's current issues below.

Due to the epidemic, it was noted that the need for energy decreased in 2020 (World Economic Forum, 2020). However, rather than slowing down the innovations of energy equipment, this sped it up. In order to adapt to the new grid structure, in transformers that are the longest and most expensive piece of equipment in energy systems to produce, numerous new solutions have been developed in the

fields of high-voltage direct current (HVDC) technology, static var compensation (SVC) transformers, magnetically controlled reactors (MCR), and variable shunt reactors. Transformers are becoming smaller while gaining more power, and businesses are competing to provide durable products in limited spaces, particularly to create solutions for offshore applications. When it comes to efficiency and grid security, load flow control and the proper loading of transmission lines are equally critical, and phase-shifting transformers that can control the grid's load flow are being developed to do this.



Figure 64: Phase Shifting Transformer Example - Best Transformer (Erdoğan, 2018)

Not only are innovative technologies being created for products, but also for the manufacture of equipment. Applications for AR (augmented reality) have grown in prominence for manufacturing businesses as a solution to reduced travel during the pandemic. Factory acceptance tests and active part inspection are available with AR in the Best AS factory, whose infrastructure was ready before the epidemic. This task may now be completed on a computer with the assistance of staff wearing AR glasses instead of having to physically examine the product during manufacturing as it would normally be done by the expert consultant and company representative visiting the facility. Similar to factory acceptance tests, which are the final inspection of the items following production, remote testing services now allow experts and customers to complete these tasks from the comfort of their own homes.



Figure 65: Remote Testing and Product Inspection with Augmented Reality - Best Transformer

The metaverse, a hot topic recently, appears to be beginning to lead innovation in the field of equipment. Some transformer manufacturers are already attempting to promote their goods in the metaverse.

Another topic of innovation in transformers now is insulation equipment that will lead to less environmental pollution. If natural-based ester oils created for this purpose are applied to the soil,

they will integrate into the ecosystem much more quickly and pollute the environment considerably less. Recently, plant-based isolation oils made from St. John's wort and other sources have gained popularity over their petroleum-based competitors. This year will see the completion of a project that was carried out separately with universities and supported by the EU to look into how these oils affect transformers (Transformers Magazine, 2020).



Figure 66: Biotrafo Project

In the modern world, innovation is also largely driven by **clean energy and energy efficiency**. Although energy efficiency innovations have slowed significantly since 2015, incentives continue to prioritize innovation efforts in this field that endangers our health and the future, according to research by the International Energy Agency (IEA) (International Energy Agency, 2021). Reducing carbon emissions and creating environmentally friendly products -both in terms of consumption and production- are the major objectives. Even though 14,000 million tons of oil equivalent are generated each year, only 33% of them are used for good, with the remaining 67% being wasted due to transmission and distribution inefficiencies (World Economic Forum, 2020). To boost energy efficiency, grids are now requiring the use of reduced-loss goods. Our country is quickly adjusting to this integration thanks to the EU's energy efficiency (EcoDesign) directive, which is a significant step in the right direction. The EU grid, where pricing and efficiency calculations are conducted, and the prices and economic position of our country's grid are different, so it would not be accurate to assert that efficiency in our grid is at its peak with these improvements. The improvements made have a significant effect on the grid, even though they may seem insignificant. A 1% improvement in energy systems would meet Russia's annual energy needs (Köseoglu, 2017). States also compel businesses to participate in this process by enacting regulations and legislation. After all, innovation can occur through any means. States vying to dominate the globe consume an excessive amount of energy, the source of production, despite their desire to avoid polluting the environment. China, the production hub and market leader of the recent time, invested 16.9 billion yuan (94.7% of the total amount spent for all coal capacity) in the renewal of 112 GW of coal power plants in 2015–18, lowering sulfur, nitrogen, and dust values (World Economic Forum, 2020).

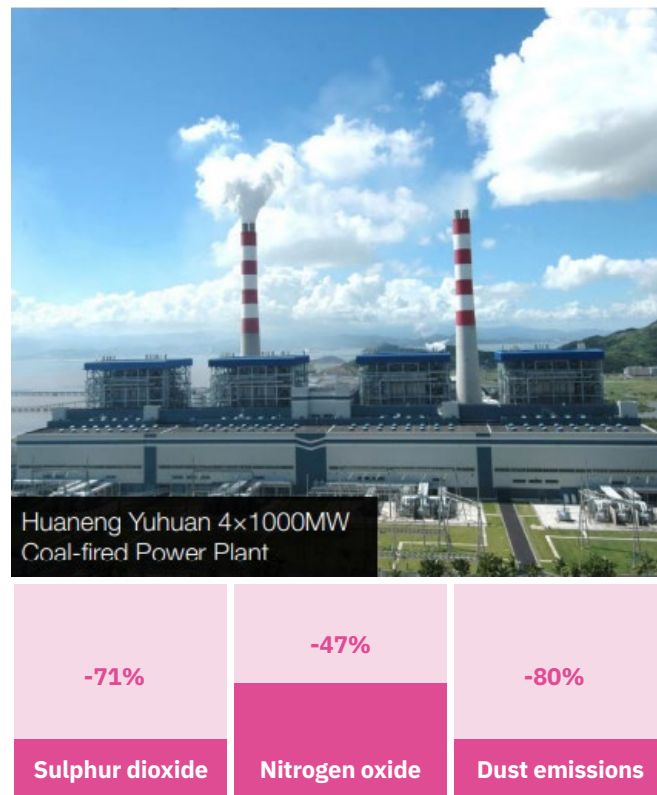


Figure 67: Emission Change in China (World Economic Forum, 2020)

On the other hand, tailor-made **solar energy** solutions are being created. Solar panel installations on vehicles and trains have long been discussed, and solar panel installations in factories or malls are becoming more popular. In addition, more tailor-made solutions include making bricks or glass used in roof construction capable of generating solar energy. With 19%, solar energy technologies are the most popular innovation topic in recent years (StartUs Insights, 2021). The goal of innovation is to spread the use of the technology by lowering the unit cost of power produced by solar energy. The development of inverter and rectifier technologies, life extension using operation and maintenance monitoring software, and the production of solar cells from alternative materials are some of the areas of concentration (Department of Energy - Solar Energy Technologies Office, USA, 2017).

Innovations in the energy sector are primarily driven by **data science**. In terms of data collected recently with studies to evaluate and forecast grid movements, it is the most active sector. The major goals for using the data collected are to develop artificial neural network solutions, make quick decisions, and improve grid stability. Only with the accurate interpretation of the data collected is it feasible to guide renewable energy solutions in the right direction. Equipment manufacturers are working on innovation initiatives aimed at making it simple to send the data of their products to the cloud, even if grid management is facilitated by the data collected in the cloud with VPP (virtual power plant) solutions. Developments are being made, for instance, to collect additional data from transformers and use the equipment as a data collecting point with the SIES project created under the framework of Best Transformer's EU-funded project, ERA-NET.



Figure 68: Li-ion Batteries and Solid State Storage Technology (Persun, 2021)

Modern hot subjects include **storage technologies**, which rank third at 16% after solar (StartUs Insights, 2021). The importance of storage solutions, which make up the common set of electric vehicles, is growing every day, and this technology is one of the most popular investments in recent years. This is especially true given the shortage of continuous renewable energy. The sector provides full haute couture solutions using various battery technologies and charging algorithms. Currently, batteries have an energy density of between 250 and 270 Wh/kg (Persun, 2021). There have been improvements in cutting-edge engineering fields like Formula One with levels like 50kW/kg. It appears conceivable to exceed capacity if issues like overheating can be avoided. Technologies for solid-state storage are becoming more popular. Solid-state storage, which is anticipated to fundamentally alter technology, is anticipated to 10 times outperform present storage capacity (Persun, 2021). Detailed researches on this subject are listed on the website of the International Energy Agency (International Energy Agency, 2020).

In recent years, one of the most talked-about subjects has also been **grid integration**. Grid analysts have been wondering, “Don’t let it disrupt us,” since renewable energy first became a source of power in our life. As generation costs fall and more people become aware of how environmentally friendly they are, the demand for renewable energy sources is rising daily. On the grid side, a question is constantly raised by this increasing generation. What impact will it have on our system, how much of it should we link to renewable energy, and how do we stabilize this changing and 100% unpredictable energy? There are several solutions, but the first one tried is to manage the grid as a series of smaller grids using the divide-and-conquer strategy (distributed grid). Smart energy meters and integration to lessen the management strain are further goals for the grid’s smartening. Significant prospects exist in these areas thanks to the EU incentives described above. There are 19,000 off-grid mini-grids, which provide close to 50 million people with power (World Economic Forum, 2020). Blockchain technology grid adjustments have also recently been on the table. These energy source tracking devices seek to improve the accuracy of resource pricing and selection. Does the Keban Dam or one of the recently built WPPs supply the electricity you use at home? Maybe it was generated in biogas plants? Would not you like to have a say in where your energy comes from? We will soon be able to track the source of the energy we use and make source/price decisions thanks to technology like blockchain.

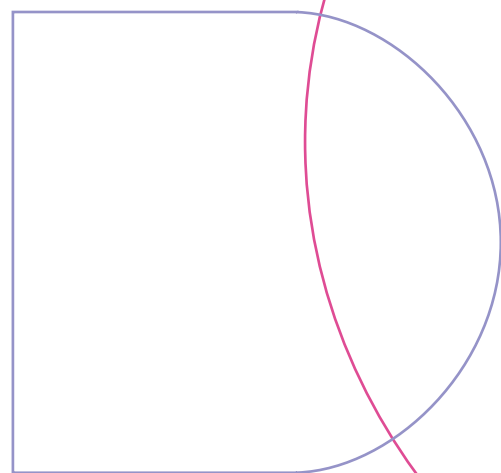
Access to energy remains difficult in today’s world. Due to the fact that 1.3 billion people still lack access to power, there is a large opportunity for innovative solutions (World Economic Forum, 2020). Off-grid solar solutions and pay-as-you-go business structures are among the innovations being suggested to deliver electricity to Africa in particular.

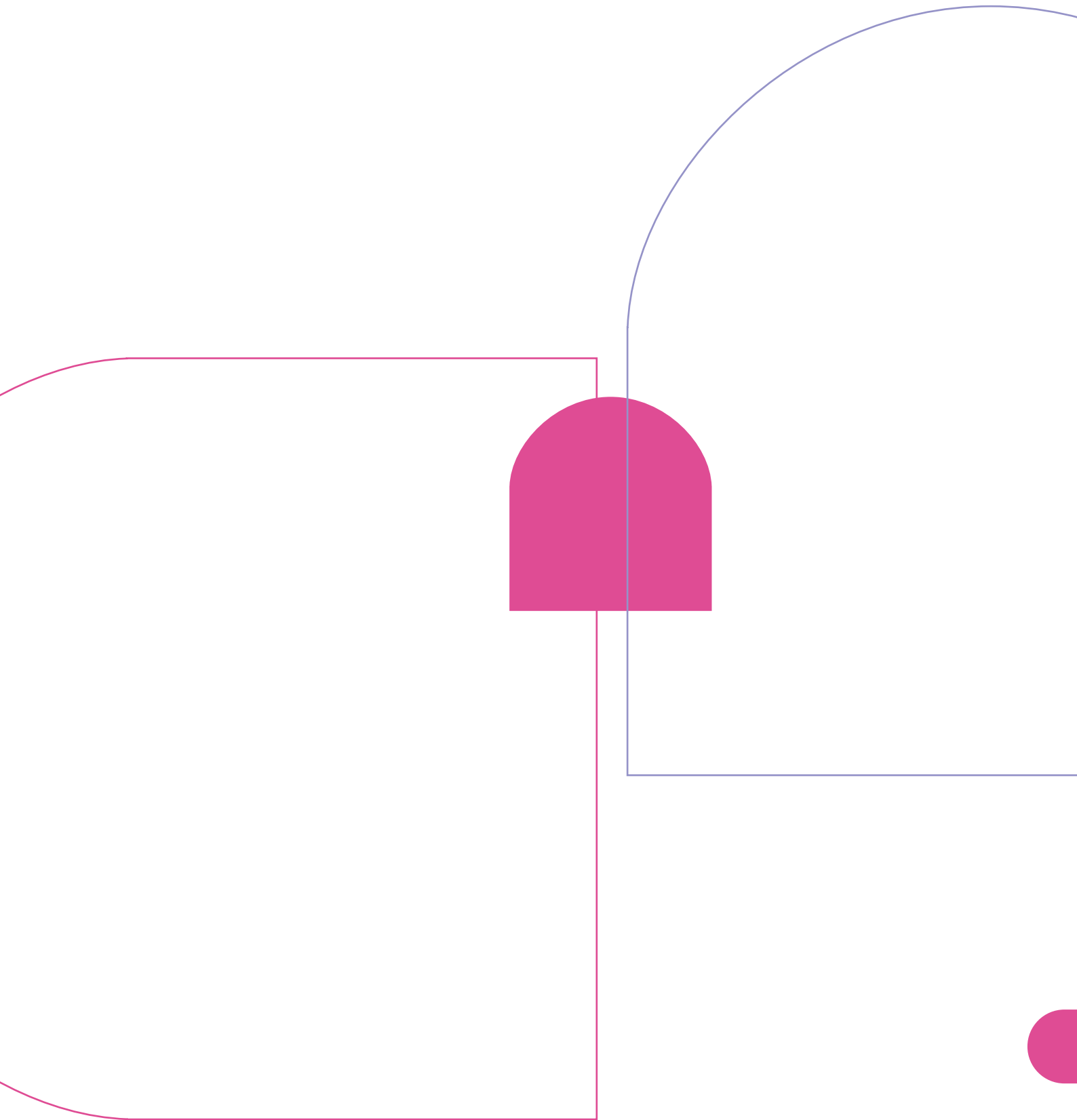
In the upcoming years, these issues -which represent the grid's future- will surely pop up more frequently. Our need for energy will rise enormously, particularly with the quick adoption of electric vehicles. Generating cleaner energy with more efficient systems appears to be the innovation aim of the upcoming years in order to keep up with this demand.

6. THE ONLY INNOVATION = CUSTOMIZED INNOVATION

The foundation of innovation today is customized innovation. Innovation cannot be accomplished in any other way. To innovate effectively in this culture, one must first collect and analyze data, carefully consider all available options, choose the best projects to launch, and promote growth through small improvements. The added value of the output of innovation that is appropriate for the team will be higher, so we need to be mindful of the resources we have available.

The energy industry has become increasingly involved in the production of such products and the development of such technologies and services that are specifically suited to the needs and preferences of the user. The advances show that the only innovation model is customized innovation, even though the energy industry does not set the bar for haute couture solutions.





CHAPTER

16

PRODUCT MANAGEMENT AND COLOR



TİMUR ERGÜN

He was born in Stuttgart, Germany in 1974. He completed his primary education in Germany and his secondary education in Yeşilköy, Istanbul. He received his degree in civil engineering from Istanbul University's Faculty of Engineering in 1997 and in business administration from the university's Faculty of Business Administration in 2003. Since 1999, he has worked in the building materials business in the fields of marketing, product, and brand management in the product groups of water, thermal insulation, and construction chemicals, particularly paint, after receiving brief experience in civil engineering on construction sites. He still works in the insulation industry as a product manager. He took part in a specifically designed 6-week course on "Color and Basic Color Knowledge" in 2008 at the ITU Faculty of Architecture. He has been a volunteer and volunteer trainer at TEGV (Educational Volunteers Foundation of Türkiye) since 2010. He is married with one child named Renk (meaning color in Turkish).

1.

INTRODUCTION

After the most fundamental necessities of food and shelter, “personalization” has always been the third need of people. It is obvious that color serves as the fundamental function that manifests in many contexts, from the markings on cave paintings painted on the walls to the mania for personalized goods that has reached a fever pitch in nearly every consumer sector today. The hue that conveys a sense of “this is mine” also plays a role in our subconscious while choosing things, from personalized phone cases to bags and shoes.

In the current market environment, consumers pay close attention to practically all of the product features and behave in a very selective manner due to the ever-increasing variety of products. Foods are typically marketed by being shown to customers in their packaged form on the shelves of big supermarkets, grabbing their attention and allowing them to select and purchase. Almost every product on the shelves is displayed within the parameters of its unique packaging, which serves as a salesperson. Packaging for industrial products has grown even more crucial as consumer happiness and consumer rights protection have become requirements. Packaging, particularly in the food industry, has evolved from only being a means of product preservation to a powerful concept that influences consumers’ buying decisions by appealing to their emotions.

2.

COLOR AND THE HUMAN EYE

It is a well-known fact that certain colors stand out because of their wavelengths and our genetic coding. For instance, red is the first color we see in crowded settings. Naturally, the fact that red is the first color we see should not prompt us to make all of our product packaging red, but it will be beneficial to thoroughly investigate packaging and product color concerns during product development and management.

One 40,000th of a square millimeter is all that the human eye can detect, and some people are better at recognizing colors than others. The wavelength difference between two colors that the human eye can distinguish is 1/40,000 mm. As a result, a healthy human eye can discern between 50–100 different color types, 100 distinct saturation levels for each type, and 100 distinct brightness levels for each level. Then, we can state that there are more than 1 million different colors and shades that we can see. From this perspective, we may say that the issue of the human eye and color is highly extensive.

Table 12: Colors and Their Wavelengths

Color	Wavelength Range
Red	620-750 nm
Orange	590-620 nm
Yellow	570-590 nm
Green	500-570 nm
Blue	450-500 nm
Purple	400-450 nm

Different wavelengths of light help us perceive them in different colors. Therefore, the color of light is actually determined by its wavelength.

Red's high wavelength explains why it is the first hue to draw our attention, whereas blue's low wavelength explains why the evil eye talisman is blue. The range of wavelengths does not quite match the colors. For instance, green at a wavelength of 500 nm is closer to blue. The wavelength of green at 570 nm, on the other hand, is closer to yellow.

3.

THE EFFECT OF PACKAGING ON THE BUYING DECISION

The effect of packaging, which is one of the key elements influencing consumers' buying decisions, has grown significantly, particularly in the food industry. Numerous researches have provided an explanation for why consumers chose larger-sized products during the pandemic, either because they needed to consume them at home or because they thought it would be better to buy everything at once rather than contact multiple things. During that period, it was stated that packaged goods were becoming more popular because they are safer, more dependable, and more hygienic. During the pandemic, packaging -a useful material that safeguards the product within, guarantees that it reaches consumers in sanitary circumstances, and facilitates the transportation and storage of products- has once again proven its significance, particularly for food products. With the pandemic, consumer demand for packaged goods began to shift. The shift in the way people shop, particularly to online, demonstrated how crucial packaging design is. Now, consumers tend to buy the most attractive packaging that they feel closest to among products that are similar in content. As natural and additive-free products solidify their position in the future, and it has become crucial to communicate this to the consumer through packaging design.

One of the most effective and cost-efficient marketing tools is packaging, but according to Zdenek Kucera, CEO of CB'a Design Solutions, when it comes to execution, it is all talk. Executives are still investing most heavily in advertising. Kucera asserts, however, that companies should pay attention to packaging if they want to build their brands and/or increase sales. "70% of a product's ability to be sold is due to its packaging. The likelihood of a buyer purchasing a product increases by 70% if the packaging enables them to hold it in their hands. This rate may be higher for children," he says. Knowing the market dynamics, the consumer, and the packaging industry inside and out as well as setting a clear strategy in line with the company's mission are essential to creating successful packaging.

Three crucial aspects of packaging affect the customer's purchase decision. These are aesthetic characteristics like the packaging's color, shape, and size, as well as information on the packaging and the technologies employed in its production (Silayoi and Speece, 2004). Packaging should help motivate consumers to buy and use (Nancarrow and Wright, 1998:111). The size, shape, and color of packaging can catch the attention of consumers and lead to impulse purchases (Berkman et al., 1997:50). The communication aspects of the packaging play a significant role in how consumers view the product. Customers believe that a product is of good quality if the packaging is good, while they attribute low quality to the product, if the packaging is of bad quality. Packaging conveys to consumers either positive or negative messages (Lysanski, 1996).

You need to draw attention to your package and make a good first impression with color. Color is one of the factors that contribute most to the image of your product and business, and you can use it to communicate meanings to the consumer including appearance, dependability, and status. Innovative packaging can help the product stand out.

While selecting the packaging/product color, you need to consider the consumer group your product appeals to. A hue color with a more generic and common connotation, as well as more specific demographic traits, desires, and wishes, should be considered for a product that appeals to all age groups. At the design stage, the message to be delivered to the customer through the packaging should be decided, and it should be assessed whether the packaging successfully grabs the customer's attention. A well-designed packaging has the power to increase sales by enticing customers to make repeated purchases.

According to a study by Bradshaw and Philips (1993), consumers make 51% of their purchases without planning. This view highlights the significance of convincing customers to purchase (Underwood, Klein, and Burke, 2001:403).

The human brain understands that thinking is a daily activity that requires a lot of effort and energy. We, therefore, behave automatically and according to patterns 90% of the time. Because of this, color plays a crucial role in the decision-making process in order to stand out and draw attention, particularly in product packaging.

4.

PACKAGING DESIGN

Professional companies that can integrate several pieces of information, such as market dynamics, trends, consumer intelligence, strategy, and goals, should be involved in the packaging design process. The most crucial aspects of packaging design include branding, and keeping the brand powerful and memorable.

Companies, not design agencies, are the ones who make mistakes in packaging design. For instance, work is started without a clear positioning, which is one of the mistakes made. Too many changes are made during the development stage. This wastes time and creates an unproductive business relationship between the client and the agency. Material choices and distinctive shapes receive far too little consideration. For instance, the text is frequently still difficult to see or the background is unappealing in many graphic designs.

Complete differentiation from competitors is an issue in standing out the packaging. Good instances of differentiation include toothpaste that comes in a box or without a box and pasta packaging made of cardboard or plastic. If the packaging is considered as a holistic marketing discourse, along with color, it will be top of mind and in the eyes. As the original square-shaped chocolate bar, the Ritter Sport brand stands out from its competitors that were launched later. Prices and other factors can sometimes cause products to become more similar. Packaging is the only tool that may explain the advantages of a product verbally or visually. Therefore, packaging design will become increasingly important.

5.

PERCEPTION IN PRODUCT PRESENTATION

"Color is not just for decoration. Given that the word 'color' is a sensation, the study of color should be treated as a mental and physiological science," says Faber Birren, who created the field of color consultancy in 1936. Likewise, Charles Blanc asserts that color affects the senses, consumes thought, and diverts the mind from its objective.

People nowadays purchase a way of life that the thing will enable rather than merely a product. This is referred to as identification in psychology. In sum, the consumer of that good believes he or she will get the lifestyle that the product promises. Because of this, goods are displayed to customers in visual ways that are appropriate for their intended uses at points of sale.

There are potentially two different methods for product presentation: The first is to remove the products from the shelves and arrange them somewhere different so they can be separated from their rivals. The second is to place the product next to other comparable products to foster synergy and increase sales. The possibility for more sales is the main advantage of pairing products together for display.

Given that the eye and attention are the basis of all marketing and communication, eye tracking is one of the most significant benefits that neuromarketing can now provide. One technique that needs to be considered in packaging design is eye tracking. By allowing you to learn more about your customers and foresee possible losses, eye tracking will improve your chances of success.

With the aid of specific physical cues, our experiences with the brand occur in our minds and direct us in this situation. Contrast, revulsion, laughter, and dread are the most prevalent bodily cues. These are emotions, as is widely known, and scientific study has demonstrated that the majority of advertising campaigns are based on these emotions.

Let's keep in mind what Jack Trout said: "Marketing is a battle between perceptions, not between products. By using the mental shortcuts that companies give consumers, you may win this battle."

Age-related corneal yellowing impairs vision and makes it challenging for older individuals to discern between colors. An elderly individual will find it difficult to distinguish between blue and green. Yellow becomes far more misleading. The elder population has trouble visually distinguishing the color gold, which is frequently utilized in products aimed at them and signifies prestige. In order to effectively convey information to older groups, it is best to use dark, bold writing against a light backdrop with strong contrast.

As a matter of fact, the majority of newly released products on the market are enhanced or differentiated variations of older ones. There is a very slim chance that a product or service that has a truly novel idea is discovered. This makes creativity with color a vital advantage.

"Color affects the senses, suffocates the idea, diverts the mind from its aim."

Charles Blanc

6. THE POWER OF COLORS AND THEIR EFFECT OF CREATING MEANING

Prior to choosing a color, it is crucial to think about your target audience. With the use of color, you may communicate both the message you wish to express and the answer to your customer's needs. The most significant contribution to the idea of color in marketing is how colors may motivate people in a good way. We may begin putting color's marketing power into practice once we fully comprehend it. Colors and emotions have been linked, according to psychologists. Let's quickly look at the ten most popular colors and how we might use them to build an image.

Black is the color of sophistication, authority, and prestige. Black can be thought of as the outer rim of space and infinity. It is the most ideal color for legibility in written language even if it has associations with eternity, death, and grief. In this way, it enables the focus to be on the actual product. It is utilized by luxury brands to represent the key component. Because it can be depressing if used excessively and by itself, it should be contrasted with the color that goes with it. Brands that effectively make use of the timeless quality of black include Chanel and Rolls Royce. Black also symbolizes corporate quality, and even in a simple logo, it inspires confidence.

Blue is associated with trust, serenity, and productivity all at once. Because of its resemblance to the sky, it is the color that is utilized in branding the most, from banks and supermarkets to airlines and technology companies. Blue is a unifying color that is utilized by both luxury and budget/bank brands, on social media, and in many other places. Blue is not impacted by the color deficiencies associated with color blindness, unlike red or green, therefore everybody with vision can see blue. Blue is serene, spotless, and most importantly, timeless. The sky never disappears. Since we have a penchant for blue, we might be willing to trust brands that use it. One of the most crucial aspects in a consumer's decision is trust. Blue is a wonderful option if you are trying to decide which feelings to trigger. This color, which is frequently used for pasta packaging in our country, can be used as an illustration of how packing styles can be changed to differentiate a product and make it stand out in the store.

Green is the color of positivity, relaxation, and growth. When exposed to too much green, which is the color of fertility, abundance, and nature, people may feel relaxed. Brands have recently associated green with ideas like responsibility and sustainability. Green is used in the advertising efforts of companies including Land Rover, Garanti Bank, and BP. Some companies, including Starbucks and Holiday Inn, capitalize on the calming qualities of green.

Orange is the color of ambition, warmth, and enthusiasm. Most people consider orange to be an unpleasant color as a result of businesses like Fawori Boya, easyJet, and Amazon. However, the more striking the orange color the brand appears more energetic. In addition to being the color of happiness, orange also symbolizes impulsivity and adventure. When you wish to arouse excitement, orange can be useful.

Pink is the color of kindness, warmth, and love. Frequently utilized by brands for young girls, such as Barbie and Hello Kitty, pink is actually a very flexible color. It may increase our blood pressure and heart rate. Pink is a bold and intriguing color as well. A good illustration of the positive and effective side of pink is the "Pink Ribbon" social responsibility initiative, which was launched by Marks & Spencer and Fibaemeklilik to increase public awareness of breast health.

Purple is a symbol of royalty, wealth, and power. Purple is seen as the color of knowledge and authority and has historically been associated with emperors and kings. Given its power, it is one of the colors that need to be utilized carefully. Among the companies that employ this color the most accurately are Milka and Cadbury. Brands should be aware that when they utilize purple in a dominant fashion, they are sending a powerful message. In this regard, it is the color that best represents prestige and quality. To distinguish its products from the other red-packaged chocolates on the shelf, the Milka brand employs an effective color usage strategy. Even though red is the color that grabs our attention right away, this use of purple is one of the best examples of differentiation.

Red is the color of strength, energy, love, and passion. It is a symbol of strength and health as well as of extremes. Everything that is red immediately catches our attention and excites us at the same time. This color and the Ferrari brand go hand in hand extremely well. Red is an appetite-stimulating color. Coca-Cola, McDonald's, and Netflix all make use of this aspect of red to persuade us to purchase more of their products. It is effectively incorporated into H&M's logo to represent the idea of disposable clothing. Other companies that effectively channel the power of red include Lego and Nintendo. Before using the color red with your product/brand, it is important to take into account that red also connotes urgency and threat.

Yellow is the color of happiness, joy, and youth. Because of its ability to warm us up like sunlight, yellow logos are used to project optimism into people's lives. This is why IKEA can convince you that you can and even want to assemble furniture on your own, while McDonald's can convince you that their food tastes great. In the area of construction material solutions, Sika guarantees that you will find everything you need. Although yellow draws attention, it may require the addition of another accent color to stand out because, when used in light tones, it is so close to white. Yellow and black are cautionary colors in nature when used together. Bees use this combination to help predators notice and stay away from them. One of the first colors we perceive after birth is yellow. It is frequently utilized in products for infants and kids as a result. Yellow is used by Nikon and DHL to produce an effect that mixes optimism and confidence. Yellow attracts attention as a stopper as well. With its "yellow power" emblem, which doubles as a catchphrase, Asperox has lately made a strong debut in the cleaning supplies industry by effectively utilizing the way that people perceive color.

Brown evokes the concepts of earth, nature, and simplicity. It has a deep earth color. This characteristic of brown is used by the chocolate company Hershey to represent the product within the packaging. Its utilization by UPS provides us with a harmony of coziness, comfort, and familiarity. Additionally, the color brown conjures up qualities like power and simplicity, depth, richness, and nourishment. Brown has a lot of power when used properly, despite the fact that it may look muted and underutilized. It is among the hues that are most frequently used in the construction materials sector.

White is the color of purity, integrity, and a firm position. White has been designed as the pinnacle of modernism by Apple and Google branding. Due to its association with cleanliness and hygiene, it is frequently utilized in dentistry, cleaning, and healthcare items. It gives the impression of a perfect canvas on which the brand could exist.

7. CONCLUSION

Packaging should grab the consumer's attention in every way, pique their curiosity, explain the features of the product, inspire confidence in the consumer, and leave a positive impression of the product in their minds. Additionally, packaging aids in the quick identification of a business or brand (Kotler, 2000).

In other words, the packaging is both an integral aspect of the product and an additional instrument for protecting it. In addition to its conventional duty, packaging now plays a marketing role due to the growth and expansion of major markets. Today, the product's packaging plays a significant role as a tool for communication. Packaging is a lifestyle extension as well as a "sales tool." Today, neuro-marketing makes it very evident that, if we so want, we can steer consumers' thinking in a particular direction.

A brand's awareness can rise by up to 80% by strategically using colors. If colors are to be utilized in combination, they should complement one another, appeal to the target market, and have a narrative that ties in with the product. It is important to consider whether the colors chosen for the company logo are consistent with the brand or company. When selecting colors, the customer profile should also be taken into account. Because a person's environment, cultural perception, and gender all have a significant impact on their affinity for a particular color.

CHAPTER

17

PRODUCT MANAGEMENT IN THE METAVERSE



MERİH ESKİN

Merih Eskin finished her undergraduate studies at the Faculty of Business Administration at Istanbul University before beginning her master's program in accounting and auditing there. Not finished her thesis studies there, Eskin earned her master's degree in finance from Bahçeşehir University with a focus on "US - Capital Markets and Stock Market." She is in the thesis phase of her Ph.D. studies at Istanbul University's Production Management Department. She co-authored a master's thesis in finance that was published, a joint scientific article that was submitted to an international peer-reviewed journal, and a booklet on kaizen practices that was released by ISO-KATEK. She compiled the information for the booklet after participating in the JCCME Program on Productivity Improvement training in Japan as part of the AOTS. scholarship. As a founding member of the TOBB Machinery Manufacturing Council and the TOBB Women Entrepreneurs Board, Eskin has actively participated in the conception, planning, and execution of projects in the Turkish machinery manufacturing industry since 2004. Since the founding of the centers and the beginning of the supports, she has been a member of the Ministry of Science, Technology, and Industry's R&D and Design Centers and Techno-Investment Commission. She has served as TUBITAK Technology-Based Enterprise's official mentor since 2016.

The huge accumulation of content that has been turned into digital data as a result of the convergence of information technology and content has become the ammunition required for new knowledge. Digital data was transferred from physical space to a separate network environment, called cyberspace, as a result of the convergence of the content environment and the communication sector. Telecom and cyberspace enabled networked interaction, which produced a social structure. Telecom and cyberspace enabled networked interaction, which produced a social structure. The emergence of different requirements in the operation of social order, the transition from the era of digitalization to the era of dataization, and the entanglement of four disciplines (mathematics and cryptology, computer and database systems, economics and monetary theory, sociology, and gamification) that have become increasingly intertwined opened the door for the metaverse.

The anonymous Satoshi Nakamoto, who established the problem-solving mechanism of the blockchain and applied it to information and communication technology, proved with the genesis block, i.e. block zero, that a trust-building and decentralized structure could be created with this mechanism. This block was a surprise egg that encoded the development of a new trading mechanism and, as a result, a new financial system. It also served as the first block of bitcoin and opened the public blockchain.

The youth who gave up on this world and defected to the virtual one discovered that a different world was possible thanks to utopian technologies and radical entrepreneurs who developed quickly after this message. This message addressed the ossified capital structure, insurmountable class positionings, the resisting order and its indestructible inertia, humanity overwhelmed by prejudices and oppression, and humanity overwhelmed by prejudices and oppression.

The metaverse evolved from being an ideal to a goal to finally being a creative entrepreneur's project. A new era for the human mind will begin as a result of the interaction between the three components of new information (completely AI-powered), new media (holographic transportation network), and the human mind, each of which will draw unique features from its essence.

The human mind will thus encounter a third field of activity at a new level of consciousness, a level of consciousness in a totally abstract cosmos observed through fictitious metas.

INFORMATION: THE MOST IMPORTANT VALUE

Information is an intangible value, not a tangible one. The protection of this value has always required the use of encryption techniques. It is important to encrypt information with a code and decode it with a code in this procedure, which uses logic and mathematics. The encryption method, which was steadily developed during the Second World War, lay the groundwork for software. Digital technologies have uploaded too much information to the network to be consumed, and new information is still being uploaded every second in the form of text, sound, photos, and moving pictures. This is thanks to Alan Turing's encryption machine (Turing Machine/Enigma), followed by Claude Shannon's mathematical communication model and the transistor system (binary alphabet of 1 and 0).

In the metaverse universe, where holographic teleportation occurs, life will have started when new wireless communication technology with 6G technology is introduced. This technology was inspired by Graham Bell's Photophone and allows all living and non-living beings in both universes to communicate with one another. The pre-metaverse phase has started with its predecessor formations, even if the metaverse does not yet exist. The metaverse will allow real-time simultaneous interaction of digital (objectification), cyber (spatialization), and social (order) settings with the physical world.

THE MEDIUM IS THE MESSAGE

A declaration that you will employ a competitive strategy is made when you consciously choose to operate in a different media or field of activities. Due to the medium they are in, metaverse will allow people or organizations to be seen as “having the competence to give a distinctive value by differentiating from their competition.” Because “the medium is the message.”

As a product, the metaverse serves as a disruptive innovation model for the physical world, its main rival. While the precursor forms are still occurring without interruption, the exceptional rate of development is a sign of a fundamental innovation that will engulf the entire society before its significance is fully appreciated.

Updating your conception of value creation requires that you comprehend the metaverse environment that will be connected to the actual world and make future projections that take into account its dynamics. A system that will be fitted with light-speed processors is being developed in this brand-new, unproven arena, where uncertainties are high and technology and speed are crucial. The products and services that will be provided to this sci-fi atmosphere will not be based on development or diversification but rather on possibilities and projections.

All applications and browsers, operating systems, storage areas, social applications, and messaging platforms will decentralize, while crypto asset wallet connections will ensure anonymous but secure identity use, and the pervasive internet, which offers three-dimensional visual reality, will be able to semantically analyze the data. In this way, the data ownership is private, inaccessible, secure, and anonymous, and the information filtered by machine learning from the complicated information pool will be presented in a customized and deepened way, with verifiable communication provided with protected infrastructure security.

With no or very little wait time for data transfer over a 6G connection, the metaverse provides the promise of speed that makes everything possible quickly. All types of internet-enabled equipment, especially autonomous vehicles, are in simultaneous communication with one another in this environment where latency is practically removed.

According to Marcus Weldon, light communication will make it possible for humans and machines to share a sixth sense experience in a future in which the physical, digital, software, artificial intelligence, and biological worlds would all be connected in real-time. The ecosystem experts from 6G Flagship, on the other hand, proclaimed their data transmission goals with light in 2030 and claimed that when inanimate objects begin to produce information and talk with one another, the generation of information will dramatically grow. The utilization of applications like virtual and augmented reality, vehicle-to-vehicle communication, artificial intelligence and machine learning, self-determining intelligent systems, and big data marketplaces are highlighted as becoming commonplace in our daily lives.

The hologram can currently be touched after a physical orientation process, controlled by voice, hand, or eye movements, and used by viewing its holographic projections to interact with the desired object. In the totally holographic metaverse, the orientation process needed to use contemporary hologram technologies in the physical world would change to a mental orientation. One can only predict the type of strategy to use to bring a product into existence and manage it in the three-dimensional spatial void, the domain of nothingness, where the sensations of sight, hearing, smell, touch, and taste are conveyed, by experiencing the antecedents. Holographic transportation is a potential expectation given current standards since machine-to-machine communication is still limited in scope, even with 5G technology. Undoubtedly, new technologies will call for new data transfers that put speed and security first.

Once a solution is developed in this direction thanks to the transmission of information with light, living things and objects will be able to wirelessly communicate with one another anywhere in the world without human intervention. We will have access to a much larger frequency range, higher data speeds, and lower latency thanks to innovations like data communication systems using cubic satellites and drones, cell-free communication, and communication continuity in backscattering conditions. The doors of the metaverse will be opened to people, robots, and metas in real time thanks to large-scale network automation that will function in a wireless propagation environment with complete AI assistance.

METaverse, THE MAGIC CIRCLE

Being in the metaverse is equivalent to being in the magic circle where the “act of playing” takes place. One must be inside the magic circle in order to manage a product that has been given to the circle. The behaviors inside the circle are unaffected by the class and cultural disparities that exist outside of it. It is necessary to acquire new knowledge as well as a vision and practice of product design and management.

Organizations and individuals need to get ready for a strategy that includes the metaverse. Even the company identity, vision, goal, and values at the top of the pyramid can be changed, as demonstrated by the Facebook-Meta example. Inter-universe goals have replaced international or global goals. By concentrating on the predecessor entities of the metaverse and who their stakeholders are, what their potential needs and requirements might be, the segments formed in their respective fields and the values that can be tailored for them, and maps of channels and relationships, a business model can be created.

An organization’s inclusive orientation to the metaverse can be outlined in a business plan that can then be used to launch product development (product innovation) and commercialization (product management).

One should first identify the business purpose and then examine the entry strategy, looking at choices like mergers, acquisitions, or innovation for the target product, in order to determine the most accessible regions of opportunity in the metaverse. In this method, the market area, category, and segment can be identified, the function of the product can be established, and the equipment to target the particular area of emphasis can be planned. Being innovative is necessary for adjusting to this new reality, yet not enough to exist in it. Examining and experiencing the prior forms of the new order, predicting the areas of opportunity, and accurately projecting the creation of a value proposition by identifying segments inside the opportunity areas would be a good place to start. It is a sign that the growth phase will start when a product or service that completely fills a demand draws interest from forward-thinking consumers, even reaching the early adopter stage, but in reality, this is no different from a business finding itself perched on the precipice of a cliff. It is challenging for the original set of innovators and early adopters to reach the intensity that would secure the product’s survival, even with clearly stated distinctive features. It is vital to be prepared to choose an area of attraction, taking into account market density rather than market size, and ease of access to the market rather than market density, in order to reach out to the untried and make compelling results fast and visible. The opportunity area that is in line with the value proposition will be reduced as a result, and a test area with the desired speed and visibility will be created. The likelihood of adoption will increase if you attack at the proper point, enabling you to overcome the divide and go through the remaining stages of the product lifecycle.

Artificial intelligence and machine learning will be in charge of testing and evaluating the product in the metaverse, making it quick and inexpensive to fix any potential flaws. Production will have already started while the data of the prototypes that pass the test is being consumed by robots, the manual

laborers of the new order replacing the dark factories in the real world. The only tasks left for humans are to think creatively, direct artificial intelligence that is unable to choose between unrealistic options, or direct robots and artificial intelligence to make choices based on novel experiences and to reason backward by looking forward.

System engineers who know this universe well will undertake the tasks of identifying common beliefs, core values, behaviors, and expectations that differentiate in the metaverse, perceiving and conceptualizing these signs that are not clearly expressed and can only be perceived, and activities that will enable them to be added to the corporate culture, and their possible impact will be measurable, testable, scalable and optimizable with artificial intelligence algorithms.

The concept of user experience (UX) and creating an interface that maximizes customer interaction time will be crucial.

Differentiating the processes of awareness, experimentation, availability, and repetition as a failure prediction algorithm rather than for deployment may work better. The complex initial phase of product development, when the product concept is still very hazy, uses these chaotic, unpredictable, and unstructured activities as a means of retroactively identifying and resolving root causes. These activities include strategic planning, concept creation, and pre-technical evaluation. The development process is organized, distinct, and formal.

The people who have the knowledge and insights on the subject being examined, discussed, or listened to, in the direction being explored, with the meaning and depth being sought, will be recognized and available without intermediaries thanks to data drilling and relationship architecture. This will make it possible for a giant network of minds and personalities to connect with one another. The organic will be in the center, producing the initial knowledge and adding to it.

While it may be legal to “hack” for growth, clones that are unable to surpass the original while the original is in use will continue to be expensive due to launch costs. Copying will only be acceptable if it is possible to do so. This is what is to trigger growth.

Everyone will be encouraged to engage in the metaverse, which will be a cosmos of high individualism and creative conflicts, but those that can coordinate will be able to stand out.

It is important to be skilled at managing conflict if you want to develop a cooperative, competitive, and consensual culture in a free and unrestricted setting. It is required to properly direct avoidant and compliant types and to create balance in chaotic circumstances.

It is essential to create a system that enables reconciliation by establishing a balance of interest, power, and right-sharing in the issues, people, and processes that make up the conflict triangle. There will always be an issue with how rights and power are distributed. Among the key dynamic factors are the process approach between rights and interests and the human approach between interests and power.

Autonomy-based teams will be on the rise in the metaverse. These teams will have developed into small, selective structures that are considerably more flexible, mobile, and capable of forming autonomous forms rather than massive teams that are a part of a corporate structure and dependent on top management. The development of more extensive alliances will depend on the success of these reformist teams, which will foster a culture of joining and disbanding for short-term partnerships. Businesses that can merge these result-driven, creative, independent teams with their own commercial objectives will be able to move quickly.

The parts of the human mind that are still a mystery are where artificial intelligence falls short. Artificial intelligence can now operate in areas such as analytical reasoning, technical proficiency, or intellectual intelligence. On the other hand, the physical capacities of the human body are virtually

totally embodied in robots. It is now well acknowledged that compared to robots, the human body is expensive and inefficient. Robots can now be considered the new laborers of the physical world. In terms of imaginative reasoning and the capacity to draw conclusions about emotions, the human body's mental capacities are nonetheless unique. This is why in the metaverse, emotional intelligence will take its proper place as a vital leadership requirement.

People who are aware of themselves and their limitations, who can manage and regulate their impulses, who have both internal and external motivation, who can empathize, direct, and have the continuity of reaction monitoring will emerge as leaders who will create the metaverse culture. While managing the perception of reality on behalf of themselves and the community they serve, virtual leaders will be chosen from the avatars of persons with high emotional intelligence. The ability to enter the constructed sense of reality, as well as the will to maintain the link with the physical world at the necessary equilibrium, are both crucial components of this process.

“Human nature makes mistakes due to uncertainty and speed.”

By processing the data through error algorithms, artificial intelligence, which learns by studying both past and simultaneous current scenario data, is now able to quickly decide what needed to be done to take corrective actions. The high frequency of errors, the requirement for correction, and the recurring nature of these errors will speed the strategy cycle and keep it in motion in an uncertain environment like the metaverse. Competitiveness in the metaverse is determined by the pace of making the changes. Artificial intelligence, which is essentially a human mind expanded, will be the most effective tool for avoiding potential errors and ensuring accurate decision-making.

Artificial intelligence's job in the metaverse is to anticipate threats, respond rapidly in an emergency, and take action in the worst-case circumstances. The fact that error-detecting artificial intelligence locates and simultaneously eliminates the root cause with backward-working do-measure-learn algorithms, that these dynamics ensure continuity with lean and agile models, and that they spark creativity and the creation of new knowledge by removing the fear of error, can all contribute to the development of a more genuine and satisfying ecosystem. In this universe, robots and artificial intelligence are the only things capable of zero error, but human imperfection is natural and valuable.

At each level, the user has new expectations and a distinct frame of mind. Through continual measurement and feedback on the potential consequences of the combinations, the various components that make up the product will discover a new shape that satisfies the expectation, and this is how the top step of the pyramid that will produce return will be attained. The differentiation that optimizes the return is made possible by the simultaneous operations of the unit, team, and algorithm.

After analyzing the tracked and measured artificial intelligence algorithms, a cocktail of senses must be injected for people to come to the metaverse with hope, expectation, and happiness as well as opportunities that will make their lives easier and allow them to realize who they are socially for the roles they play will be utilized. In other words, critical path inferences must be drawn for them to succeed functionally and emotionally, and any kind of other support that facilitates what is difficult will be at work. In order to keep the engaged people in the metaverse environment and to bring new people and entities into the system, individual satisfaction rates will be crucial.

METaverse CULTURE

Metaverse'ün sunduğu fiziksel internet sayesinde oluşacak katılımcı kültür, sıradan bireylerin kamusal alana daha kolay ve aktif bir şekilde katılımını sağlayacaktır. Birbiriyle bağlantılı içerik ve platformlar arasında kolaylıkla geçiş yapılabilmesi ve birçok mecranın birleşimi ile hazırlanmış olay sunumları sayesinde, bu ortamlara özgü bir keyif ve bağımlılık yaratılacaktır. Bununla birlikte, kültürel pratikler yaratacak bu kullanımların Metaverse teknolojisinin altyapısını oluşturan blokzincir ve yapay zekâ teknolojileri gibi platformlarda gömülü algoritmalarca bilgi manipülasyonu ve propaganda olasılığını da barındırdığı ve insanı araçsallaştırma tehlikesi içerdiği öngörülmelidir.

“The human develops technology, while technology changes humanity.”

When considering the metaverse universe, it is impossible to claim that technology and technological conditions are the only directly influential force that determines people's behavior and actions, nor can it be said that it is human and society alone that develops technology in line with their wishes and needs, and makes sense of knowledge and experience. It is evident that in order to create and analyze the metaverse universe and culture, we need to check the possibilities to be provided by technology, rather than the technology itself. The creation of a holistic interaction between technology and society without affecting either's nature is necessary for the development, continuation, and strengthening of metaverse culture. Also, individuals must be free to use technology in different ways for different purposes, according to their competencies and creative intelligence.

When a new technology is introduced into society, it does not just add a new process to the existing condition; instead, it generates an entirely new ecology. Living in simultaneously connected virtual and digital environments with a seamless visual connection will produce a novel lifestyle that has never been seen before.

Activities in the metaverse, for instance, can be created with or without effects on real life. In either case, the universe's owner will be emotionally involved with the results of their actions, and happiness or unhappiness, satisfaction or dissatisfaction will be experienced. Results that have an impact on actual life can show how strong this bond is. Results from the metaverse, for instance, can be added as citizenship points in the real world. Through smart contracts, people can officially decide whether or not their actions in the metaverse have an impact on their actual lives.

It is a well-known fact that when something that humans make is turned into a commodity, they go through a process of alienation, adopt values that are not their own, adopt a pseudo-conscious ideology, and voluntarily support the maintenance of social institutions in which they are disadvantaged. It can be anticipated that this alienation will be differentiated and that a democratic environment that eliminates all categories would arise with the transition of physical production to robots in the metaverse. The social power derived from the sharing of knowledge and experiences can be recovered through the development of the public sphere in a decentralized cyberspace that is not governed by governments and corporations.

ECONOMY IN THE METAVERSE

The development of new mechanisms to fill in the remaining gaps and the full integration of old systems, next-generation systems, and next-generation precursor entities are required for the construction of the metaverse economy.

A single digital wallet should enable seamless communication across all of the systems that make up today's commercial infrastructure, virtual world platforms, crypto payments, and trading platforms for digital assets. In order for this wallet to establish secure interactions and transactions, following need to be ensured: Customer intelligence and reputational checks are developed to reduce the risk of manipulation, such as screening for money transactions; accelerating the identification and approval of community members by reconfiguring credentials for changing roles and differentiated participation in media access are ensured; mechanisms to prevent bullying and harassment in cyberspace are created; alternative payment assets and spaces to use for private interaction needs are provided; next-generation currencies and digital assets as mortgages are accepted; the interoperability of metaverse financial instruments with foreign exchange and cash markets globally is ensured; the use of cryptocurrencies is expanded; mechanisms to support the proliferation of projects, initiatives and investments of decentralized open organizations are established; fast migration channels between platforms and devices for rapid interaction in cross-platform digital asset management are enabled, and storage, bandwidth, and processing capacities are increased for this purpose; national differences in regulatory rules for the investment, trading, and financial activities of digital assets in the virtual world are eliminated.

A new era is ahead of us, where we will internalize differences by experiencing the ecosystem-expanding effect of producers and consumers whose physical and geographical location barriers are removed, the effect on employment opportunities of the workforce and employers who can meet at long distances without mobilization, the deepening of the talent pool by accessing education easily and at low-cost thanks to effective learning technologies, the formation of global virtual units that offer services and services supported by real-time and sensory features to millions of customers with extended reality (XR) technologies, and the transition period from cash to cryptocurrencies.

In the metaverse, the way of doing business, product management, and brand funding will have been changed entirely. Decentralized finance (DeFi), on the other hand, will emerge as a ground-breaking innovation that will fundamentally alter the traditional approach to finance. The metaverse's economic tools will be more valued and a new financial ecosystem will be developed to the extent that they can be coupled with conventional economic tools.

The top application layer of the blockchain, according to its system design, is made up of users such as wallet owners, exchangers, and ledger monitors. The data, consensus, and network layers come next. These are built on top of a network of machines and clouds. This hierarchy can be used to review the various layers to be involved in. Smart contracts, cryptocurrencies, and tokens are used to create value. The most valuable product of the new period in the real world and in the metaverse is cryptocurrency since it is a radical, disruptive, and architectural innovation object. A new coin needs to be created and managed by a highly skilled team with a strong background in technology.

The understanding is similar to that in the actual world, despite the fact that the money supply in the metaverse is different. A brand-new profession called data mining was developed as a result of the cryptocurrency phenomenon. Data mining is necessary to create a cryptocurrency, just as gold must be mined by miners before it can be sold. Data miners mine the digital data, mine the block, and the reward for this work -money- enters circulation. Money does not have an endless supply; rather, the blockchain's conditional code places a cap on it. In this system of value exchange, product marketing knowledge is essential.

It is expected that the development of the ecosystem would speed up if the virtual gaming platforms' virtual currencies and other digital assets are validated in other commercial settings than those of the platforms themselves. Hardware scalability will be aided by the introduction and spread of virtual wallets that support numerous currencies and payment options.

In terms of the workforce in the metaverse, the need for a specialized workforce, including 3D modeling and software development kit specialists, software developers and designers (for the design of avatars, wearables, objects, architecture, and interiors), content creators and gamification designers (for virtual platforms, for products, assets, NFT), metaverse event organizers (concerts, parties, art shows, community gatherings, sporting events, sightseeing, and travel), online and offline relationship and engagement specialists, and community managers (marketing the platform, sales support and loyalty, etc.) will increase.

DISCOVERING AND STRATEGICALLY POSITIONING THE METAVERSE

In the metaverse, it is possible to perceive new perspectives; use tools, channels, services, products, and assets; be inspired by these experiences to predict business models and adaptable areas of opportunity; design your own space in line with those predictions; build a corporate network of other users with investment potential; and position yourself to start a business or collaborate with others.

You should ask yourself some questions and give answers to help guide your strategy after you have a firm understanding of the metaverse interaction and believe that you can acquire the abilities to control it. You should take into consideration your previous experiences in the metaverse, how you will transform your current business model, how you will maximize added value by focusing on the community as a participant or content provider, how you will differentiate your experiences, and any potential effects of product promotion, distribution channel establishment, or expanding into areas like digital product trading and sponsorships.

When positioning in the metaverse, it will be necessary to invest in technical staff with expertise in 3D modeling or the use of software development kits to create an environment in the metaverse, as well as in human resources with the potential to lead the orientation of virtual world staff, undertaking training and interaction among those who are interested and willing to work in the field. If the reward of being a pioneer in the Metaverse is worth the risk of spending scarce resources, and if young communities equipped with digital and cryptographic technologies are the target audience of that company, it is imperative that the priority area that will create added value in this universe is realized as soon as possible for a company that has included a metaverse strategy in its action plan or has a competitor with such a vision.

Thanks to holographic teleportation, it is necessary to be ready for interactions with virtual individuals that are more real than the real ones and to think about how to manage products in these environments. It is critical to begin experimenting with the environment for designing potential intellectual property and business models in the metaverse, as well as to experiment with precursors to identify ecosystem partners and collaborators, which may reveal different needs and potential opportunities, while an ecosystem of avatars, virtual spaces, and digital products is being built to bridge the gap between digital and physical products.

Every home in the real world might soon have 3D augmentation systems because people will want to use the same things as their NFT or Avatar. The metaverse offers the possibility of employment in addition to product trading. Real people can work as retail store salespeople, doctors, teachers, waiters, waitresses, or croupiers. When there is a need for additional services at their place of employment in the metaverse,

an actual person's avatar may also hire another avatar. High-yield precision agriculture, real-time remote healthcare, smart environments and infrastructures, autonomous vehicles and cyber-physical systems, the internet of things, led, photodiode, and sensor technologies, and high-yield sensors are the priority development areas in life in interaction with the metaverse. In other words, the fertile ground of the creative economy is bursting with opportunity, and the harvest is not far off.

Innovations like the transformation of marketing and advertising activities and branding experiences, as well as the experimentation and testing of products or services with digital twins, will significantly improve the speed and efficiency of the metaverse economy in comparison to traditional operations. By creating virtual digital twins, producers or consumers can test products or services at a lesser cost. They can use a production setting in which they have developed a twin to evaluate how robotic systems will interact with the physical environment. A port company's logistics, container loading optimization, the management of a subway system's passenger mobility, the implementation of security measures for the disabled, or the administration of a virtual security system in high plazas are some examples of this.

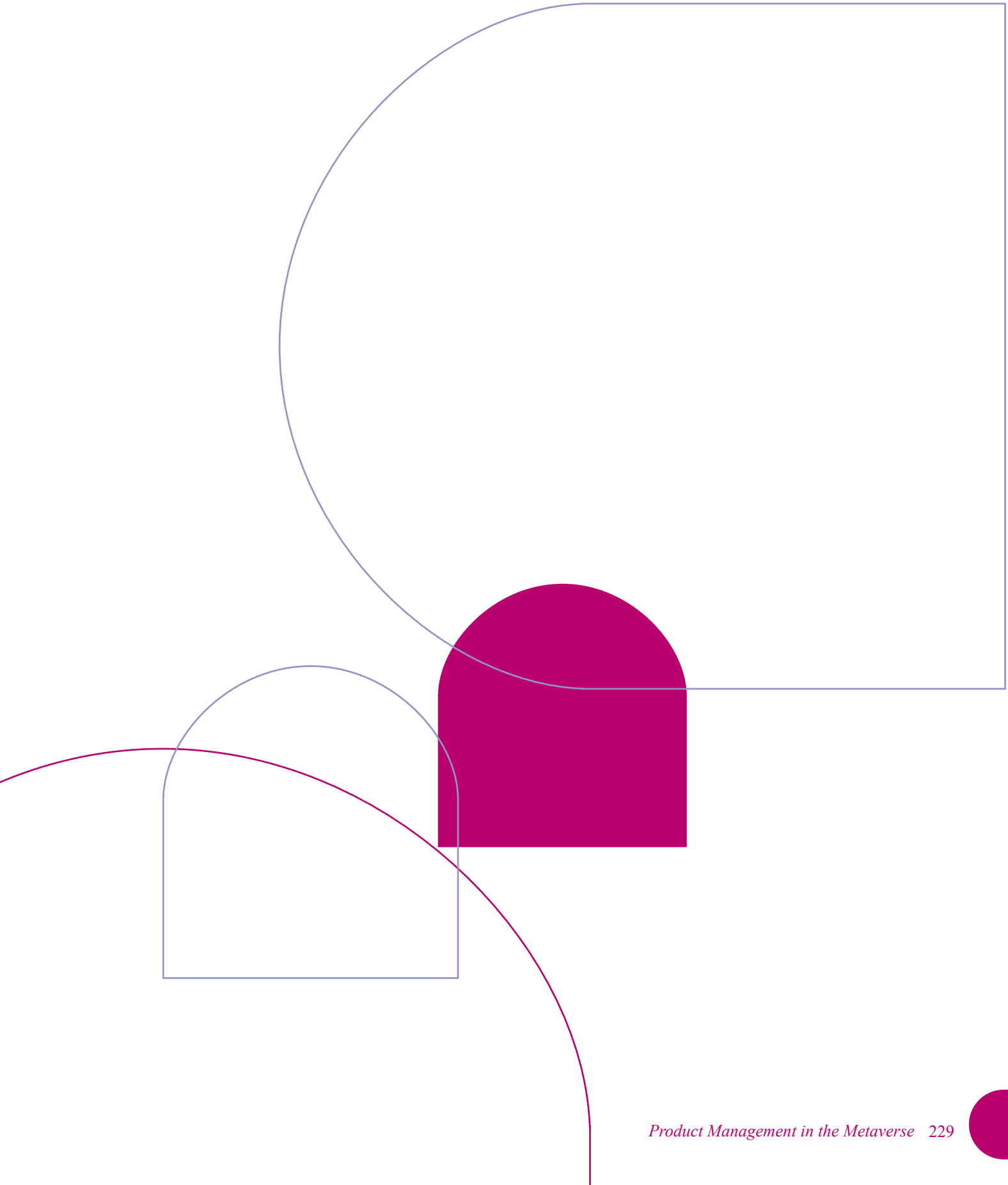
In conclusion, the metaverse does not yet exist, despite the existence of precursor platforms and experimental activities servicing the formation of the metaverse. However, a communication network with cutting-edge algorithms that can process information at the metaverse's processing speed and data storage capacity, transmit real-time holographic reflections, and enable layer-secure communication between animate and inanimate beings will be operational before 2030.

This situation, which meets the technological requirements of the Metaverse, will allow for the merging of numerous virtual universes created in a variety of ways on the semantic web into a single cyberspace, deepening and expanding human interaction and allowing individuals to form communities based on shared values and express themselves more authentically. The distribution of assets and experiences can become democratic thanks to its structure, which reduces distances, gets rid of geographical restrictions, makes things more accessible, and does away with middlemen.

It is essential to have already experienced the precursor entities and to plan the capability for the metaverse to develop its goods and services. The predictions' main emphasis should be on the products and routes that the metaverse's revenue streams will follow, as well as the most suitable business model.

Undoubtedly, there will be a lot of surprise eggs in this magic circle. Even a state model might be among them. The metaverse society's virtual territories might be linked to the real world, be connected to a region made up of oceans or unclaimed lands that belong to everyone, and have the option of being acknowledged by the community of states. This virtual world might produce a decentralized link of sovereignty and citizenship, producing a single world state, with stateless people, people with no other homeland than the metaverse, and people who want more than one homeland. Or it may establish metaverse citizenship in the communities on the Moon, Mars, or Saturn.

Saying "All countries are fantasy. It is all in your head," Jed of Liberland may be the interface of this design with his large cryptocurrency holdings in his wallet.



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Notlar

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COMPILATION OF THE EXPERIENCES IN TÜRKİYE FROM THE PRODUCT MANAGEMENT PERSPECTIVE

2022



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