VAASAN AMMATTIKORKEAKOULU
UNIVERSITY OF APPLIED SCIENCES

Huong Nguyen Thi

CHANGE MANAGEMENT IN PRODUCT DEVELOPMENT PROJECT

A case of Furniture industry

Technology and Communication
2023

ACKNOWLEDGEMENT

I extend my heartfelt appreciation to my colleagues at Scancom, TA, MD for their collaboration and valuable insights during the interview process, enhancing the depth of this thesis. Special thanks to the experienced professionals in the furniture industry for generously sharing their knowledge and perspectives, contributing significantly to the study.

I express gratitude to Dr. Adebayo Agbejule for expert guidance in project management, ensuring the research stayed on track. Your support has been instrumental in navigating the complexities of this study.

A deeply personal acknowledgment goes to my husband, whose unwavering support and understanding freed me from work for over a year. He not only took on the financial responsibilities of our family during challenging times but alongside my son and daughter, provided the emotional strength needed for me to concentrate on this thesis.

Furthermore, I would like to express my pride in my parents in my home country, despite the physical distance. Their encouragement motivates me every day, demonstrating that familial love transcends geographical boundaries.

Helsinki 25.1.2024

VAASAN AMMATTIKORKEAKOULU
UNIVERSITY OF APPLIED SCIENCES
Master of Project Management

ABSTRACT

Author	Huong Nguyen Thi
Title	Product Change Management- Case of Furniture industry
Year	2023
Language	English
Pages	77+ 1 Appendix
Name of Supervisor	Adebayo Agbejule

This study focuses on the contemporary challenges faced by the furniture industry in managing changes during product development. It explores four key dimensions of change: Product Design, Production Process, Project Management, and Market/Regulatory Alignment. Emphasizing the significance of Project manager's competence, project management tools, the research investigates the Agile and Hybrid approach, addressing challenges like resistance to change and innovation-stability balance.

The study, employing qualitative interviews with experienced project managers, contributes practical insights for navigating change complexities in furniture product development, aiming to enhance industry understanding and success. Through qualitative methods, including in-depth inter-views with experienced project managers in the furniture sector, the study investigates the strategies, tools, and techniques employed in mass production industries to navigate changes effectively and ensure a streamlined product development process.

The strategy advocates for a flexible approach, combining Stage-Gate and Agile methodologies, with an emphasis on cross-functional collaboration and iterative planning. Integration of PLM or PDM software is recommended for efficient change processes. Lessons learned underscore the importance of iterative approaches, user-centric design, and continuous learning, with recommendations for structured change management systems and targeted training programs. Overall, the framework aims to empower teams to navigate challenges effectively and remain competitive in the dynamic landscape of furniture product development.

Keywords Change Management, product development, furniture industry

CONTENTS

FIGURE, TABLE

1 INTRODUCTION

1.1 Background and Motivation

We are living in a world where change is constant and often unpredictable. Change not only brings new opportunities but also challenges. It can alter how we work, interact with each other, and even how we perceive the world. Adaptability and the ability to embrace change become more important than ever.

The furniture industry, with its emphasis on aesthetics and functionality, necessitates personalization to meet individual customer requirements. It utilizes a diverse range of materials, requiring expertise. Adapting to ever-changing trends is vital for maintaining market appeal, with the product development process involving design, material selection, production, and quality control.

Change management is crucial for successful project execution and organizational prosperity. It minimizes disruptions, ensures project continuity during change, promotes acceptance among stakeholders, maintains team performance, and fosters an adaptable organizational culture. Furthermore, effective change management addressing both internal and external sources of change. Internally, it encompasses the implementation of new designs and materials, while externally, it involves responsiveness to customer feedback, market shifts, and emerging technologies. Managing change ensures the furniture industry's competitiveness and innovation in a dynamic market.

The main objective of the interviews was to delve into the methods utilized by project managers in recognizing and addressing change within product development projects, particularly from a management perspective. These discussions aimed to uncover the tools, strategies, and essential steps employed in managing change effectively throughout the project lifecycle. By focusing on the practices of project managers, the interviews sought to provide insights into how changes are identified, evaluated, and integrated into the product development process,

thereby informing the development of robust change management approaches tailored to the furniture industry's needs.

1.2 Research Objectives

In the manufacturing industry, there is a significant gap in our understanding of how to effectively deal with changes during the product development process. We lack clear, practical guidance on this front. The primary objectives are to identify the nature of changes occurring in product development projects, analyze the approaches employed by project managers in managing these changes, and delineate strategies that enhance the efficiency of change management in the furniture industry.

This research has three main aims:

Firstly, it aims to explore and identify the changes occurring in product development projects within the furniture industry, conducting a comprehensive examination into the driving factors, such as technological advancements, market trends, and evolving consumer preferences.

Secondly**,** the research seeks to examine the role of project managers in navigating and managing change within the context of furniture industry product development. This involves an analysis of the skills, competencies, and strategies employed by project managers to effectively lead and adapt to change throughout the project lifecycle.

Lastly, the research aims to develop efficient change management strategies tailored to the furniture industry. This involves formulating and proposing strategies by drawing insights from best practices in change management, both within and outside the industry, and adapting them to address the unique challenges and opportunities presented by furniture product development projects.

1.3 Research Questions & Structure of Thesis

This thesis is organized with a clear and comprehensive structure to delve into the complexities of change management within the furniture industry's product development. The thesis begins with the introduction about background, motivation, research objectives, questions, and the overall structure of the thesis. It provides a roadmap for readers to understand the flow of the document (see Figure 1).

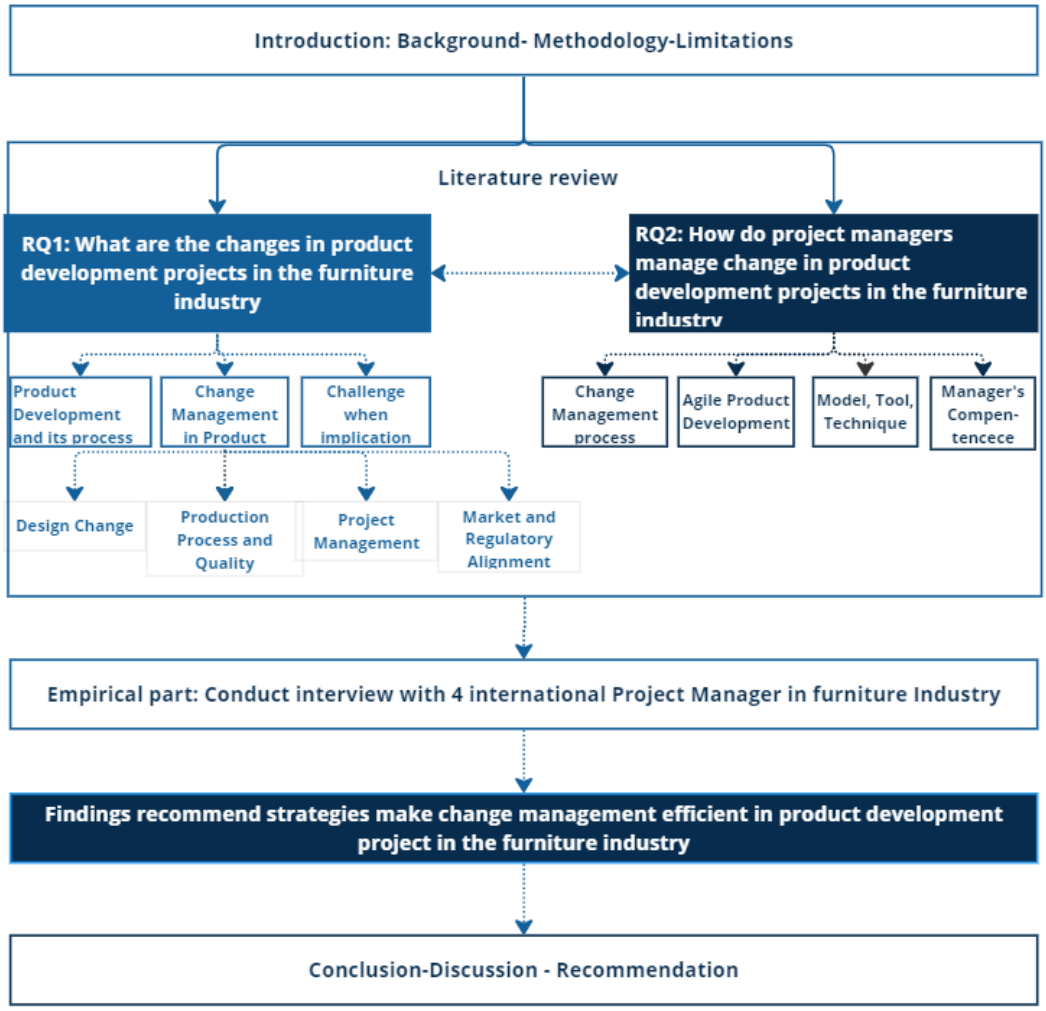

Figure 1. Framework of thesis

The literature review, as the second chapter, delves into essential topics such as product development, change management processes, agile product development, and barriers in change management. This section lays the theoretical foundation for understanding the dynamics of change within the context of the furniture industry.

Chapter 3 takes looks into the furniture industry, offering an overview and emphasizing the current challenges in managing changes. It introduces a case study that serves as a practical application of the theoretical concepts discussed earlier. The chapter sheds light on the intricacies of the product development process in the furniture industry and the challenges encountered.

Chapter 4 outlines the research methodology including design and approach, providing insights into how qualitative research, specifically in-depth interviews, was employed to capture the perspectives of Project Manager/ product Manager in Furniture industry. Case selection and data collection methods are justified, ensuring a robust and ethical research process.

The findings and approaches section (Chapter 5) unfolds the identified challenges, analyzes them, and compares the empirical results with existing literature. This part offers the understanding of the specific issues faced by the furniture industry in managing changes during product development.

Chapter 6 provides a detailed exploration of effective change management strategies, tools, models, and techniques. It draws lessons from the findings and applies them to the furniture industry, offering practical recommendations to enhance change management practices.

Chapter 7 summarizes the research findings, discusses practical implications, and suggests future research directions as well as highlights contributions to the existing literature, this final section ties together the entire thesis, providing a cohesive

conclusion to the exploration of change management in the dynamic context of furniture product development.

The structure is deliberately organized to guide readers through a logical progression, ensuring a thorough understanding of the challenges, strategies, and implications associated with change management in the furniture industry (see Table 1 below).

Table 1. Structure of Thesis

Chapter	Subchapter	Research Method	Output
1-INTRODUCTION	1.1-1.5	Literature review	Establish context, motivation, objectives, scope, and methodology
2-LITERATURE REVIEW	2.1-2.5	Literature review	Summarize existing knowledge on product development, change management, etc.
3-THE FURNITURE INDUSTRY - CURRENT CHALLENGES	3.4-3.4	Case study, Market analysis	Analyze challenges faced by the furniture industry, providing insights into market dynamics and trends
4-METHODOLOGY	4.1-4.4	Qualitative research	Describe the research design, case selection, data collection methods (interviews, surveys), and analysis techniques. Gather insights from project managers and engineers in the furniture industry
5-FINDINGS AND APPROACHES	5.1-5.4	Qualitative research	Present findings on challenges in furniture product development, analyze these challenges, and compare them with existing literature to validate and contextualize the results
6-DISCUSSION AND CONCLUSION	6.1-6.6	Qualitative analysis	Summarize and synthesize research findings, discuss contributions to the literature, highlight practical implications for the furniture industry, and suggest future research directions. Formulate recommendations for enhancing change management practices in the furniture industry

1.4 Scope and Limitations

To acknowledge the scope and limitations of this research, the study primarily focuses on the challenges related to managing changes in the furniture industry, with a specific emphasis on the product development process. While change management extends to various facets of the industry, such as supply chain management and operational processes, these areas are beyond the scope of this study. Additionally, the research is limited to the context of the furniture industry, and the findings may not be directly transferable to other industries. This study also centers on the role of an individual handling both product development and project management responsibilities.

1.5 Methodology Overview

The methodology employed in this research encompasses qualitative data collection techniques, leveraging interviews and literature review. Interviews will serve as a primary means of gathering data, allowing for in-depth exploration of the subject matter. Additionally, a thorough review of pertinent literature will complement the interview findings, providing context and theoretical frameworks.

Data analysis will involve several approaches to ensure comprehensive understanding and validity. Content analysis will be used to systematically examine interview transcripts and literature, identifying key themes and patterns. Comparative analysis will enable the researcher to compare and contrast different perspectives and findings, enriching the analysis. Triangulation of data from interviews and literature will further enhance the reliability and credibility of the results by corroborating findings across multiple sources.

2 LITERATURE REVIEW

2.1 Product Development

Product development is the creation of products with new or different characteristics that offer new or additional benefits to the customer. Product development may involve modification of an existing product or its presentation or formulation of an entirely new product that satisfies a newly defined customer want or market niche (Ullman, 2009;(Ulrich & Eppinger, 2003); (Lutters, 2014).

Product development in particular is characterized by a high complexity, dynamic and uncertainty. A new product that is introduced on the market evolves over a sequence of stages, beginning with an initial product concept or idea that is evaluated, developed, tested and launched on the market (Booz, Allen & Hamilton, 1982) see Figure 2. They also pressed there are five dimensions that assess the performance of a product development process: a) Product Quality, b) Product Cost, c) Development Time, d) Development Cost, and e) Development Capability. (Ulrich and Eppinger 2004: 2)

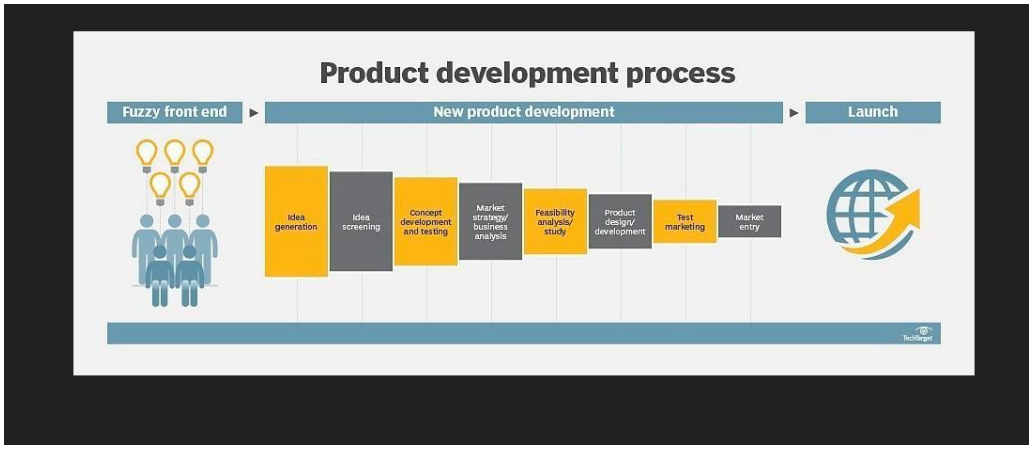

Figure 2. Product Development Process.

Menon et al. (2002)on the other hand emphasizes the learning perspective: “change, flexibility, dynamism, cooperation, invention, innovation and information utilization should be embraced” in order to expedite the process of product development.

Developing new products that fulfill existing consumers' needs, wants, and demands is at the heart of a reactive market orientated approach followed by many companies (Jaworski et al., 2000; Slater and Narver, 1998; Van Kleef et al., 2005).

The NPD process consists of stages divided into activities and decisions, to take a new product from idea to market (R. G. Cooper & Kleinschmidt, 1986). Product development processes in general can be defined as a set of activities that, taken together, produce output to customers where customers can be either internal or external (Benner & Tushman, 2003). Other authors, such as Adams (2003) and McCarthy, Tsinopoulos, Allen and Rose-Anderssen (2006), also describe the NPD process in terms of the behaviors adopted (linear, recursive or feedback loops). This description helps to understand the evolution of the NPD process over time, from linear to more recursive models.

The best-known NPD process model is the Stage Gate System (SGS) developed by R. G Cooper (1990) characterized by its sequential stages and gate reviews, this system offers a structured approach to overseeing project progress. At each gate, thorough evaluations are conducted, allowing for informed decision-making regarding the continuation, modification, or termination of projects. The details shown in Figure 3 below. Designed for large companies, this system is both a conceptual and operational model, divided into five main stages: 1) preliminary assessment; 2) detailed investigation; 3) product development; 4) testing and validation and 5) commercialization (market launch). Cooper combines a pre-stage of ideation with five gates that ensure the go/no-go decision through the process. The stages are broken down into 13 specific activities and multiple tasks required to develop a new product idea and bring it to the market.

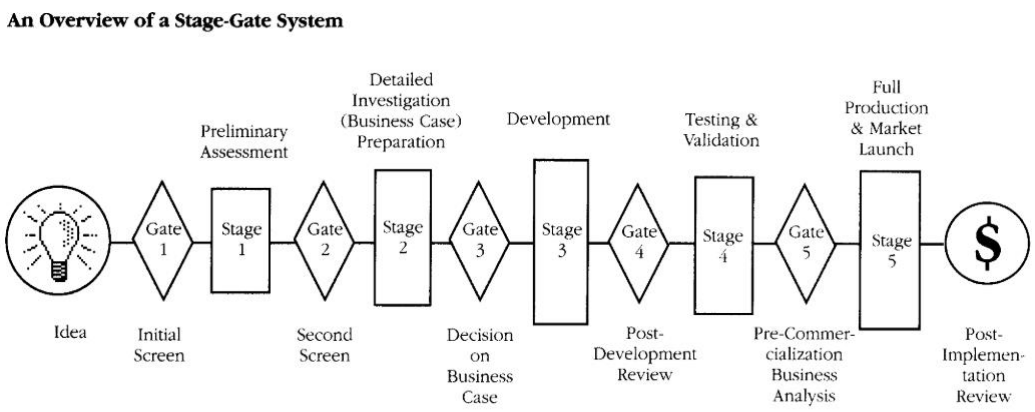

Figure 3. Overview of Stage-gate process (Cooper ,1990)

2.2 Change and Change Management

Changes are happening due to external forces and / or internal forces. External forces are market position, legislation and regulations, technology and economics related factors. Internal forces are changes in organisations and in operations, and often result of external force(Murthy, 2007,.) See details in Figure 4 below

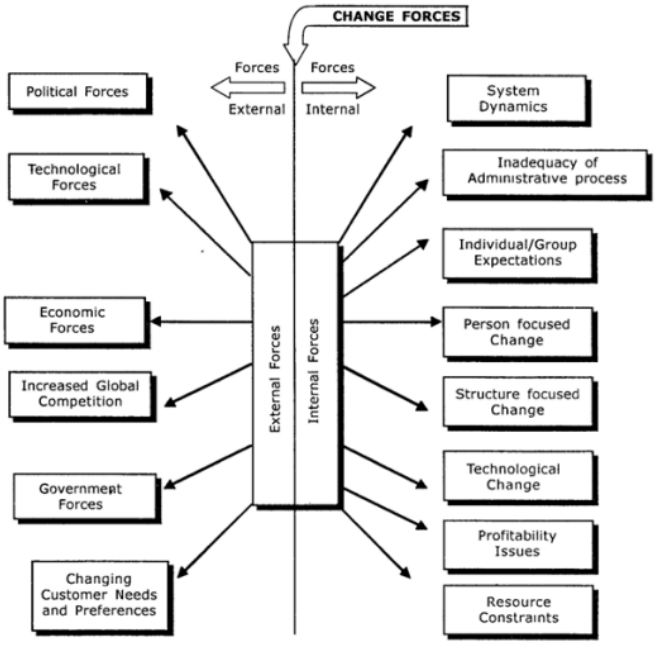

Figure 4. External and Internal Change Forces (Murthy 2007, 11)

According to Baca, change is a constant. Project managers encounter it frequently. Typically, our first instinct is to view change as a problem or something that brings negative effects. However, it's essential to realize that while change can indeed lead to difficulties, it also has the potential to bring about positive outcomes(Baca 2005)

While Cooper press that change is a necessary fact of project life, and project management must be capable of handling all types of changes. Handling changes well creates long-term business relationships and satisfies customer needs. (Cooper, 1990).

Baca, Westland, and Boles all talk about how changes in a project can have both good and bad effects. They stressed that managing these changes is crucial to make sure a project stays on track. Baca mentions three important parts of change management: having the power to accept or reject changes, knowing how to deal with changes, and keeping track of all change requests and actions takenBaca 2005). They highlight that the goal of managing changes is to make sure the project stays on time, within budget, and keeps its quality. Westland also emphasizes the importance of a process that identifies, reviews, and approves changes before they affect the project. Boles adds that the purpose of a change control process is to properly identify, document, analyse, follow, approve, and execute project change requests. All these views come together to show how different experts define and stress the importance of change management in making sure a project does not run into problems.

Change Management is the discipline that guides how we prepare, equipment and support people to successfully adopt change in order to drive organizational/project success and outcomes.

Baca (2005) introduced a comprehensive approach to Change Management Process emphasizing the need for organizations to adapt to evolving environments

effectively. The process involves several key steps, including identifying the need for change, analyzing its potential impact, planning strategies for implementation, and monitoring progress throughout. Baca's model underscores the importance of engaging stakeholders at every stage, fostering collaboration and buy-in for successful change adoption. Moreover, it highlights the significance of communication and transparency in managing resistance and ensuring smooth transitions. By incorporating feedback loops and evaluation mechanisms, Baca's Change Management Process facilitates continuous improvement and organizational resilience in the face of change refer in Figure 5 below .

Baca's model underscores the importance of engaging stakeholders at every stage, fostering collaboration and buy-in for successful change adoption. Moreover, it highlights the significance of communication and transparency in managing resistance and ensuring smooth transitions. By incorporating feedback loops and evaluation mechanisms, Baca's Change Management Process facilitates continuous improvement and organizational resilience in the face of change. Stakeholders propose changes through a transparent mechanism, with designated authority accepting or rejecting based on project goals. Impact assessments analyse the effects of changes on timelines, budgets, resources, and quality standards. A Change Control Board reviews and approves change requests, maintaining centralized documentation. Communication and coordination are crucial, requiring a clear plan to inform stakeholders and foster collaboration. Implementation involves executing approved changes, closely monitoring the process, and addressing unexpected challenges. Thorough testing and validation ensure alignment with quality standards, market trends, and regulatory requirements.

Documentation, capturing rationale and impact assessments, remains a key focus. The process concludes with stakeholder feedback and lessons learned for continuous improvement.

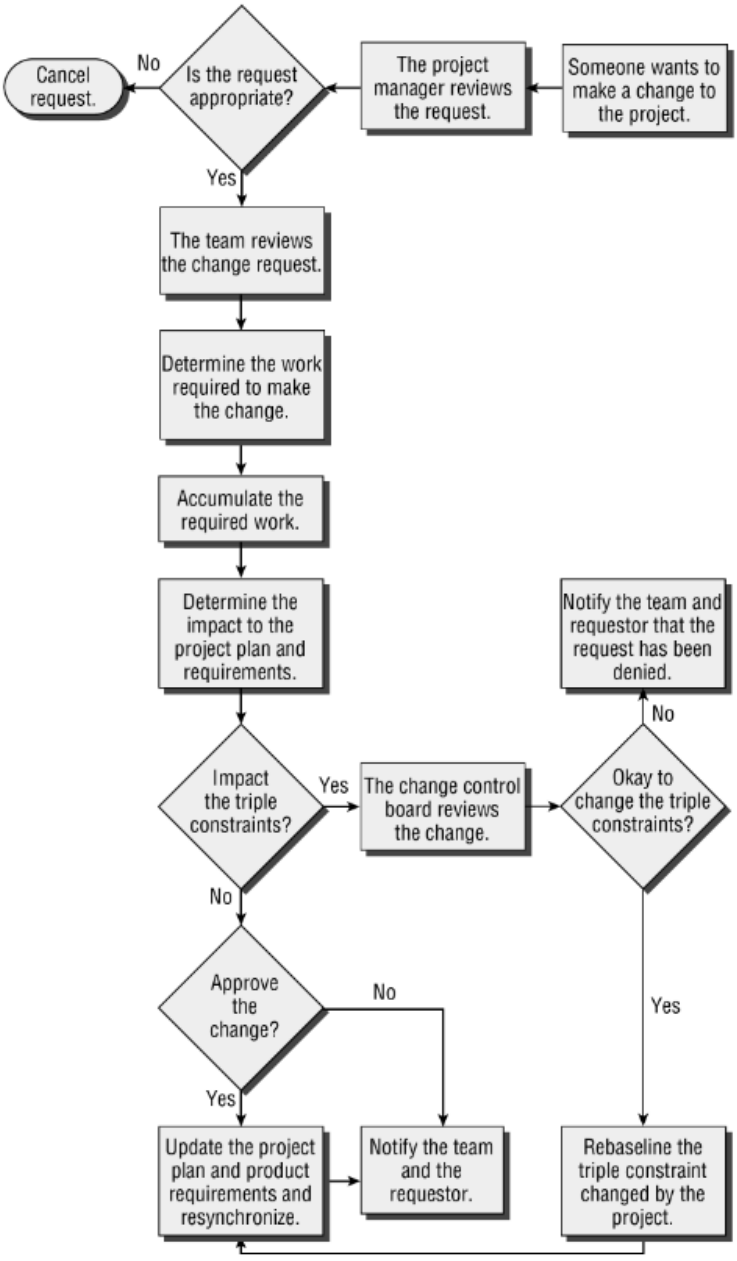

Figure 5. Change Management Process(Baca 2005)

2.3 Change Management in Product Development

Changes during product development are troublesome and costly (Turner 1999, Hooks and Farry 2001). Making changes during product development can be difficult and expensive. In industries with a lot of uncertainty, like furniture industries, it's almost impossible to avoid changes. Wu and others say that: ‘‘perfect design is unrealistic and thus design changes are inevitable’’. In unpredictable business environments, it's clear that we cannot fully control technical and market changes

External forces beyond project control, such as political, economic, environmental, and third-party factors, contribute to some changes in product development projects. These external factors, including climate, hazards, or civilian complaints, can be particularly challenging to control in certain project environments, as noted by Wu et al. (2005) in the context of a road construction project. In uncertain business environments, technical and market changes are recognized as elements that cannot be fully controlled, reinforcing the need for adaptable change management strategies (Brown and Eisenhardt 1995).

Change Management in Product Development is vital for navigating the dynamic nature of projects. It systematically handles alterations in design, production processes, and project strategies, ensuring effective management of changes. The goal is to minimize disruptions, maintain continuity, and facilitate a smooth transition. This proactive approach is crucial in projects where adaptability and responsiveness to market trends and regulations are paramount. Change Management involves identifying, evaluating, and implementing changes with consideration for resource allocation, quality maintenance, and compliance with industry standards. It not only ensures project outcomes but also fosters an organizational culture embracing innovation for long-term success in a dynamic environment.

In project change management, maintaining continuity and addressing disruptions are crucial for overall operational flow. It helps manage stakeholder resistance and encourages acceptance, essential in projects with workflow, process, or tech

changes. This fosters success by securing cooperation and support, maintaining team and project performance for organizational efficiency during transitions. The proactive approach cultivates adaptability, contributing to long-term success and openness to new methodologies while preserving operational integrity

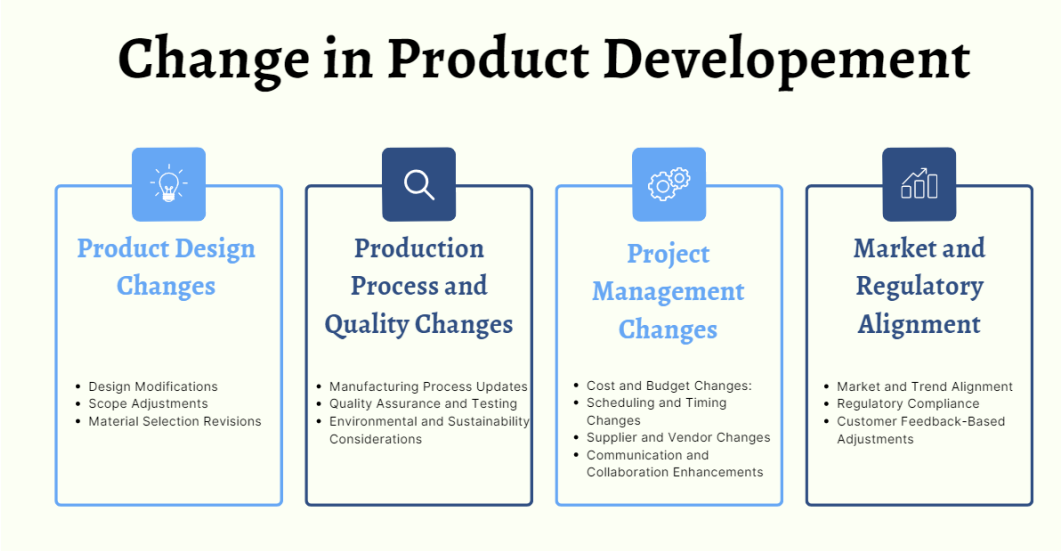

Figure 6. Changes in Product Development Project

In essence, change management is a proactive strategy for recognizing and managing project modifications in a structured and controlled manner. If changes are being handled effectively in project management, results in projects are being completed as planned, meeting deadlines, staying within budget, and maintaining the specified quality standards. We will study what are typical changes in product development project see Figure 6 above and following sub chapter 2.3.1 to 2.3.4.

2.3.1 Product Design Changes

Product design changes are a fundamental aspect of the development process. Wu et al. emphasize that achieving a perfect design is unrealistic, making design changes inevitable. These alterations can be sparked by evolving customer requirements, shifts in market demand, or the need to address unforeseen technical challenges. The study conducted by Dvir and Lechler distinguishes between plan changes induced by external factors and goal changes related to project

scope(Dvir & Lechler, 2004) .Product design changes are essential for adapting to dynamic environments and ensuring that the final product aligns with customer needs

2.3.2 Production Process and Quality Changes

The production process takes resources, such as raw materials, labor, capital and equipment, and turns them into finished goods or services for consumers. The goal of the production process is not only to produce but to do so efficiently. The goods or services should be delivered to customers as quickly as possible see Figure 7.

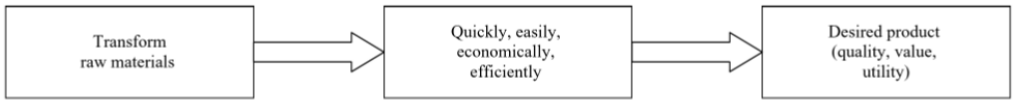

Figure 7. Definition about Manufacturing

Changes in the production process, quality have an important impact on product development projects. Whether driven by external pressures or initiated voluntarily, modifications to the manufacturing process introduce variables that can affect the project's triangle. Forced changes, like supplier disruptions or customer complaints, demand swift adjustments to uphold project timelines. Conversely, voluntary changes, such as equipment upgrades or improvements in quality control methods, aim to boost efficiency but require careful planning to mitigate potential disruptions. Assessing the impact of these changes on product quality, project timelines, and overarching goals is crucial. Managing these changes through a structured approach, including a formal change control system, ensures that modifications align with project objectives. The Wheel of Manufacturing Enterprise, outlined by the Society of Manufacturing Engineers in 1994 (see Figure 8), is a conceptual framework that illustrates the various components essential for the functioning of a manufacturing enterprise. It helps organizations visualize and un-

derstand the interdependencies between different functions within a manufacturing environment, facilitating better decision-making and optimization of operations

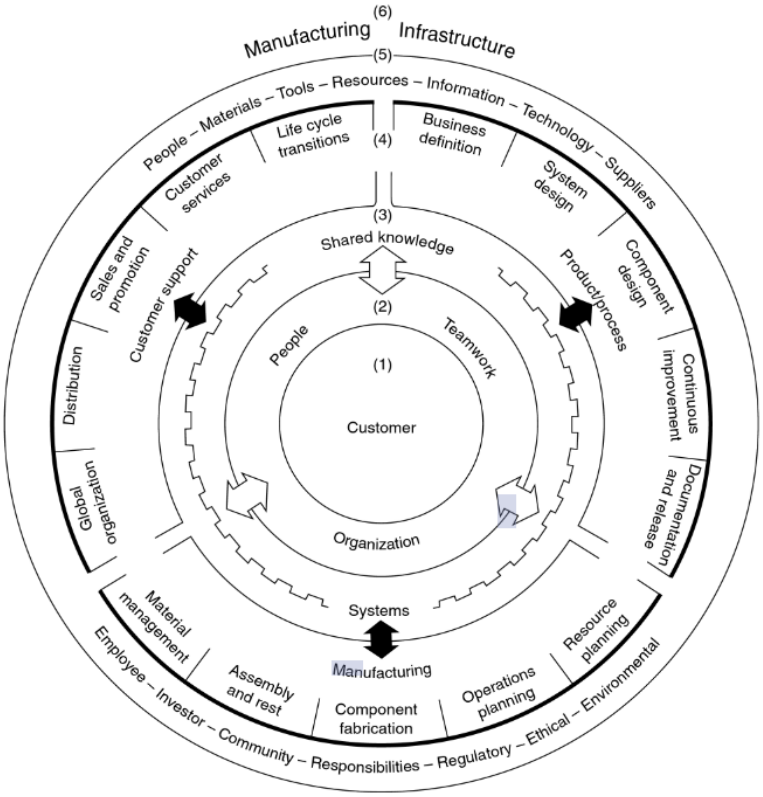

Figure 8. The wheel of manufacturing enterprise (outlined by the Society of Manufacturing engineer ,1994)

Moreover, we are kept discussion about lean manufacturing, optimization, sustainability, and automation are driving changes in production processes. Companies are adopting lean principles for efficiency, exploring new technologies for optimization, and focusing on sustainability by aligning with eco-friendly practices. The integration of automation, including robots and semi-automated solutions, is a significant trend aiming to improve precision and reduce manual labour. The common theme is continuous improvement, pushing companies to adapt to technological advancements and evolving market standards.

2.3.3 Project Management Changes:

PMBOK 6 edition mentioned Change management as apart of Perform Integrated Change Control process. Changes are essential when adjustments to the scope, time, or cost previously approved project deliverablesbecome necessary, often impacting the project budget and schedule (Project Management Institute, n.d.) (see Figure 9)

Change management in a project refers to the structured process of planning, implementing, and controlling changes to various aspects of a project. Changes can occur in project scope, schedule, budget, or any other element that impacts the project's objectives.

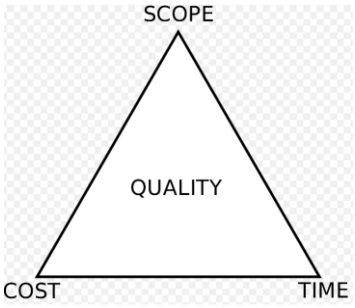

Figure 9. Project management triangle (PMBOK)

Change management in project management encompasses anticipatory, reactive, incremental, and strategic approaches. Anticipatory change involves preparing for expected modifications, while reactive change requires swift responses to unforeseen circumstances. Incremental change is gradual, focusing on continuous improvements, and strategic change involves well-analysed developments for significant overhauls to boost competitiveness. These diverse approaches provide project managers with the flexibility needed to navigate various change scenarios effectively

2.3.4 Market and Regulatory Alignment

Customers are one of the key sources for new product development projects, and understanding customer needs is required to ensure product success (John Wiley & Sons, 2005).

Although direct customer participation in product development does not always guarantee the desired outcomes, engaging with customers serves as a valuable tool to mitigate uncertainty and gain insight into their future requirements more effectively

The special needs of market-driven product development include balancing different requirement types, market-pull and technology-push trade-off, and release planning and requirement selection(Dzamashvili Fogelström et al., 2010)

Recognize and adapt practices based on the nature of the market. Understand the differences between business-to-business (B2B) and business-to-consumer (B2C) markets and tailor approaches accordingly. Besides, requirement engineering software tools alone cannot solve the problems. Recommended practices include a systematic way of working and small cross-functional teams during product definition. Early handovers between product management and R&D should be avoided. In addition to internal collaboration, product management and R&D professionals should aim for some direct contact with selected external customers, not only for clarifying the real and project specific needs, but also for building overall understanding to meet diverse needs better.

On the regulatory front, the discussion focuses on changes in environmental standards, safety regulations, and the emphasis on ethical sourcing practices. Strategies for dealing with regulatory alignment changes include comprehensive compliance training programs, embedding compliance in design thinking, implementing continuous monitoring and auditing processes, and securing leadership support for compliance. Together, these two main categories encapsulate the

multifaceted considerations in steering furniture product development projects through evolving market and regulatory landscapes

2.4 Leading the change

2.4.1 Project Manager's Competence for Leading Change

A widely accepted perspective posits that Project Managers function as drivers of change, assuming the role of change agents (Müller & Turner, 2010) This viewpoint emphasizes their pivotal position in shepherding projects through transitions and underscores the notion that effective project management inherently involves managing and steering change processes. When talk about Project Manager's competence, It is truly an oversight when we do not mention IPMA which is a global standard for individual competence in project.

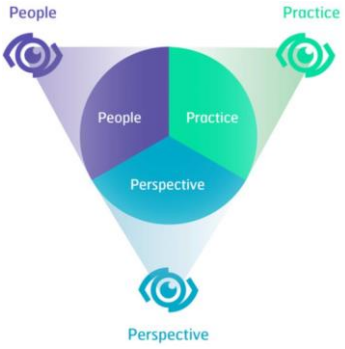

Figure 10. The Eye of Competences (IPMA)

Besides, R.W. Quinn & R.E. Quinn (2016) argue that change management and leadership development should be a connected topic. Changes in corporate culture and behaviours are hard to maintain without effective leadership. Therefore, the concepts of change management and change leadership are intertwined.

Understanding the drivers, pace and unpredictability of change, however, does not mean that firms know how to manage change (Ulrich et al., 1997;Conner, 1999).

Moreover, Higgs & Roland(2000)points that there are 8 cluster needed for change management competency frameworks which show in Figure 11 below

Table 5 The full change management competency framework

Competency cluster	*Competency indicators*
Change Initiation (CIN); ability to create the case for change and secure credible sponsorship	— Surfaces issues — Demonstrates impact of issues on performance — Influences key sponsors — Secures sponsor commitment
Change Impact (CIM); ability to scope the breadth, depth, sustainability and returns of a change strategy	— Scope of thinking — Depth of impact (systematic thinking) — Reframing — Identifies 'returns on change'
Change Facilitation (CF); ability to help others, through effective facilitation, to gain insight into the human dynamics of change and to develop the confidence to achieve the change goals	— Manages human dynamics — Encourages and supports self-management — Conflict management — Process management
Change Leadership (CL); ability to influence and enthuse others, through personal advocacy, vision and drive, and to access resources to build a solid platform for change	— Networking — Relationship building — Personal impact — Sells ideas
Change Learning (CLE); ability to scan, reflect and identify learning and ensure insights are used to develop individual, group and organisational capabilities	— Coaching — Listening and inquiry — Knowledge management
Change Execution (CEX); ability to formulate, and guide the implementation of a credible change plan with appropriate goals, resources, metrics and review mechanisms	— Organisation savvy — Manages resistance — Journey design — Journey management
Change Presence (CP); demonstrates high personal commitment to achievement of change goals through integrity and courage, while maintaining objectivity and individual resilience ('a non-anxious presence in a sea of anxiety')	— Courage — Resilience — Authenticity — Objectivity
Change Technology (CT); knowledge, generation and skilful application of change theories, tools and processes	— Theories — Tools — Processes

Figure 11. The change management competency framework (Higgs & Rowland, 2000)

2.4.2 Change Model, Tools and Techniques

Change model is a framework for any project or programme that is seeking to achieve transformational, sustainable change.

Table 2 below shown the ideation (Ceptureanu, 2015) Change tools at SMEs are categorized into planning, implementing, and communicating change.

Table 2. Change management tool category (Ceptureanu, , 2015)

PLANNING CHANGE	IMPLEMENTING CHANGE	COMMUNICATING CHANGE
Impact Analysis Burke-Litwin change model McKinsey 7S framework Leavitt's diamond Organization design SIPOC diagrams	Kotter's 8-step change model Training needs assessment	Stakeholder analysis Stakeholder management Mission statements and visions statements

When choosing a change model, it is important to consider the specific goals, challenges, and cultural aspects of project. Additionally, involving key stakeholders and employees in the change process and providing effective communication throughout are critical factors for successful implementation.

Establishing a successful change management system is crucial, involving alignment among the project manager, sponsor, and team. Key considerations include the role of the change control board, timing for planning and baselining, and synchronization from the project's outset.

Nilsson et al. (2000) stress the importance of information as one of the key factors for success. They emphasize that information serves as a catalyst for innovation and adaptation, enabling organizations to identify opportunities, anticipate challenges, and navigate complex environments with agility and foresight. Further-

more, they argue that a culture that values and promotes information sharing fosters collaboration, creativity, and synergy among team members, ultimately driving organizational performance and competitiveness.

Data management systems are built on data management platforms and include a range of components and processes that work together to help you extract value from the data. These can include database management systems, data warehouses and lakes, data integration tools, analytics, and more (SAP website) see detail in Figure 12

Product data management (PDM) is the technology and associated software systems that support the management of both engineering data and process information during the product development phase and beyond(Chang, 2015)

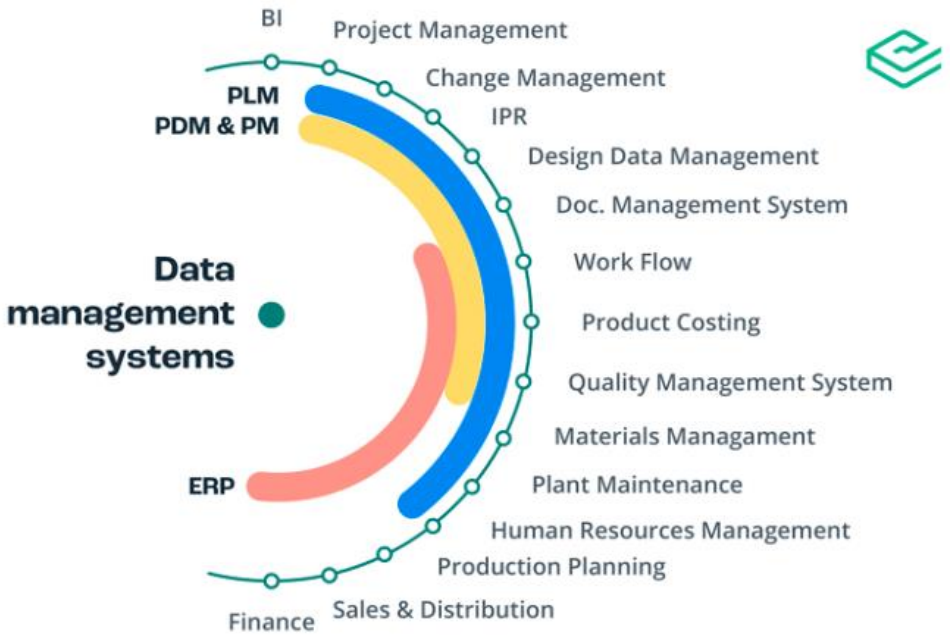

Figure 12. Data management system (source: Internet)

Chlebus et al. (1998) mentioned that PDM have 2 main functions: Engineering and Data Management which details show in Table 3 below.

Table 3. Function of Product Data Management system(Chlebus et al., 1998)

Engineering	**Data Management**
Product specification	Workflow determination
Product Structure	management version
CAD model and drawings	Change Management
Part Structure	Project planning and management
Manufacturing Plan	Team data management
Machining instruction	Technical controlling
NC Program	Interface to PPC/MRP system
Production and order management	

Project management tools offer invaluable benefits, particularly in the realm of change management. These tools streamline communication, enhance collaboration, and provide transparent documentation, ensuring that teams can effectively navigate and implement changes. With features like real-time updates, efficient task management, and resource allocation capabilities, project management tools empower organizations to proactively address risks and adhere to timelines. Furthermore, they facilitate historical data analysis, enabling continuous improvement in future projects. In the context of change, these tools foster engagement with clients and stakeholders, ultimately contributing to the overall success and efficiency of the project.

2.4.3 Agile and Hybrid Approach(Agile and Stage-Gate)

According to Schmidt et al. (2018), the motivation which lead company using Agile as “they want to improve communication, reduce reaction time to changes, increase project effectiveness, shorten product development and improve the adherence to schedule”

Designing parts and components using CAD programs is a well-established practice, and digital prototypes can be quickly and easily created for assessment (Grieb, 2010, p. 52). However, to determine the feasibility of an idea before engaging in virtual UX testing, it is essential to boost confidence. Simulation tools offer a solution by allowing virtual testing of parts and components, a common design approach (Karlberg et al., 2013, p. 70). Simulations, often based on CAD models and leveraging FEM and/or CFD methods, enhance confidence levels. Yet, these simulations often neglect production characteristics, leading to the eventual production and testing of real prototypes to accurately predict their behavior (Lashin & Stark, 2021, pp. 1144).

´´*Agility - based on the system triple approach - is the ability of an operating system to continuously check and question the validity of a project plan with regard to the planning stability of the elements of the system triad and, in the case of an unplanned information constellation, to adapt the sequence of synthesis and analysis activities according to the situation and requirements, thereby specifically increasing the benefits for customers, users and providers*`` (Albers et al ,2019).

For furniture industry, physical product, time restrictions due to waiting or manufacturing times and physical restrictions, such as physical limitations or splitting into appropriate increments, present the Agile development with great challenges.

There are four groups of interpretations of Agile, encompassing team collaboration, customer integration, task management, and fast learning through prototyping

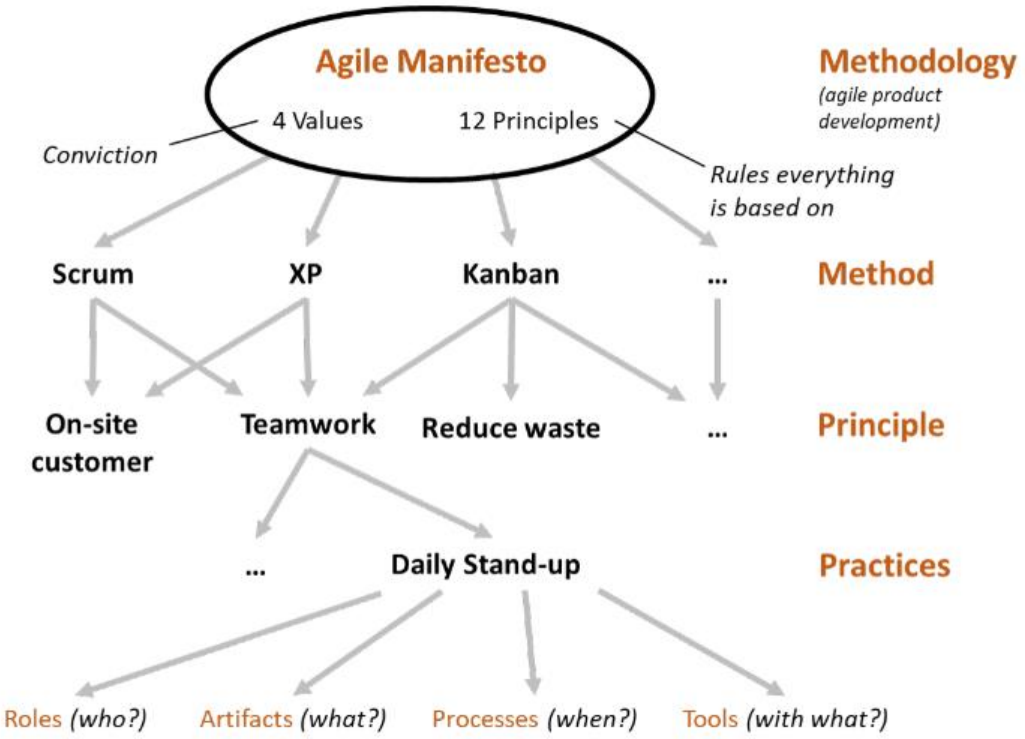

Figure 13. Agile approach (Schmidt et al., 2021)

The hypothetical framework to structure and define often used terms in the context of agile development are shown in Figure 13.

The "Hybrid" approach - Agile and Stage-Gate in new product development and innovation processes combines elements of Agile methodologies and traditional Stage-Gate models. Empirical studies, such as those conducted by researchers like (R. Cooper & Sommer, 2018)., (Conforto & Amaral, 2016), and Grushka-Cockayne, have explored the effectiveness of hybrid models in various industries beyond software development. Results suggest that industrial companies implementing Agile/Stage-Gate hybrids can achieve substantial performance benefits, balancing stability with flexibility. The studies propose frameworks such as the Industrial Scrum, combining Agile and Stage-Gate, and highlight positive impacts on project and product development performance.

The adaptability of the hybrid model is particularly beneficial for lead user projects, providing a management framework that is both reproducible and responsive to the unforeseen.

Cooper (2016) investigated two large-company best-practice examples to illustrate how to run a hybrid model. He claimed that for physical product developers, an agile/stage-gate hybrid product development model is feasible and may yield positive results in Table 4 below shows the benefits and challenges of hybrid approach

Table 4. Advantages of a Hybrid approach

Advantage	Description
Improved Product Precision	Ensures early and cost-effective development. allowing for quick customer feedback and aligning with the idea that customers may not know what they want until they see it
Adaptability to Uncertainty	Accommodates projects with high innovation by promoting experimentation, trial and error, and establishing requirements during the solution-finding process
Accelerated Development	Time-boxed sprints introduce urgency, focusing on essential deliverables within fixed timeframes, contrary to traditional approaches fixated on comprehensive lists of requirements
Focused Teams	increase speed by ensuring adequate resources and focus on a single project, avoiding the common issue of under-resourced and slow-moving traditional project teams.
Enhanced Communication	incorporating dedicated teams, designated spaces, and daily face-to-face scrums, fosters improved within-team communication. This contributes to more effective, cross-functional teams and higher success rates in new product development

The benefits of the Agile-Scrum hybrid, such as improved communication, adaptability, accelerated development, and focused teams, contribute positively to change management efforts. They create an environment that is more conducive to embracing and adapting to the changes introduced by the new methodology.

2.4.4 Barriers and Challenges in Change Management

Gill (2003) identified that change programs fail because of *inefficient management.* According to Kotter, the most common reason companies fail is due to of lack of experience with successful changes. Poor management, leadership and lack of knowledge create negative feelings among employees, such as self-protection, arrogance, pessimistic attitude or general immobilization. (Kotter 2014)

Wang (2017) analyzed failures at Walmart, JCPenney, and Borders. Poorly received business models (Walmart, JCPenney) and resistance to technology (Borders) led to obsolescence. Common factors include inadequate stakeholder involvement, weak market strategies, and inability to adapt (Wang 2017)

By acknowledging and addressing emotional reactions of individual/ team member through change process, project managers can enhance the overall success of change implementation. This understanding allows for the development of targeted interventions and adjustments to the project plan as needed. That's time Project manager should understand The Kübler-Ross Change Curve (fig 14)

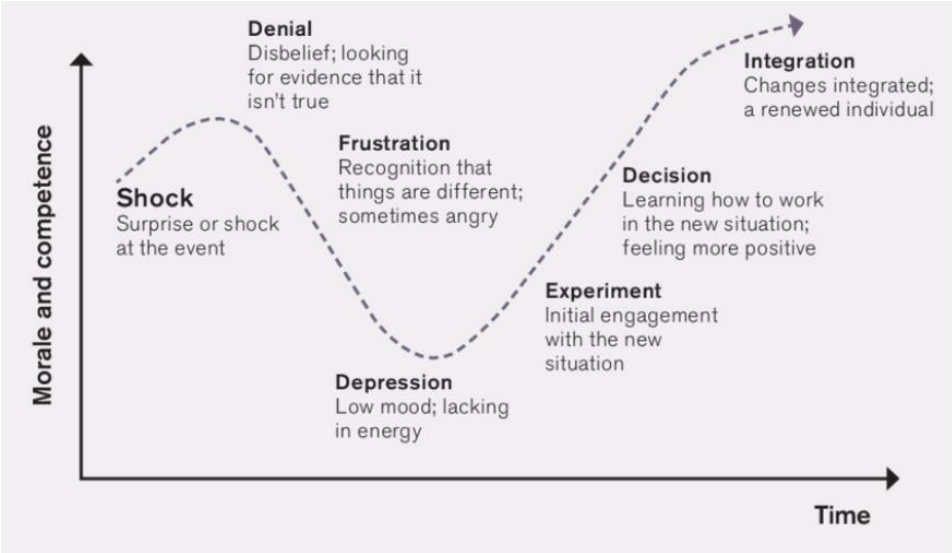

Figure 14. The Kübler-Ross Change Curve

Significant volumes of information are generated during product development which are then used to create catalogues, bills of materials and support a variety of processes that include production, test, operation, inventory management and maintenance. The modification process also leads to the creation of multiple product variants in the supply chain. This makes it harder to determine the relevant information about a design modification that needs to be communicated to customers and suppliers.

Challenges face in managing and communicating design changes, the potential divergence in product designs over time, and the importance of addressing these issues for continued safe operation and compliance.

The case study illustrates real-world challenges in designing and implementing a change management process, including resource constraints, negotiations, and unexpected change requests (. Baca 2005).

3 THE FURNITURE INDUSTRY - CURRENT CHALLENGES IN MANAGING CHANGES

3.1 Furniture industry Overview

The global furniture market, currently valued at $516.66 billion, is poised to reach $780.43 billion by 2030, reflecting a substantial 5.36% compound annual growth rate (CAGR). This impressive growth is underpinned by a heightened demand for aesthetically pleasing household furnishings, such as sofas, stools, and chairs, as consumers seek to enhance their living spaces (see below Figure 15). Despite initial challenges during the COVID-19 pandemic, including upholstery shop closures impacting sales, the industry witnessed a surge in demand for ergonomic furniture due to the widespread shift to remote work, coupled with a significant increase in online shopping.

While the furniture sector benefits from global and regional vendors and finds momentum from the real estate sector and cost-efficient producers in China and Vietnam, it faces critical challenges. The industry is navigating a landscape marked by increased demand for adaptable and portable furniture, driven by residential and infrastructure growth. However, these growth opportunities are counterbalanced by challenges related to rising material costs and a scarcity of skilled labor.

Notably, effective management of change is pivotal for the industry's sustained success. The furniture sector is inherently dynamic, influenced by evolving styles, materials, and functionalities. As consumer preferences evolve, companies must adeptly adjust their product development processes to remain competitive. Furthermore, the integration of new technologies in furniture design and manufacturing presents a significant challenge. Embracing innovative materials, production techniques, and smart technologies necessitates substantial changes in traditional methods and skill sets. Successfully managing this technological shift while ensuring a seamless transition for the workforce is a complex but crucial task for industry players.

Moreover, the growing emphasis on sustainability and environmental considerations adds another layer of complexity. Adapting product development strategies to align with eco-friendly practices and materials requires substantial changes in manufacturing processes, sourcing, and overall business models. The global nature of the furniture supply chain further underscores the importance of effective change management. Successfully navigating change in a distributed and interconnected network of suppliers, manufacturers, and distributors demands robust communication, coordination, and adaptability.

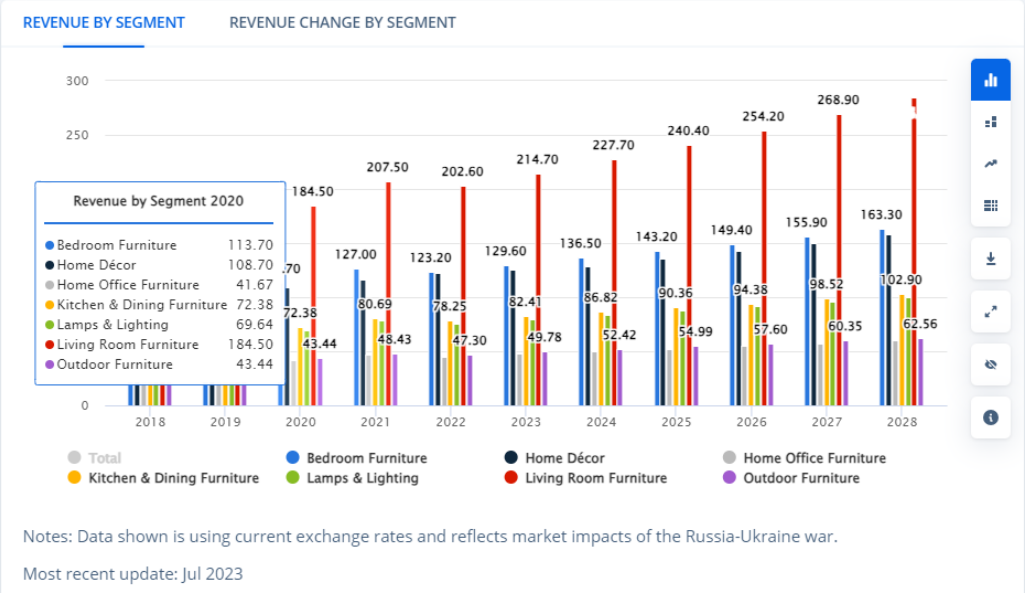

Figure 15. Revenue by Segment 2020 Furniture Industry (Statista Market Insights)

3.2 Case Study Introduction and Rationale

Product development projects in the furniture industry across the Asian region face distinctive challenges. Despite the significant contributions of countries like Vietnam and China to the global furniture market, there are hurdles that impact the product development process. One notable challenge lies in the balance between tradition and modernization. Many Asian countries, deeply rooted in craftsmanship and traditional techniques, encounter difficulties in seamlessly integrat-

ing innovative design and manufacturing technologies into their product development projects. Moreover, the diverse consumer preferences both domestically and internationally add complexity, necessitating adaptability in design and production. Additionally, the rapid evolution of global market demands poses a constant challenge for Asian furniture manufacturers to keep pace with changing consumer needs. The need for sustainable practices further complicates product development, as companies navigate the incorporation of eco-friendly materials and processes. Overall, while Asia remains a powerhouse in the furniture industry, the dynamic nature of product development projects underscores the necessity for continuous innovation, adaptability, and the harmonization of traditional craftsmanship with contemporary demands. As a result, embracing change through agile methods, original designs, and adaptive strategies is crucial. To thrive, the industry must foster creativity, integrate market insights, and evolve with consumer needs for sustained success. The main changes during a furniture development project are looked into next.

Product Design Changes include design modifications, scope adjustments and material revisions.

Design modifications include changes to the aesthetics, structure, and dimensions of furniture products. For example, altering the shape of a chair, changing the upholstery fabric, or updating the style of a sofa.

Scope adjustments are changes to the scope may involve adding or removing specific features or functionalities from a furniture piece. For instance, deciding to include additional storage compartments in a cabinet or simplifying the design of a desk.

Material selection revisions refer to adjustments in the types of materials used in furniture production, which can affect product quality, durability, aesthetics, and sustainability. For example, switching from traditional wood to sustainable and eco-friendly materials.

Production Process and Quality Changes include manufacturing process updates, quality assurance and testing, environmental and sustainability ….

Manufacturing process updates refer to modifications in the production methods and techniques used in furniture manufacturing. Changes might involve adopting new machinery or assembly methods to improve efficiency and quality.

Quality assurance and testing: Enhancements in quality control processes and testing methodologies to ensure that furniture products meet or exceed quality standards. This can involve stricter quality checks or implementing advanced testing technologies.

Environmental and sustainability considerations: Changes made to align furniture manufacturing with environmental sustainability goals, such as using reclaimed materials, reducing waste, and minimizing the environmental impact of production processes.

Project Management Changes include cost and budget change, scheduling and timing change, supplier and vendor change, communication and collaboration enhancements.

Cost and budget changes: Budget-related adjustments that may arise from design or material changes. These changes could involve increasing or decreasing the allocated budget for specific components or phases of a furniture product development project.

Scheduling and timing changes: Modifications to project timelines and delivery dates to accommodate design changes or unexpected delays in the production process.

Supplier and vendor changes: Alterations in supplier relationships, such as selecting new suppliers, changing material sources, or revising procurement strategies to ensure a steady supply of materials.

Communication and collaboration enhancements: Improvements in how project information is communicated within the project team and with external stakeholders, such as suppliers, manufacturers, and retailers. Effective collaboration is crucial to ensure that changes are well-coordinated and executed.

Market and Regulatory Alignment include market and trend alignment, regulatory compliance, customer feedback-based adjustments

Market and Trend Alignment: Adaptations made to furniture products to meet evolving market trends and customer preferences. This may involve staying updated on the latest design trends and incorporating them into product development.

Regulatory compliance: Adjustments to ensure that furniture products meet industry regulations, safety standards, and environmental requirements. Staying compliant with local and international regulations is crucial.

Customer feedback-based adjustments: Modifications based on customer input and feedback, such as addressing common complaints or adding features, function that customers have requested after review design, prototype or mockup. Customer satisfaction and feedback play a significant role in product development.

4 METHODOLOGY

4.1 Research Design and Approach

This study applies a qualitative research approach to study deeply the complexities of change management within the furniture industry, with a specific focus on the product development process. Qualitative methods, particularly in-depth interviews, provide a nuanced understanding of the strategies, tools, and steps undertaken by management-level professionals in identifying and managing changes.

4.2 Case Selection and Justification

The case selection for this research involves a purposeful and strategic approach to gain in-depth insights into change management within the furniture industry in the Asia area, specifically focusing on the product development project. Four project managers with substantial international experience from 2-20 years in furniture product development were selected for interviews. The justification for this case selection lies in the richness of perspectives these professionals bring, considering their varied experiences in navigating the complexities of change in the industry.

The criteria for selecting these cases include their extensive background in managing product development projects, ensuring a depth of knowledge and practical insights. The international experience of the project managers adds a global dimension, considering the furniture industry's diverse landscape and global market trends. The selection also emphasizes professionals with a long-standing history in the field, aiming to capture nuanced insights resulting from their seasoned expertise.

By including project managers from different companies within the furniture sector, the research anticipates diverse viewpoints and practices in dealing with

change. This diversity contributes to a comprehensive understanding of the challenges and strategies employed in various organizational contexts.

The case selection, therefore, aligns with the research objectives, seeking a nuanced exploration of change management in the furniture industry, enriched by the experiences and expertise of the chosen project managers.

4.3 Reliability and Validity of Case Study

Data collections methods are evaluated based on reliability and validity (Silverman, 2011). Reliability refers to the stability of findings, where validity as represents the truthfulness of findings (Silverman, 2011, p.360). Reliability is "degree to which the findings of a study are independent of accidental circumstances of their production" (Silverman, 2011, p.360). Validity discusses the problem of whether an account accurately represents the social phenomena to which it refers (Hammersley, 1990, p.57). Yin (1994) provides guidelines on how the issues of reliability and validity are addressed in qualitative research (see Table 5) below.

Table 5. Case Study Tactics for Four Design Tests (Yin,1994- p33)

Test	Case Study tactic	Phase of research
Construct validity	Use multiple sources of evidences Establish chain of evidence have key informants review draft case study report	Data collection Data collection Composition
Internal validity	Do pattern matching or explanation building or time- series analysis	Data analysis
External validity	Use replication logic in multiple case study	Research design
Reliability	Use case study protocol Develop case study database	Data collection Data collection

4.4 Data Collection Methods

Empirical material is gathered through semi-structured interviews conducted with 4 project managers and 1 project engineer all possessing international working experience in the furniture industry. This diverse sample ensures a comprehensive

exploration of varied viewpoints. Ethical considerations, including informed consent and confidentiality, are meticulously adhered to throughout the data collection process.

The collection and analysis of data were carried out in 2 steps. First, respondents received an online questionnaire to describe their company, their product development project as well as their own profile before interview. In this questionnaire, the first respondents were asked to answer both closed and open-ended questions. The open-ended questions allowed the addition of useful information about activities/tasks carried out in the product development project.

In the second step, an interview was conducted. The interview conducted follow theorical framework. All interviews, which lasted approximately 45 min, were not recorded but the researcher was noted and transcribed in verbatim form. See Table 6 for summary of interviewees.

Table 6. Summary of Interviewees

Name	Title	Experience in Furniture(Years)	Project manager´s experience(years)	Date of interview
A	Product Manager	>5	<10	12/12/2023
B	Senior Project Manager	>10	>10	15/12/2023
C	Head of product Development	>15	>20	20/12/2023
D	Junior Product Manager	<5	<5	23/12/2023
E	Project Engineer	>10	N/A	23/12/2023

4.5 Data Analysis Techniques

In analysing the data gathered from interviews with four experienced project managers in the furniture industry, the research employs a qualitative approach, pri-

marily focusing on thematic analysis. A thematic analysis involves a systematic examination of interview transcripts to identify recurring themes and patterns. As each interview is transcribed, the researcher reads and re-reads the text, identifying codes that represent specific topics or concepts related to change management in furniture product development. These codes are then organized into overarching themes, offering a comprehensive understanding of the challenges faced by project managers in implementing changes. The analysis also incorporates elements of the constant comparative method, ensuring a continuous refinement of codes and themes as new data emerges. Additionally, a framework analysis is applied, using pre-defined categories to structure the interpretation of the data. Through these methods, the research aims to uncover valuable insights into the complexities of change management in the furniture industry, as perceived by seasoned project managers with extensive experience in product development.

Throughout the data analysis process, ethical considerations will be prioritized. The confidentiality of participants will be strictly maintained, and the reporting of results will focus on aggregating insights without revealing individual identities. The study will adhere to ethical guidelines, ensuring respect for participants' privacy and the responsible handling of sensitive information.

5 FINDINGS AND APPROACHES

5.1 Findings from Interviewees

The insights gathered from various experienced professionals in the furniture industry provide a comprehensive understanding of the changes, challenges, and effective strategies in product development projects. Each interviewee brings a unique perspective based on their years of experience and role within the industry. The findings uncover a diverse range of experiences and perspectives in the furniture industry regarding change management in product development. Emphasis is placed on customer needs, adaptability, and effective communication as crucial elements for successful change management. The industry is also open to drawing insights from other sectors to enhance its approaches to design, production, and customer satisfaction.

5.2 Analysis of Findings

5.2.1 **Changes in Product Development Projects in the Furniture Industry**

Changes in Product Design: Interviewees A, B, C,D and E identify shifts in product design as a significant change in recent projects. Interviewee B: "*Recently, I developed a chair, going through 8 different versions in just two months, mean we change design 8 times totally*". These changes are likely influenced by factors such as market trends, customer preferences, and competitive dynamics.

Market dynamic and Sustainability: Interviewee C highlights the industry's adaptability to annual trends in materials, colour, and style, emphasizing the need for designers to stay informed ."*Each year, we have new trends; it can be material, colour, style...* Market dynamics, as noted by Interviewees A, C, and F, underscore the importance of adapting to trends and consumer shifts. This includes a shift towards sustainability, reflecting the industry's commitment to meeting evolving

consumer preferences and environmental considerations (Interviewee B: "*understanding and aligning with customer lifestyles are vital for developing products that meet their needs and preferences* "). Interviewee C specifically mentions using platforms like World Global Style Network for staying updated, with a notable industry shift towards sustainability, reflecting a commitment to eco-friendly manufacturing and meeting consumer preferences.

Modernization of Production Processes*:* Interviewees B, D, and E highlight the modernization of production processes with advanced machinery, leading to improved quality. This technological advancement is a shared observation, reflecting a broader industry move towards more efficient and high-quality manufacturing. Interviewee B specifically notes the use of modern machines in the production process: "*We need to change the list of products because we will be utilizing a robot for welding aluminium chairs* ".

Technological Advancements*:* The integration of modern machines and technology tools in the production process, as mentioned by Interviewee B, and the acknowledgment of staying informed about technological advancements by Interviewee C, reveal a proactive approach to adopting innovations (Interviewee B: *"using modern machines"*; Interviewee E: *"stay informed about technological advancements"*). This reflects the industry's recognition of the role technology plays in enhancing efficiency, precision, and overall product quality. The adoption of these advancements demonstrates a commitment to staying competitive in a technologically evolving landscape.

Project changes were totally acknowledged by all five interviewees as significant aspects of product development. These changes encompass various dimensions, including alterations to design, cost, and project timelines. Interviewee C: " *Project is simple if customer want to change specs or function of product at very first step*" . For instance, as highlighted by Interviewee B's example of developing a chair with 8 versions in two months, it illustrates that both the timeline and cost of the project are subject to definitive changes. Interviewee B: *"definitely we have to delay*

the launching date, spend a lot of money , resource for this". This consensus among the interviewees underscores the dynamic nature of project management in product development, where adaptability to modifications is essential for successful outcomes. Interviewee C: *"Customer asked for changing many things as material, function of product except the launching date*".

Factors Driving Changes*:* Interviewees A, B, D, E, and G collectively identify factors such as attractive design, ergonomics, safety, sustainability, and cost as key drivers for changes in product development. These factors reflect a holistic approach to addressing consumer needs, industry trends, and competitive dynamics. Interviewee B highlights the importance of considering trends and competitive factors

5.2.2 **Project Manager´s Competence**

Dynamic Nature of Projects: Product development projects often encounter unforeseen challenges, changes in requirements, or unexpected technological shifts. An adaptable approach allows project teams to respond quickly and effectively to these changes. Recognizing and understanding market trends is vital for creating products that align with current consumer preferences and needs. This requires a keen understanding of consumer preferences, design aesthetics, and emerging materials. Competent project managers should proactively seek information about industry shifts and integrate these insights into their project strategies.

Technology Knowledge: The integration of technology into product development, as mentioned by Interviewee B and Interviewee E (Interviewee B: " *the integration of 3D printing technology, has change the way we develop item* "; Interviewee E: "*We're working to put together AI and 3D visuals to help our customers and product team make decisions more easily*"), necessitates project managers to be technologically adept. Competence in leveraging project management tools, like MS Project, and staying informed about cutting-edge technologies ensures efficiency and competitiveness.

Transparent communication: Demonstrating effective communication is a crucial skill, as emphasized by Interviewee E, an Engineer. He faced challenges when communicating changes with the project manager. In certain previous projects, redesigns were necessary because the engineer and project manager were not aligned on the proposed changes, leading to misunderstandings and a lack of shared understanding (Interviewee F stressed the importance of "*transparently communicating changes*"). Project managers must articulate changes transparently, address concerns, and maintain open feedback loops. Clear communication fosters a shared understanding of changes and helps alleviate resistance among team members.

Leadership abilities: Leadership skills, emphasized by Interviewee C and Interviewee A (Interviewee C: *" Ability to addressing team or stakeholder conflicts skilfully and diplomatically to maintain a positive work atmosphere ";* Interviewee B: *" Effectively assigning tasks and responsibilities to team members based on their strengths and expertise "* while Interviewee A: *"strong communication skills and leadership abilities*", are crucial. Project managers need to guide teams through changes, recognize and overcome resistance, and effectively utilize team strengths. Leadership is instrumental in maintaining project cohesion during transformations.

Interview D stressed that: *"For me, as a project manager, besides specialized knowledge, it is essential to have Time management skills and People management skills"*.

Change Management expertise: While predicting every detail of an unforeseen change is impossible, strategic planning establishes a resilient framework, fostering flexibility, adaptability, and proactive responses to uncertainties in the project management journey. Navigating change is a central competency for project managers, according to Interviewee C: *"Always have an eye on environmental scanning, external factors like industry trends and potential disruptors that might impact the project*" Interviewee D: "*understand the project clearly and extensively to*

adapt to constant changes"). Competent project managers must have a deep understanding of the project's intricacies to adapt to evolving circumstances. This involves anticipating changes, providing suitable solutions, and ensuring the project stays aligned with its original purpose. Interviewee A *"Identifying potential risks associated with the changes and developing strategies to mitigate these risks*", interviewee B: *" resource allocation strategies, including flexible plans and alternatives, are key to accommodating potential changes"*

Hybrid approach: Three out of four interviewees acknowledged awareness of the hybrid approach. Specifically, Interviewees A, B, and C highlighted this approach in furniture product development projects .Interviewee B highlight : *"This is essential for leveraging the strengths of both traditional and agile methodologies"* while Interviewee C mentioned: "*Competence in the hybrid approach allows project managers to tailor strategies to the needs of each project".* This approach combines elements of Agile and Stage-gate methodologies. It is essential for proficient project managers to grasp this hybrid approach and comprehend its application. This understanding enhances the adaptability of furniture product development projects, allowing them to effectively respond to changes in requirements or scope.

Cost Analysis: Interviewee D emphasizes the importance of analysing and building reasonable costs quickly, highlighting the need for strong analytical skills (Interviewee D: *"analyse and build reasonable costs, quickly adapt to changes".* Project managers should possess the ability to assess costs, make informed decisions, and swiftly adapt to changes without compromising the project's financial viability. Problem-Solving mentioned by Interviewee C, D is a critical competency. Project managers encounter various challenges during changes, including team resistance and disruptions to timelines. Competent project managers should be adept at identifying issues, devising solutions, and maintaining project progress.

Time Management: Interviewee C highlights time management as a crucial skill for project managers (Interviewee C: *"Managing resources. Setting deadlines and monitoring project progress*". Competent project managers must efficiently allocate resources, set realistic deadlines, and monitor progress. Time management ensures projects stay on track, especially when dealing with changes that may impact timelines. *Planning:* Interviewee B, C, D emphasizes the importance of developing a clear change management plan (Interviewee B: "*Develop a clear, detail change management plan*"). Competent project managers should excel in project planning, foresee potential changes, and develop strategies to manage modifications effectively. This proactive approach ensures that the project is well-prepared to navigate modifications seamlessly, aligning with the dynamic nature of the project development process

Cross-Functional Collaboration:

Collaboration Skills: As highlighted by 5 Interviewee A,B,C,D,E, (Interviewee B: " *cross-functional collaboration is key to make sure build right product at the right price and right time",* competent project managers should excel in fostering collaboration among cross-functional teams. Furniture product development often involves collaboration among designers, manufacturers, and suppliers. Competence in promoting effective communication and collaboration is vital for success.

5.2.3 Challenges

An interviewee highlighted:" As *a design engineer, it doesn't feel great to switch designs under tight deadlines, especially when there's uncertainty about when they'll be approved"*

Interviewee C says: *"Priority setting can be challenging"*

Resistance to change? While project Managers mention that they adaptability instead of resistance. Interviewee A "We explore ways to bring benefits and long-term happiness for both customers and the company" . while Engineer mentioned

“that it is not easy that you change a construction you did 5 years, it applies for a lot of items just because a customer wants to change, we need time for Engineering Change Order.

5.2.4 **Effective Change Management Strategies, Tools, and Techniques**

Communication and Leadership*:* Interviewee F's emphasis on transparent communication, addressing concerns, and maintaining an open feedback loop highlights the importance of effective leadership in change management (Interviewee F: "transparently communicate changes"). Clear communication fosters a shared understanding of the changes, addresses potential resistance, and ensures that the team is aligned with the project's goals. Leadership skills become pivotal in guiding teams through the change process.

Hybrid Approach: The introduction of the Hybrid approach, combining Agile and Stage-gate methodologies, Interviewee B suggests an evolving approach to change management: "*“This is essential for leveraging the strengths of both traditional and agile methodologies”* . This hybrid model provides a structured framework while allowing the flexibility required to adapt to changing requirements or scope. Understanding and implementing this approach can enhance the industry's capacity to manage change efficiently.

Technology Integration: The use of tools like MS Project by Interviewee C underscores the significance of technology in change management (Interviewee C: *"Ms Project as right hand of project Manager* "). These tools facilitate tracking and managing changes, streamlining the process and ensuring that modifications are well-documented and monitored. Technology integration can contribute to efficiency and accuracy in change implementation.

Change Management Models: Interviewee F mentioned of models like Kotter's 8-Step Process and Prosci's ADKAR model suggests that structured change management models are valued in the industry (Interviewee F: "Kotter's 8-Step Process

and Prosci's ADKAR model"). These models provide a systematic and organized approach to change, ensuring that key aspects like communication, stakeholder engagement, and organizational readiness are addressed.

Leadership Skills*:* Interviewee C's emphasis on leadership skills, including active feedback, recognizing resistance, and utilizing team strengths, points to the human element in change management (Interviewee C: *"Active feedback to team members and stakeholders"*). Effective leadership is crucial for guiding teams through transitions, addressing challenges, and ensuring that changes are successfully implemented.

5.2.5 Strategy

Strategies: The Hybrid approach, which blends Agile and Stage-gate methodologies, received strong endorsement from Interviewee B, *"No, I think the Hybrid is the best suitable for furniture product development "* This approach provides a dynamic framework for managing changes in product development projects, allowing for adaptability and iterative development cycles.

Cross-Functional Collaboration: Ensuring collaboration among different departments, such as design, production, and marketing, emerged as a crucial strategy. Interviewee A,B,C emphasized the project manager's role in accurate and timely communication to all relevant parties during changes .Cross-functional collaboration ensures a holistic approach to change management, fostering coordination and synergy among diverse teams.

Technology Integration: Integration of technology, including AI, databases, and project management software, played a pivotal role in supporting design and analysing product data. Interviewee E highlighted the use of AI for design ideas and database analysis, while Interviewee C underscored the common use of tools like

,Ms project, Exel, Gannt chart , PLM,. This technological integration enhances efficiency and decision-making, aligning the strategy with advancements in digital tools.

User-Centric Design: Prioritizing user experience and preferences in product design was another strategic focus. Interviewee B emphasized the importance of designing products that ensure ease of use and meet user requirements . This user-centric approach aligns product development with market needs, enhancing customer satisfaction.

Environmental Sustainability: Incorporating environmental sustainability into product development practices emerged as a strategic consideration. Interviewee D provided an example from highlighting their use of 100% recycled plastic for products, showcasing a commitment to sustainable practices. This aligns with the growing importance of eco-friendly practices in the furniture industry.

Another example from interviewee B showing that their factory now using wood dust from production processing to make durability material: wooden table top, wooden board…

Risk Management: Proactive risk management strategies to anticipate and mitigate challenges were cited as essential. Interviewee D stressed the need for experienced project managers to handle risks effectively, emphasizing the importance of learning and staying open-minded (Interviewee D: "*To mitigate risks, experienced managers must stay open-minded, continuously learn, and not compromise on what they believe to be correct*". This strategic focus ensures preparedness for unforeseen challenges, contributing to project resilience.

5.2.6 **Tools and Process**

When asked about the change management process, 3 out of 4 individuals mentioned that they do not have an official document. This implies that there is a lack of clarity regarding specific roles and responsibilities, with the knowledge limited to identifying the decision-maker without a detailed understanding of individual tasks and assignments.

Interviewee C says "*Depending on the change category, the decision-maker varies, and the person in charge of the change also differs, for example design change won't be made by the production department"*

While Interviewee B states *"we did it case by case, follow the minutes of meeting to follow who do what"*

The revelation that three out of five project managers do not use dedicated project management software but rely on other tools like Axapta, ERP, and PLM highlights several noteworthy aspects.

Project Management Software: when asked the reason that they did not use project management software. Interviewee A : " *Because furniture product development project requires design intricacies, material specifications, and production processes. Tools like ERP offer integrated functionality, streamlining design iterations, material management, and production workflows*" . Interviewee A also noted their reliance on ERP to manage data and the status of product development.

While Interviewee B: "*Axapta software enhances communication among cross-functional teams, especial in changing all member of project team can access to see the change to make sure all team in same page*"

Interviewee C: "*We always faced with design aesthetics and prototyping, with product development tools offering specialized functionalities for visualization, prototyping, and testing. PLM can help us on that* "

Interviewee D: "*Due to cost saving, in parallel I used D365 software & excel to manage, but there have a lot challenge when manage change"*

When asked if they think they need special software for managing their projects, all four interviewees mentioned hearing about tools like Trello, Jira, and Asana. However, they expressed concerns about the cost and resources required, and they weren't sure about the specific details of these tools. Despite this, they all emphasized the importance of such tools in product development projects. These platforms offer helpful features like assigning tasks, tracking progress, and facilitating communication, which ultimately make it easier to handle changes in the project.

Interviewee C , she is the only one among the interviewees who has experience using Microsoft Project in her previous company. She highlighted that Microsoft Project contributed to effective decision-making, particularly in managing changes within the project: "*by visualizing project timelines, tracking and enabling resource reallocation. Its scenario planning, communication tools, and integration capabilities contribute to informed decision-making and seamless adaptation to changes within a project*"

5.2.7 Techniques

User -Centric design: As Interviewee B highlighted: "*I believe that a user-centric design approach has been my most effective strategy for the past seven years, significantly advancing my career*". It plays a pivotal role in furniture product development. This technique ensures that the end-users' needs, preferences, and experiences are at the forefront of the design process.

While interviewee F: *" As a design engineer, my goal is to create products that combination of innovation and customer needs ".*

Hybrid Approach: Interviewee A provided insights into how this approach allows for adaptability through iterative development cycles and frequent feedback (Interviewee A: *" instead of finish product and send to customer review, we divide process many step, which customer can review and approve in early stage "*. The Hybrid approach provides a structured framework for managing changes while allowing flexibility in response to evolving project needs as Interviewee C experience: *"Customer can change design after they review the photo render, after foam mock-up or uncoated sample before they see the final sample"*

Clear Communication: Ensuring accurate and timely communication of changes to stakeholders was highlighted as a technique. Interviewee D stressed the project manager's role in transmitting information accurately and promptly during changes: *"PM is transformer information from stakeholder to internal team, if you give something unclear, you lose time and money"*. Clear communication is crucial for project success and helps ensure that everyone involved is on the same page, working towards common goals as Interviewee C mentioned*: "Conflict and delay are the main consequences of unclear communications"*

Backup Plans- Mitigate plan for Risk: Having backup plans to address unforeseen challenges during changes was identified as a technique. Interviewee B, D emphasized the importance of having contingency plans in place to respond promptly to unexpected situations. Interviewee B: *"I have to emphasize that we have changed the way we work since covid 19, ensuring seamless collaboration among team members working remotely".* Backup plans contribute to risk mitigation, ensuring project managers are well-prepared to navigate uncertainties. Interviewee D: *"Managing projects during COVID-19 introduced challenges not only in remote customer interactions but also in team dynamics and supply chain disruptions"*

Leadership: when asked about Leadership style, Interview C mentioned that: "*Not consistently, A leader who can adapt their approach based on the project phase, team dynamics, and goals will likely navigate the complexities of product development more successfully ". While* A, B consist to apply transformational leadership.

Leadership qualities that embrace new perspectives and continuous learning were recognized as a technique. Interviewee D emphasized the need for project managers to remain open-minded and not compromise on principles they believe to be corrected. Open-minded leadership fosters adaptability and a proactive approach to change management.

5.3 Challenges Faced in Managing Changes in Furniture Industry

In recognizing the challenges within furniture product development projects, several key issues have emerged based on findings from interviews. The dynamic nature of the furniture industry, marked by continual changes in product design, market trends, and regulations, stands out as a significant challenge. This necessitates a strategy emphasizing adaptability to navigate these shifts effectively. The competency of project managers surfaces as another critical concern, with a need to address ineffective leadership and enhance adaptability among project management teams. The identified challenge of lacking change expertise highlights the importance of surfacing and addressing issues impacting change to prevent potential performance issues. Inefficient tools and methodologies present obstacles that impede the change management process, underlining the necessity for a more streamlined and effective approach. Challenges related to Limited capabilities in project management tools and techniques as operational costs, lack of expertise, and team allocation issues, become apparent through interviews. Additionally, issues in documentation and decision-making processes, hindering transparency and traceability, are recognized challenges. The need for enhanced project management capabilities, especially in overcoming limitations within tools like

Excel, becomes evident. These challenges, identified through interviews, collectively underscore the intricate landscape of furniture product development, prompting a strategic response to enhance adaptability and efficiency within this dynamic industry.

Implementing change in furniture product development projects can be challenging, as it involves various aspects such as design, manufacturing, marketing, and distribution. Here are some common challenges associated with change in furniture product development projects which divide in 3 dimensions: Social & Project management (Table 7), Technical dimension & Market alignment (Table 8)

Table 7. Challenges in Social & Project management dimension

Challenges	Description	Impact
Resistance to change	Implementing changes, especially in product design or production processes, can face resistance from team members or stakeholders accustomed to existing workflows. Overcoming this resistance and fostering a positive attitude towards change is a critical challenge.	Resistance can lead to delays, decreased morale, and hinder overall adaptability.
Change expertise gap	Issues impacting change are not effectively identified or addressed, leading to performance issues.	Can lead to performance issues and ineffective change implementation
Coordination and communication	Ensuring clear communication about the nature, reasons, and implications of changes is vital. Ensuring effective communication and coordination among project teams, suppliers, and stakeholders is challenging, especially with changes occurring during the project.	Poor communication can result in misunderstandings, errors, and misalignments in the implementation of changes.
Timeline pressures	Changes in design, scope, or materials disrupt planned project timelines, leading to delays in product development and launch.	Time delays can affect market entry, especially in industries where being first to market is crucial for competitiveness.
Budget and cost	Changes in design, materials, or processes may impact the project's budget and cost structure.	Budget overruns can strain financial resources and impact the overall profitability of the project.

Project Management tool limitations	not using project management, just use product data management system and Excel	Limited capabilities may not address advanced needs effectively

Table 8. Challenges in Technical & Market alignment dimension

Challenges	Description	Impact
Lack of Documentation and Decision-Making	Inefficient documentation and decision-making processes hinder transparency and traceability	
Resource allocation	Changes may require reallocation of resources, impacting manpower, materials, and equipment, and affecting overall resource planning.	Inadequate resource allocation can lead to inefficiencies, delays, and compromises in the quality of the final product.
Regulatory compliance	Changes may necessitate adjustments to meet regulatory requirements, adding complexity to the project.	Non-compliance can result in legal issues, product recalls, and damage to the organization's reputation.
Maintaining product quality	Implementing changes without compromising product quality requires careful consideration and testing.	Inadequate testing or rushed implementations can lead to quality issues, affecting customer satisfaction and brand reputation.
Adapting to Market trends	Staying aligned with rapidly evolving market trends requires quick decision-making and adaptability.	Failure to adapt to market trends can result in products becoming outdated or less appealing to target customers.
Sustainability considerations	Introducing sustainable practices or materials may pose challenges in terms of availability, cost, and integration with existing processes.	Difficulty in implementing sustainable changes may hinder the organization's commitment to environmental responsibility.

5.4 Summary of the interviews

Overall, the findings and literature complement each other, with the literature providing theoretical frameworks and tools that align with the practical experiences and challenges identified in the findings. Both emphasize the importance of clear communication, adaptive leadership, and structured frameworks in successful change management as detail shown in below table 9 and table 10

Table 9. Summary of Interviews

Aspects	Findings	Literature
Product Development Process	Four out of five interviewees confirm the use of a stage-gate process in their product development, consisting of five main stages and additional add-on stages for clarification and guidance.	Stage-gate system by Copper 1990
Force of change	Align with literature about internal(production process, strategic, optimization cost, capability of manufactory) and external force(market trend, technology, sustainability, supply chain, customer feedback) from Murthy 2007. The finding emphasizes that changes in product development projects, categorized as Product Change and Project Change, can emanate from the interplay of both internal and external factors	External forces are market position, legislation and regulations, technology and economics related factors. Internal forces are changes in organisations and in operations, and often result of external force(Murthy 2007)
Change Management Tools, model	No change model applicated due to charities of furniture project. But finding show that the needed of . Also, emphasis on clear communication, adaptive leadership, and change management plan.	Tools such as Impact Analysis, Burke-Litwin Change Model, and SIPOC Diagrams.
Considerations for Change Management System	Absence of official Change management system: Procedure, documentation, change process, Change management plan	Literature acknowledges the need for a successful change management system.

Table 9. Summary of Interviews (continues)

Aspects	Findings	Literature
Product Data Management System (PDM) Functions	Align with literature about product data management: including Product Lifecycle Management (PLM) and Enterprise Resource Planning (ERP), is common for data management. These tools are frequently employed to synchronize with other systems for seamless operations.	Literature details PDM functions in engineering and data management.
Project Management Tools	Notably, project management software is not utilized in this context. They mainly use Excel as tool for project management	Literature underscores benefits of project management tools.
Agile and Hybrid Approach	The findings shown that project managers possess knowledge about the hybrid approach, with some of them implementing and demonstrating the effectiveness of this approach in the development of physical products such as furniture. This align with literature	Literature discusses the Agile-Scrum hybrid approach and its advantages.
Barriers and Challenges in Change Management	Lack of official documentation and unclear decision-making processes contribute to challenges. They do case by case	Literature supports the idea of inefficient management, lack of experience, and resistance to change as common barriers.
Emotional Reactions and The Kübler-Ross Change Curve	Emotional reactions and adaptability to change are highlighted in the interview	Literature references The Kübler-Ross Change Curve, emphasizing addressing emotional reactions during change.
Communication Challenges	Highlighted challenges related to managing and communicating changes.	Literature recognizes challenges in communication during product development.

6 DISCUSSION AND CONCLUSIONS

In recent years, the furniture industry has experienced notable transformations in product development projects, as highlighted by an interview with professional in the field. A fundamental shift towards sustainability has emerged as a pivotal factor, with the interviewee emphasizing the growing importance of environmentally friendly practices in product development. Furthermore, the integration of advanced machinery into production processes has led to a significant enhancement in product quality, reflecting a commitment to modernization.

The research findings present a comprehensive framework for effective change management strategies in furniture product development projects. The approach centers around four key areas: product design change, project change, production process and quality change, and market trends and regulations. Project manager competencies, including adaptive leadership, are identified as pivotal, emphasizing skills such as project management, change expertise, leadership, technical proficiency, continuous improvement, strategic management, and effective communication. The strategy advocates for the use of appropriate tools and techniques, combining the adaptable product development process with Stage-Gate and Agile methodologies. The agile/hybrid approach is highlighted as a dynamic strategy, incorporating iterative planning, customer collaboration, design flexibility, and cross-functional teamwork. The integration of Agile principles at specific development stages is recommended to address challenges. The research also suggests leveraging PLM or PDM software for change process integration, ensuring data accuracy, transparency, and efficient collaboration.

Additionally, lessons learned emphasize the value of an iterative approach, user-centric focus, and technological integration, while recommendations include fostering continuous learning, establishing structured change management systems, and targeted training programs for project managers and designers.

6.1 Theoretical Contribution

A focal point of this research is the proposition of an innovative change management framework tailored to the intricacies of furniture development. This framework addresses the distinctive challenges embedded in the design, materials, triangle of project and manufacturing processes associated with furniture production.

The inclusion of empirical findings from industry professionals adds a real-world perspective to the study. The identification of significant changes and crucial competencies, along with a detailed examination of employed techniques, provides a practical framework for project managers. The comparison of industry practices with established change management models informs the adaptability of existing models. Insights into resistance to change and cultural dynamics enhance the understanding of challenges in product development projects. The illustration of a hybrid Agile-Stage-Gate approach (e.g. Cooper, 1990) and practical implications for project managers offer valuable contributions, making the thesis a comprehensive resource for professionals seeking effective change management strategies in the unique context of product development projects.

RQ1: What is the change in product development project in furniture industry?

The furniture industry is undergoing significant changes in product development projects, driven by market trends, technological advancements, and a commitment to sustainability. Interviewees highlight frequent shifts in product design, adaptation to market dynamics, and modernization of production processes, including the integration of advanced machinery and technology tools. Project changes, such as alterations to design, cost, and timelines, are acknowledged as essential aspects of product development, reflecting the industry's dynamic nature and the need for adaptability. Factors such as attractive design, safety, and

sustainability are key drivers for these changes, underscoring the industry's commitment to innovation and meeting evolving consumer needs in a competitive market environment.

One significant change is the increasing focus on sustainability and eco-friendly practices. Empirical findings suggest that many furniture companies are incorporating sustainable materials and production methods into their product development processes. This trend aligns with literature highlighting the growing importance of sustainability in product development across various industries, driven by consumer demand and regulatory requirements (Dzamashvili Fogelström et al., 2010).

Moreover, there is a noticeable shift towards adopting advanced technologies in product development, such as CAD/CAM software and simulation tools. These technologies enable companies to design and test furniture prototypes virtually, reducing the need for physical prototypes and accelerating the development process. This finding resonates with literature discussing the role of technology in enhancing product development efficiency and innovation (Grieb, 2010; Lashin & Stark, 2021).

Furthermore, the empirical findings suggest that customer preferences and market trends are driving rapid changes in product design and features. Furniture companies are increasingly focusing on customization and personalization to meet diverse customer needs and stay competitive in the market. This trend is consistent with which article (Baca, 2005).

RQ2: How project managers mange the change in product development project?

Managing change in product development projects demands project managers with a diverse skill set and effective strategies to navigate challenges and achieve success. Empirical evidence underscores the pivotal role of project managers in

steering the dynamic nature of these endeavors, requiring robust leadership, communication, and problem-solving abilities (Müller & Turner, 2010). Moreover, literature emphasizes the criticality of project managers' competencies in change management, with frameworks like IPMA offering valuable guidance for their development (IPMA Competence Baseline, 2015). Project managers must proactively anticipate and address changes, foster stakeholder engagement, and uphold project objectives amid evolving circumstances. By leveraging their expertise, project managers mitigate risks, encourage collaboration, and propel project triumph amidst change. Thus, refining project managers' competencies in change management, as highlighted in Higgs and Rowland's work, is imperative for effectively steering product development projects and attaining desired outcomes.

Project managers adeptly navigate change complexities in product development projects through an array of strategies and tools, as evidenced by empirical findings and existing literature. Although formal change management systems may be absent, project managers rely on clear communication, adaptive leadership, and meticulous change management planning to adeptly handle shifts (Baca & John Wiley & Sons, 2005). Despite the lack of specific change models, tools such as impact analysis, stakeholder analysis, and SIPOC diagrams are esteemed for their efficacy in managing change processes (Ceptureanu, 2015), aligning with literature accentuating the importance of such processes and tools in facilitating project adaptation and ensuring favorable outcomes (Project Management Institute, n.d.). Additionally, project managers demonstrate proactive change management by embracing hybrid methodologies like Agile-Scrum, amalgamating flexibility with structured processes to tackle uncertainties and complexities in product development projects (Conforto & Amaral, 2016)

As a result, project managers in the furniture industry employ a combination of communication, leadership, and strategic planning to effectively manage change

and drive project success, drawing from both empirical insights and established management principles.

6.2 Practical Implications

This section provides hands-on recommendations based on the research findings, designed to guide professionals and practitioners navigating the intricate realm of furniture product development.

Implementation of Changes

Recognizing the diverse nature of changes in furniture projects, this part offers practical guidance for a comprehensive approach to change implementation, covering: Need to build *a strategy* for smoothly integrating *design modifications*, considering factors such as material compatibility, aesthetic coherence, and quality standards. Additionally, the chapter provides practical insights for *optimizing production processes*, emphasizing efficiency while minimizing disruptions. Recommendations for *handling changes at the project* level, addressing shifts in timelines, resource allocation, and the overall project scope. Moreover, guidance on *adapting to external factors* ensures agility in responding to market trends and regulatory requirements, keeping the project resilient in the face of external, ensuring that the project remains agile in the face of external influences.

Cross-Functional Collaboration

First and foremost, the communication needs to be transparence, ensuring a shared understanding of changes across design, production, and project management. Recommendations for incorporating market trends and regulatory updates into collaborative processes, ensuring alignment with broader industry dynamics. Finally, practical approaches should be adopted for agile methodologies to enable swift responses to changes in project scope, timelines, or market conditions. Together, these initiatives promote a collaborative and agile environment, responding effectively to the dynamic nature of product development.

Strategic training for adaptation

In order to equip project teams with the necessary skills for handling various aspects of change, this section provides valuable insights into strategic training initiatives:

Firstly, the focus is on *Mastering tools*, offering training strategies to ensure that the team becomes proficient in using new tools introduced during changes in design, production processes, or project requirements. This ensures that everyone is well-prepared and capable of efficiently adapting to technological advancements.

Secondly, there is an emphasis on *Staying informed on regulations through guidance on training initiatives*. This ensures that teams remain updated on changing regulations and standards, fostering compliance in the intricate process of product development. Additionally, project members should be encouraged to engage with furniture exhibitions and relevant associations for updates. These knowledges are crucial for producing products that meet industry standards and legal requirements.

Lastly, the section addresses the importance of *Understanding market dynamics* by providing practical approaches for training teams to comprehend and respond to the evolving dynamics of the market. These training and knowledge can come from training from internal department such as the sale team after their business trip, market, production team, supply chain or purchasing team. This enables teams to make proactive adjustments to their product development strategies, ensuring that their products align with the changing demands and preferences of the market. In essence, this strategic training framework aims to empower project teams to navigate the multifaceted challenges of change effectively and stay ahead in the dynamic landscape of product development.

6.3 Recommendations

6.3.1 Change Management Strategies Overview

The strategy focuses on four main areas: product design change, project change, production process and quality change, and market trends and regulations. The approach is built upon three fundamental pillars: project manager competencies, tools and techniques, and the agile/hybrid methodology. These categories represent a holistic framework for navigating change in furniture product development projects(see Figure 16 below)

At the core of effective change management lies *the competency of project managers (*see Figure 17). In addition to the competencies of a project manager, the role also demands characteristics of an adaptive leader. As emphasized in literature and findings, adaptive leadership underscores the significance of project managers possessing key qualities. These include expertise in change management, effective communication, adept stakeholder management, a commitment to continuous improvement, strategic management skills, flexibility, ongoing learning, and adaptability to diverse project phases and team dynamics. The amalgamation of these attributes is essential for navigating the complexities of project management, ensuring successful adaptation to changing circumstances, and fostering positive project outcomes. The breakdown of the competency cluster and dedicator is presented in Table 11 below.

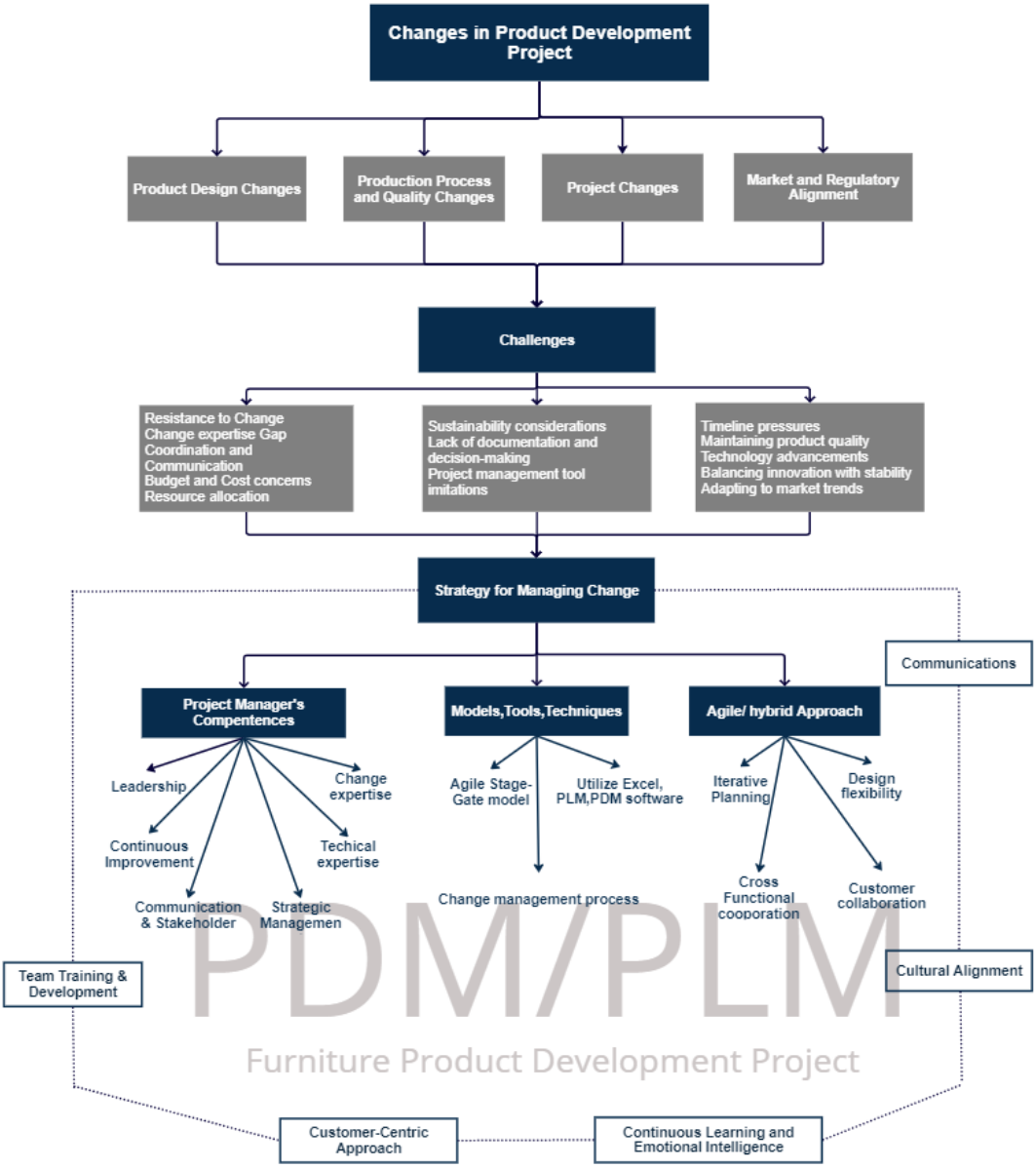

Figure 16. Strategy Overview for Change management

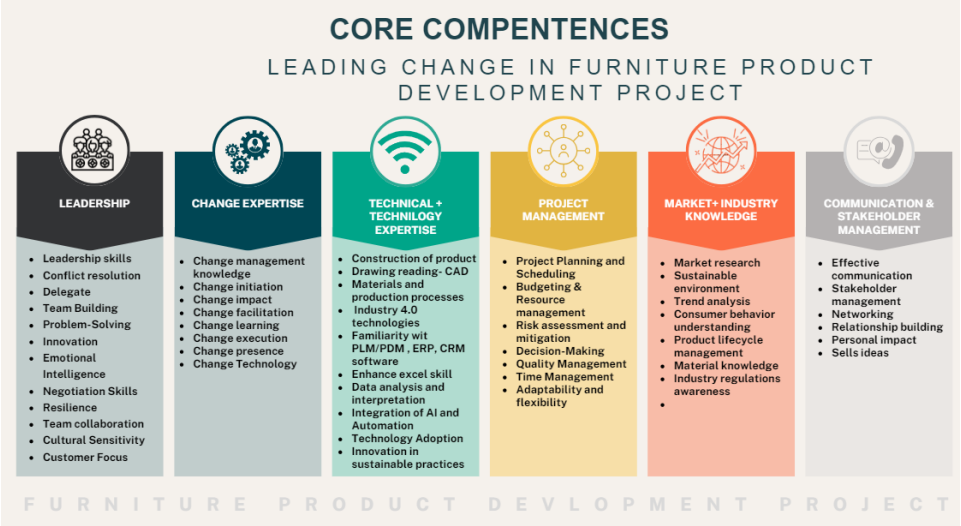

Figure 17. Strategy- Core competences for Project Manager

The utilization of appropriate *tools and techniques* is crucial for streamlined change management. The strategy approach to change management involves leveraging two key aspects: the adaptable product development process and a robust change management process. The product development process strategically combines Stage-Gate and Scrum methodologies, ensuring a meticulous and sequential evaluation of each development stage. This hybrid model introduces flexibility, allowing swift responses to evolving project requirements and striking a balance between control and adaptability, ultimately enhancing efficiency in furniture product development. Simultaneously, the change management process is fortified through the development of a comprehensive plan. This plan encompasses structured procedures and models, defining the who, what, when, where, and how of managing change. Clear roles and responsibilities are assigned, versatile tools such as Excel and templates are integrated, and key activities, such as reviewing, analyzing, promptly approving, and efficiently managing changes, are executed. This strategic integration of adaptable product development and a comprehensive change management plan empowers teams to navigate change effectively in the dynamic landscape of furniture product development.

Table 10. Competence descriptions

Competency Cluster	**Competency Indicators**
Project Management	- Efficiently plans and executes project tasks and timelines. - Manages resources and budgets effectively. - Utilizes project management tools and methodologies.
Change Expertise	- Surfaces issues impacting change. - Demonstrates the impact of issues on performance. - Human dynamics insight - Formulates and guides implementation plan - Applies change theories, tools, processes
Leadership	- Builds networks and effective professional relationships in project - Inspires and leads furniture project teams through change with a non-anxious presence. -
Technical + Technology Expertise	- Knowledge, generation and skillful application of change theories, tool and processes. - Demonstrates proficiency in industry-specific tools and techniques for furniture design. - Stays updated on technological advancements impacting furniture development
Continuous Improvement	Identifies opportunities for continuous improvement in furniture product development. - Implements and supports furniture-specific change initiatives for ongoing enhancement. - Encourages and supports self-management and conflict resolution in the furniture industry
Strategic Management	Aligns organizational goals with change strategies in the furniture sector. - Develops and executes strategic plans for change initiatives in furniture product development. - Balances short-term furniture project goals with long-term vision
Communication & Stakeholder Management	Effectively communicates furniture-specific change objectives to stakeholders. - Manages relationships with stakeholders throughout the furniture product development process. - Listens actively to stakeholder concerns and inquiries related to furniture development

Last but not least, *the agile/hybrid approach* stands out as a dynamic and versatile strategy supported by literature and findings. Li et al. (2023) help to manage conflict in product development project. Applying the Agile/Hybrid Approach in furni-

ture product development entails iterative planning, customer collaboration, design flexibility, and cross-functional teamwork. It is recommended to develop detailed plans iteratively, ensuring regular involvement of customers for feedback. Additionally, fostering a culture that embraces design changes is advised. Implementing a seamless change management process and enhancing cross-functional communication are essential. Moreover, it is recommended to embrace continuous monitoring, quick adaptation, and leverage both the structured Stage-Gate model and Agile principles for effective management of change. Transparent communication, a learning culture, and real-life examples are pivotal for success. These strategies enhance change management, promoting adaptability and customer-centricity in physical product development.

6.3.2 Tools, Model and Techniques in Change Management

Following the general strategy in previous section 6.3.1, we continue with details for each *Tool*

Based on the findings, interviewees do not recommend using Agile–Stage-Gate-Scrum due to various challenges, including operational costs, a lack of Agile expertise, and team allocation issues where one team is responsible for multiple projects. Especially for physical products, proves complex, and obtaining quick customer feedback poses a challenge. Agile might not seamlessly fit all development stages, particularly in precision-demanding later stages. In combination with the literature, researchers propose a solution: integrating the Agile approach at specific stages of the product development process. This combination proves effective in navigating the complexities of change and responding to evolving market trends and regulations. While not a model per se, this combination of Agile approaches addresses the identified challenges.

Integrating Agile principles into furniture product development involves a strategic approach across ideation, design, and development. In the ideation sprint, Ag-

ile is applied by incorporating Design Thinking, customer focus, market trend analysis, and compliance with industrial regulations. The design sprint emphasizes quick iterations and adaptability through activities such as rendering 3D models, sketching, CAD-based construction drawings, and simulation. During the development sprint, Agile principles are implemented with a focus on collaboration and adaptability, utilizing 3D printing, mock-up parts, Styrofoam prototypes, and final product creation. Each stage contributes to a more flexible, responsive, and iterative product development process, aligning with Agile principles for enhanced creativity and faster time to market. See Figure 18 below.

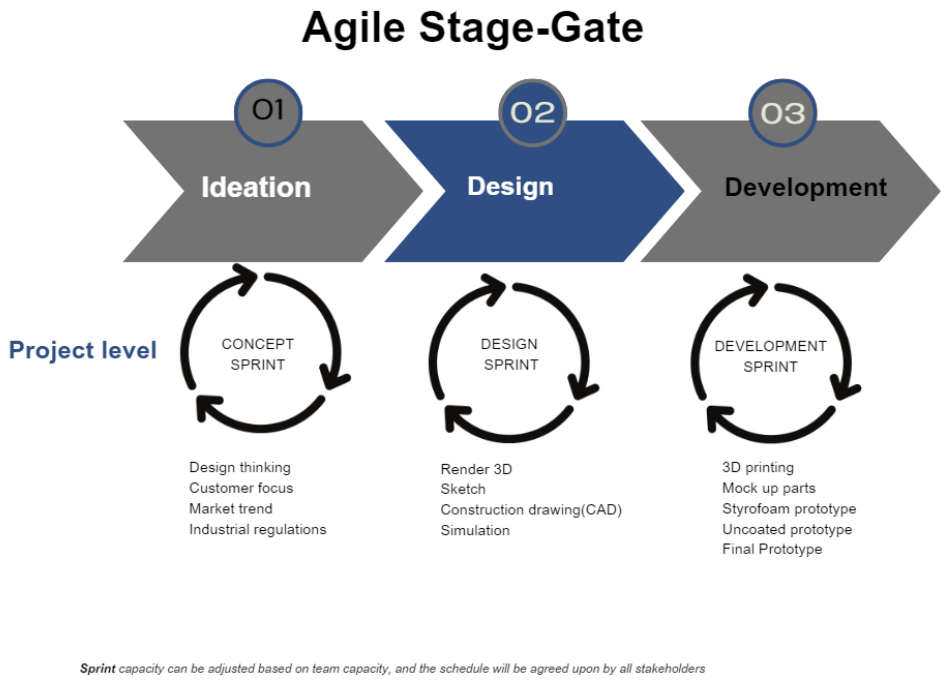

Figure 18. Agile Stage Gate approach

In response to the identified challenges related to the lack of official documentation and decision-making, a strategic initiative involves establishing *a change process* integrated with the functions of Product Lifecycle Management (PLM) or Product Data Management (PDM) software. Process details in Figure 19.

This integration ensures data accuracy, and promotes efficient collaboration. Automated workflows, version control, and audit trails enhance transparency, reducing errors and saving time. The integrated approach of the system improves decision support and traceability, contributing to overall operational excellence. Some famous example include PTC Windchill, Enovia, Teamcenter, ERP, Microsoft D365 .Instead of using project management software with change management function, the researcher recommended *Utilizing change management functions in PLM or PDM Software*: By integrating these advanced software solutions into the project management framework, organizations can effectively address the complexities associated with change management. PLM and PDM systems offer robust features for formalizing change requests, maintaining version control, automating workflows, fostering collaboration, and providing analytics for informed decision-making. This approach not only streamlines the change management process but also contributes to enhanced project efficiency by establishing a centralized platform for comprehensive project documentation and communication.

Besides, we can also *enhance project management in Excel* with data validation, conditional formatting, and track Changes. It is recommended to utilize functions, pivot tables, and charts for analysis purposes. Additionally, leveraging scenario manager, data consolidation, and named ranges is advised. Regularly saving versions and considering dedicated project management tools for more advanced needs are also recommended practices.

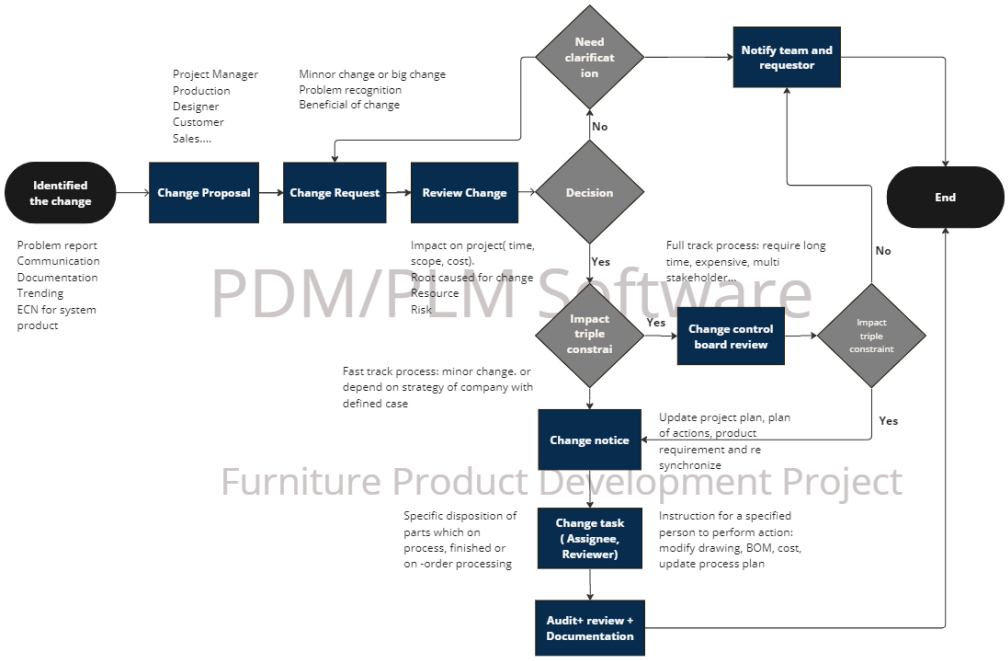

Figure 19. Strategy- Change management process base on Data management software(PLM/PDM)

6.4 Lessons Learnt and Application to Furniture Industry

One crucial lesson learned from both literature and findings is the value of adopting an iterative approach in product development. Dividing the process into manageable steps, as seen in the Hybrid Approach, allows for continuous feedback and early customer involvement. This iterative methodology aligns with the unique intricacies of the furniture industry, providing opportunities for adjustments and improvements throughout the development cycle.

User-Centric Focus: The purpose of adopting a User-centric focus in furniture product development is to embrace change and enhance the overall success and satisfaction of the product as prototyping, user testing, VR, AR customization features, social media engagement with brand. This approach is not intended to prevent change; instead, it aims to ensure that changes are driven by a deep understanding of user needs, preferences, and experiences. By prioritizing the end-user

experience and incorporating their feedback at various stages, designers and project managers can ensure that the final product meets consumer expectations and market demands. This lesson underscores the importance of understanding and catering to customer needs in a competitive market.

Technological integration: The integration of technology tools, such as Designers can employ AR-enabled software to create intricate 3D models of furniture items, allowing them to visualize products in a virtual environment. Taking this a step further, interactive customer applications with AR capabilities empower users to virtually place furniture items within their living spaces through smartphones or tablets. Artificial Intelligence (AI) algorithms enhance the user experience by providing personalized product recommendations based on individual preferences and design trends. Applying these technologies facilitates efficient communication, collaboration, and decision-making. For the furniture industry, where design intricacies and material specifications are crucial, leveraging technology streamlines workflows, enhances precision, and ensures that changes are well-documented and monitored.

6.5 Recommendations for Enhanced Change Management Practices

Integrated change management functions in PLM or PDM software involves incorporating the change management functions available in Product Lifecycle Management (PLM) or Product Data Management (PDM) software. Rather than solely investing in dedicated project management software, leveraging the capabilities of PLM or PDM systems can offer a more holistic solution. These platforms not only provide features for effective task assignment, progress tracking, and communication but also bring advanced change management functionalities. By centralizing project documentation and seamlessly integrating change processes within these systems, organizations can achieve greater clarity in roles and responsibilities. This integrated approach significantly enhances overall project efficiency, aligning with the dynamic needs of furniture product development projects.

Establishment of a Change Management system: To address the absence of an official change management system, there is a recommendation to establish a structured system that includes procedures, documentation, a change process, and a change management plan. This systematic approach can provide clarity on decision-making processes and roles, contributing to a more organized and effective change management practice.

Foster continuous learning and emotional intelligence: Prioritizing continuous learning and professional development is essential for project managers in the furniture industry. This aligns with the requirements of adaptive leadership, enabling effective navigation through various project phases and team dynamics. Offering opportunities for project managers to enrich their skills and stay abreast of industry trends ensures a proactive and resilient approach to change management. Additionally, placing emphasis on emotional intelligence is recommended. Project managers should undergo training in emotional intelligence to recognize and address emotional reactions during change. Developing emotional intelligence skills equips managers to handle resistance, foster a positive work atmosphere, and ensure seamless transitions throughout the change management process

Training and Development: Recommendation for both project managers and designer is to attend furniture fairs, join platforms like WGSN, and review department reports (sales, procurement, supply chain) to stay updated on new trends, materials, and smart production methods. For designers involved in furniture product development, targeted training programs can focus on staying updated with design trends, sustainable practices, and user-centric principles. This could include workshops on using modern design tools and virtual prototyping techniques, enhancing their adaptability and technical skills.

At the same time, project managers can undergo comprehensive training in change management methodologies, emphasizing the hybrid approach. Specific sessions on effective communication, leadership during change, and utilization of

change management function in product data management as PDM, PLM can enhance their ability to navigate changes efficiently. Collaborative training sessions, bringing both designers and project managers together, can foster cross-functional understanding. Joint workshops on communication and collaboration tailored to the furniture industry's unique challenges can improve teamwork

6.6 Future Research Directions

Looking ahead, future research based on what has been learned is suggested here, considering the limits of the current study. The first area is to explore the use of sustainable materials in making furniture. This is important because people are becoming more concerned about being environmentally friendly. Another area for research is to explore how project management tools or software, coupled with data management systems for physical products like furniture, can adeptly manage changes, assessing how these tools handle change, track progress, and coordinate tasks within the unique challenges of physical product development.

Additionally, an area worth looking into is how new technologies impact how we design and make furniture. Technology is always changing, so we can explore how these changes affect the process of managing and making changes in the furniture industry. This research could help us improve the way we design and produce furniture using the latest technologies.

REFERENCES

Alarcón, L. F. and Ashley, D. B. (1998) Project management decision making using crossimpact analysis. International Journal of Project Management 16 (3) 145 – 152.

Allen, Booz & Hamilton. (1982). New product management for the 1980's. New York: Booz, Allen & Hamilton, Inc

Baca, Claudia M. Baca I. (2005). Project Manager's Spotlight on Change Management (1st ed.).

Benner, M. J., & Tushman, M. L. (2003). Exploitation, Exploration, and Process Management: The Productivity Dilemma Revisited. The Academy of Management Review, 28(2), 238–256. https://doi.org/10.2307/30040711

Brown, S. and Eisenhardt, K. (1995). Product development: Past research, present findings, and future directions. Academy of Management Review 20 (2) 343- 378.

Ceptureanu, Eduard Gabriel. "Research regarding change management tools on EU SMEs." Business Excellence and Management 5.2 (2015): 28-32.

Chang, K.-H. (2015). Chapter 6 - Product Data Management. In K.-H. Chang (Ed.), e-Design (pp. 265–321). Academic Press. https://doi.org/https://doi.org/10.1016/B978-0-12-382038-9.00006-5

Change management with PTCWindchill : https://support.ptc.com/help/windchill/plus/r12.0.2.0/en/index.html#page/Windchill_Help_Center/ChgMgmtAbout.html Accessed: 25.12.2023

Chlebus, E., Cholewa, M., Dudzik, R., & Kozera, M. (1998). CAx application for process oriented concurrent design. Journal of Materials Processing Technology, 76, 176–181. https://doi.org/10.1016/S0924-0136(97)00345-2

Configuration and Change Management with ENOVIA https://xdinnovation.com/products/enovia/configuration-and-change-management/.Accessed : 25.12.2023

Conforto, E. C., & Amaral, D. C. (2016). Agile project management and stage-gate model—A hybrid framework for technology-based compa-nies. Journal of Engineering and Technology Management, 40, 1–14. https://doi.org/https://doi.org/10.1016/j.jengtecman.2016.02.003

Cooper R, Sommer A(2018)Agile–Stage-Gate for Manufacturers: Changing the Way New Products Are Developed Integrating Agile project management methods into a Stage-Gate system offers both opportunities and challenges. Research-Technology Management 61 17-26

Cooper, R. (2001) Winning at New Products – Accelerating the Process from Idea to Launch, Third Edition. Perseus Publishing, Cambridge Massachusetts, USA

Cooper, R. G. (1990). Stage-gate systems: A new tool for managing new products. In Business Horizons (Vol. 33, Issue 3, pp. 44–54). https://doi.org/10.1016/0007-6813(90)90040-I

Cooper, R. G. (1999) The invisible success factors in product innovation. Journal of Product Innovation Management (16) 115 – 133.

Cooper, R. G. (2016). Agile–Stage-Gate Hybrids. *Research-Technology Management,*59(1),21–29. https://doi.org/10.1080/08956308.2016.1117317

Cooper, R. G., & Kleinschmidt, E. J. (1986). An Investigation into the New Product Process: Steps, Deficiencies, and Impact. Journal of Product Innovation Management, 3(2), 71–85. https://doi.org/https://doi.org/10.1111/1540-5885.320071

David Silverman, David. (2011), Interpreting Qualitative Data, Fourth edition, Sage Publications.

Di Benedetto, A. (1999) Identifying the key success factors in new product launch. Journal of Product Innovation Management 16: 530 – 544.

Dvir, D. and Lechler, T. (2004) Plans are nothing, changing plans is everything: the impact of changes on project success. Research Policy 33: 1-15.

Dvir, D., & Lechler, T. (2004). Plans are nothing, changing plans is every-thing: the impact of changes on project success. Research Policy, 33(1), 1–15. https://doi.org/https://doi.org/10.1016/j.respol.2003.04.001

Dzamashvili Fogelström, N., Gorschek, T., Svahnberg, M., & Olsson, P. (2010). The impact of agile principles on market-driven software prod-uct development. Journal of Software Maintenance and Evolution: Re-search and Practice, 22(1), 53–80. https://doi.org/10.1002/spip.420

Furniture Market size and Share and regional forecast 2023-2030 https://www.fortunebusinessinsights.com/furniture-market-106357 accessed 25.12.2023

Gill, R. (2003). Change management--or change leadership? *Journal of Change Management, 3*(4), 307–318. https://doi.org/10.1080/714023845

Grushka-Cockayne, Y., Holzmann, V., Weisz, H., & Zitter, D. (2015). A new hybrid approach for selecting a project management methodology. Paper presented at PMI® Global Congress 2015—EMEA, London, England. Newtown Square, PA: Project Management Institute

Higgs, M., & Rowland, D. (2000). Building change leadership capability: 'The quest for change competence.' Journal of Change Management, 1(2), 116–130. https://doi.org/10.1080/714042459

Hooks and Farry (2001) Customer-centered products : creating successful products through smart requirements management /. Amacom.

Kotter, J. (2014). Accelerate: Building Strategic Agility for a Faster-Moving World. Massachusetts: Harvard Business Review Press

Li, X., Zhang, J., Peng, Q., & Wu, C. (2023). Agile solution search strategy for solving multi-conflicts in product development. Advanced Engineering Informatics, 57, 102012. https://doi.org/https://doi.org/10.1016/j.aei.2023.102012

Lutters, E. (2014). Product Development. In L. Laperrière & G. Reinhart (Eds.), CIRP Encyclopedia of Production Engineering (pp. 991–992). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-20617-7_6464

Månsson & PNyberg D(2002)Thesis Implementing Product Data Management in Product Development Projects http://www.cdio.org/files/document/file/workshop_project_support.pdf

Menon, A., Chowdhury, J., & Lukas, B. A. (2002). Antecedents and outcomes of new product development speed: An interdisciplinary conceptual framework. Industrial Marketing Management, 31(4), 317–328. https://doi.org/https://doi.org/10.1016/S0019-8501(01)00163-8

Müller, R., & Turner, R. (2010). Leadership competency profiles of success-ful project managers. International Journal of Project Management, 28(5), 437–448. https://doi.org/https://doi.org/10.1016/j.ijproman.2009.09.003

Murthy, C.S.V (2007 Change_Management. Himalaya Publishing House Pvt. Limited.

Pereira Medeiros, A., Seibel, S., Augusto Fernandes, A., & Natal Jorge, R. (2009). Furniture Industries: What need to change in the product development process? 20th International Congress of Mechanical Engineering .

PMI -Sixth Edition PMBoK Guide. A Guide to the project management body of knowledge. 3rd edition. Project Management Institute.

Project Management Institute. (n.d.). The standard for project management and a guide to the project management body of knowledge (PMBOK guide).

Quinn, R. W. & Quinn, R. E. 2016. Change Management and Leadership Development Have to Mesh. Harvard Business Review. https://hbr.org/2016/01/change-management-and-leadership-development-have-to-mesh. Accessed on 17 October 2023

Rouse, M. b. Product data Management. Retrieved from: https://searcherp.techtarget.com/definition/product-data-management-PDM. Accessed: 10.12.2023

Schmidt, J. B., Montoya-Weiss, M. M. and Massey, A. P. (2001) New product development decision-making effectiveness: comparing individuals, face-to-face teams, and virtual teams. Decision Sciences 32 (4) 575 – 600.

Schmidt, T. S., Weiss, S., and Paetzold, K. (2018), Agile Development of Physical Products: An Empirical Study about Motivations, Potentials and Applicability,ISBN:978-3-943207-28-6,available at:www.unibw.de/produktentwicklung-en, Report, University of the German Federal Armed Forces, Mu-nich, Germany.

Schmidt, T. S., Weiss, S., Paetzold, K. 1969-, & Institut für Technische Produktentwicklung. (n.d.). Agile Development of Physical Products : an Empirical Study about Motivations, Potentials and Applicability.

Terwiesch, C. and Loch, C. H. (1999) Managing the process of engineering change orders: the case of the climate control system in automobile development. Journal of Product Innovation Management 16 (2) 160-172

Thomke, S. and Reinertsen, D. (1998) Agile Product Development: Managing development flexibility in uncertain environments. California Management Review 41(1) 8-30.

Turner, J. R. (1999) The handbook of project-based management. USA: McGraw-Hill. Ulrich, K. T. and Eppinger, S. D. (2000) Product Design and Development. Second Edition. USA: McGraw-Hill.

Ulrich, K., & Eppinger, S. (2003). Product Design and Development.

Yeo, K.T. and Qiu, F. (2003) The value of management flexibility—a real option approach to investment evaluation. International Journal of Project Management 21: 243–250.

Yin, R.K. (1994), Case study research, Design and methods, second edition, Sage Publications: Thousand Oaks.

APPENDIX1. INTERVIEW QUESTIONNAIRE

Section 1: Understanding Changes in Product Development

1.1. Can you identify key changes that you've observed in recent furniture product development projects?

1.2. How do you stay informed about industry trends, technological advancements, and changes in consumer preferences relevant to furniture design and development?

1.3. In your experience, what factors typically drive changes in furniture product development projects?

Section 2: Project Manager's Role in Change Management

2.1. What do you consider the primary responsibilities of a project manager in navigating and managing change in product development projects?

2.2. Can you share examples of how you've successfully led a team through a significant change in a furniture product development project?

2.3. What skills and competencies do you believe are crucial for project managers in the furniture industry to effectively manage change?

Section 3: Tools, Models, and Techniques in Change Management

3.1. What tools or software do you commonly use to track and manage changes in product development projects?

3.2. Are there specific change management models or frameworks that you find particularly effective in the furniture industry?

3.3. Can you provide examples of techniques or strategies you've employed to facilitate a smooth transition during a change in a furniture project?

Section 4: Efficient Change Management Strategies in the Furniture Industry

4.1. From your perspective, what strategies contribute to efficient change management in furniture product development?

4.2. How do you tailor change management strategies to align with the unique challenges and opportunities in the furniture industry?

4.3. Are there specific lessons or insights from other industries that you find applicable and beneficial in the furniture sector?