Understanding *trans-level alignment* for New Product Development Teams in hybrid teamwork arrangements

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Statement of Originality

I, Margot Sandy, hereby declare on February 14, 2024, that the work from this PhD thesis is my own unless specified as sources and identified as references from journal articles, books and other publications listed within the bibliography. Furthermore, the research was conducted at Imperial College London in the Dyson School of Design Engineering from September 2018 through May 2023. I further certify that the thesis has not been submitted in any form to any other institution for any other degree program or qualification.

Copyright Declaration

Abstract

This PhD thesis investigates the impact of organisational levels on New Product Development (NPD) Teams in hybrid teamwork setups. Unlike previous studies that focused on individual levels or rarely considered two levels simultaneously, this research builds on literature covering individual, team, and organisational perspectives. Emphasising the significance of alignment throughout the entire system, the thesis aims to contribute to team outcomes. Comprising three core empirical studies with 97 participants, the research explores contextual influences on NPD teams. The first study establishes a foundation by defining effectiveness in modern NPD teamwork across organisational levels, examining broad contextual factors. The second study focuses on key factors for aligning team members within NPD environments, particularly team compositions. The third study integrates findings from previous studies to explore how identified factors impact overall alignment, aiming for better person-environment fit and compatibility. Considering individual perspectives on the organisational landscape and dynamic organisational needs, the research has the potential to enhance hiring practices and promote long-term employee retention. Utilising qualitative and mixed-method techniques, the studies present a unified approach to assess the current effectiveness of NPD teams, considering all levels of the organisation. Following a structured approach using the key stages of Design Research Methodology, the research incorporates divergent and convergent thinking. The derived whole systems approach and trans-level alignment model offer potential benefits for practitioners and researchers in understanding team effectiveness. By adopting an interdisciplinary perspective encompassing management, systems, psychology, behaviour, work, and identities, the thesis provides an original insight into team dynamics and effectiveness. Additionally, it establishes a foundation for future research, extending beyond NPD teams to explore other functionally diverse teams crucial for growth and competitive advantage across various industries.

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Abbreviations / Definitions (keywords)

Blended - An "environment that allows students to meet occasionally face-to-face but otherwise use technology to connect to the university and their peers" (Gaggioli et al., 2015; 1)

Complementary fit - A type of person-environment fit that focuses on individual abilities (Van Vianen, 2018)

Culture brokering - A process of linking diverse cultures within a team across nationalities (Jang, 2017)

Degree of virtuality - "Include three dimensions: the proportion of work time that the VT members spend working apart (team time worked virtually), the proportion of the team's members who work virtually (member virtuality) and the degree of separation of the team's members (distance virtuality)" (Schweitzer and Duxbury, 2010; 267)

Distributed / Dispersed / Global / Virtual teams - "Geographically distributed and electronically dependent" (Gibbs et al., 2017; 5)

Effectiveness - "The real-time altering of behaviour and interactions to meet the changing demands of a dynamic environment to accomplish the shared team goal" (Gorman et al., 2018: 60)

Embedded knowledge - Knowledge that is the combination of tacit and explicit knowledge that is considered more beneficial for the organization because it reflects unique combinations of information (Badaracco and Badaracco, 1991; Madhavan and Grover, 1998).

Emergent states - The desired conditions where shared behavioural patterns within the team exist over time (Marks et al., 2001; Waller et al., 2016)

Explicit knowledge - Knowledge that can be easily transferred (Nonaka et al., 1995).

Face-to-Face teams / Traditional teams / Local - "Teams that do all of their work face-to-face and make no use of technological support." (Griffith et al., 2003; 268)

Flexible work - "Various situations related to performing work outside a firm's premises" (Neirotti et al., 2019; 117)

Functional Alignment Brokers - Individuals with diverse functional and educational experiences who serve as "connectors" or "liaisons" to strategically advance R&D projects by softening functional boundaries within NPD teams without diluting the expertise of team members

Functional Balance Alignment - A balanced distribution of functions within a team to prevent the dominance of ingrained functional identities and allegiances that may hinder collaboration and alignment with broader goals.

Functional identities - The tendency to define oneself in terms of the overarching values, strategy, and norms linked to a functional area (Ashforth and Mael, 1989; Sethi et al., 2001)

Goal alignment - "A shared idea of a valued outcome that represents a higher order goal and a motivating force at work" (West, 1990: 310).

Home-based working - "Work performed by employees at home with or without the use of information and communication technologies" (Lott and Abendroth, 2022; 3)

Homeworking - "People doing supplemental work at home" (Sullivan, 2003; 160)

Hybrid teams - "Employees and teams work partly at the workplace and partly from other locations" (Lott and Abendroth, 2022; 2)

Hybrid Sociability Alignment - Adjustment for informal social interactions in virtual environments as they can be beneficial for team members to look beyond functional labels and stereotypes

Hybrid Technology Alignment - Agreement related to the organisational infrastructure needed/implemented to overcome technical constraints in hybrid environments in order to ensure comfort levels

Identity - "a set of meanings […] defining what it means to be who one is" (Burke, 1991; 837)

NPD - New Product Development Teams - Teams comprising a diverse range of expertise that play a pivotal role in introducing new products and services to the market, as highlighted by Cooper (2017), Lee et al. (2019), Mu et al. (2017), and Sivasubramaniam et al. (2012). These innovations not only fuel organisational growth but also confer a competitive edge, as underscored by Qin et al. (2021) and Sivasubramaniam et al. (2012).

Organisational identity - (Deshpande´ and Webster, 1989; Hatch and Schultz, 2002) - a shared psychological attachment to the broader organization (Shapiro et al. 2002)

Organisational Purpose Alignment - Overall team connection with the organisational identity.

Organisational trust - Team members' willingness to form long-term relationships with the organization (Robinson, 1996; Yu et al., 2018)

Person-environment fit - "The compatibility between the person and their immediate team," (Hajarolasvadi and Shahhosseini, 2022, 04022126-2)

Professional identity - The "relatively stable and enduring constellation of attributions, beliefs, values, motives, and experiences in terms of which people define themselves in a professional role" (Ibarra, 1999, 764).

Psychological safety - A state that occurs when team members feel valued and are able to speak up without fear of repercussion or ridicule (Edmondson, 1999)

Regional innovation clusters - Geographical areas with high concentrations of tech- or creative-driven organisations, researchers, and prominent universities connected to science and technology (Stephens et al., 2019; Wessner, 2014).

Relationship conflicts - Interpersonal differences (Jehn, 1997)

Remote / Mobile work - "Office work which can be conducted using electronic technologies that make possible communication—in word, image, and speech—with those who are geographically remote" (Felstead and Henseke, 2017; 196)

Shared organisational trust - Where not only the individuals trust their organization, but the organisation trusts the individuals

Smart work - "The work that individuals perform from a physical distance for their organizations in a flexible and innovative manner using mobile devices such as smartphones" (Kim and Oh, 2015; 1038)

Supplementary fit - A type of person-environment fit that focuses on similar values and preferences (Van Vianen, 2018)

Tacit knowledge - Knowledge that is more challenging to transfer or communicate (Nonaka et al., 1995; Polanyi, 2009)

Team Cohesion - The sense of belonging a team member feels within a group (Bollen and Hoyle, 1990)

Team Commitment Alignment - Overall individual connection to the team identity.

Team identity - A shared psychological attachment to a work team (Shapiro et al., 2002)

Team trust - The shared beliefs and perceptions that team members have of their teammates (De Jong and Elfring, 2010)

Technology brokering - (Hargadon and Sutton, 1997) - The process that connects macro and micro perspectives in innovation

Telework or Telecommuting - "…Involves using computer technology to work from home or another location away from the traditional office for a portion of the work week" (Sardeshmukh et al., 2012; 194)

Temporal brokerage - (Mell et al., 2021) - The process of linking across distances

TMS - Transactive Memory System - (Jarvenpaa and Keating, 2011; Peltokorpi and Hood, 2019; Wegner, 1987) - relying on team members' cognitive divisions where team members trust other team members for sharing and retrieving different types of knowledge (Akgun et al., 2006; Tang et al., 2015).

Transdisciplinary - An approach that goes beyond traditional boundaries of investigation by taking a holistic view (Arthur et al., 1989).

Trans-level - Refers to influence across levels

Trans-level alignment - A framework that comprehensively evaluates the current effectiveness of NPD teams by considering all levels of the organisation in a unified manner

Workplace Autonomy Alignment - An organisation's trust in their employees, specifically to set boundaries for their best working conditions with regard to hybrid team arrangements

Acknowledgements

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I will continue to be curious, always look to improve/be better and strive to make all of you proud.

Chapter 1: Introduction

MRQ: How might trans-level alignment within New Product Development teams influence effective hybrid teamwork?

1.1. Research Overview

"System blindness is a costly self-delusion." -*Barry Oshry*

The primary focus of this review centres on the effectiveness of New Product Development (NPD) teams operating within hybrid teamwork arrangements. This Ph.D. study adopts a comprehensive approach, termed trans-level alignment, which encompasses all levels of the organisation, as elaborated upon later in this chapter. NPD teams are multifaceted groups comprising various disciplines such as marketing, engineering, design, manufacturing, and project management (Bonesso et al., 2020; Hodgson and Paton, 2016; Song and Swink, 2002). Each member contributes distinct expertise crucial for the successful commercialisation of new products and services (Cooper, 2017; Lee et al., 2019; Mu et al., 2017; Sivasubramaniam et al., 2012). These teams embark on projects characterised by varying degrees of uncertainty and complexity, starting with a product brief or mission directive. Their goal is to deliver a tangible product or service to the marketplace within a defined timeframe, aiming to confer a competitive advantage to the organisation (Qin et al., 2021; Sivasubramaniam et al., 2012). Despite more than 50 years of research highlighting the pivotal role of NPD teams in driving innovation (Cooper, 2017; Lee et al., 2019; Mu et al., 2017; Sivasubramaniam et al., 2012), challenges persist in fully leveraging their potential, necessitating ongoing study and analysis.

Past research has frequently concentrated on processes that may lose significance or adapt with the evolution of product types, whether physical, digital, or service-oriented. Nevertheless, a constant factor in new product development, irrespective of the product type, is the efficient utilisation of diverse knowledge throughout the project. As the demand for various types of knowledge rises, and working arrangements for knowledge integration (e.g., hybrid, in-person, virtual) become diverse, coupled with the growing need for quicker outcomes, addressing the complexity of these teams becomes a pertinent focus. Given this intricacy, questions emerge regarding how to support teams for superior innovation outcomes, underscoring the necessity for an alternative approach.

The main research question (MRQ) of this doctoral study is 'How might trans-level alignment within New Product Development teams influence effective hybrid teamwork?' This question holds significance as it outlines the thesis's objective of comprehending contextual considerations across levels to unlock the full potential of functionally diverse team compositions. The development of the MRQ will be discussed later in this chapter. Additionally, the thesis objective is explored through three core chapters (4, 5, and 6), presenting studies conducted at different organisational levels. The overarching goal is to identify factors impacting the entire system by considering perspectives from various levels of the organisation.

The research structure, illustrated in Figure 1.1, follows a divergence-convergence thinking approach inspired by the Double Diamond process (UK Design Council, 2005) and adapted for this study. This framework aligns with the key stages of Design Research Methodology (DRM) (Blessing and Chakrabarti, 2009). The first diamond involves exploring the topic of New Product Development teams, diverging through the mapping of key concepts, authors, and relevant studies and theories, and providing a broad overview of the current literature landscape (akin to the Research Clarification stage in DRM). Subsequently, a clear definition of the problem/direction is established, and the Main Research Question (MRQ) takes shape for further investigation, leading to entry into the second diamond (corresponding to the Research Studies stage).

Within the second diamond, convergence takes place as understanding, support, and evaluation occur through empirical analysis from descriptive and prescriptive studies involving NPD teams (reflecting a stage in DRM). The findings, discussions, and conclusions then guide the thesis toward the solution area, which encompasses, in part, a framework that comprehensively evaluates the current effectiveness of NPD teams. This evaluation considers all levels of the organisation in a unified manner, termed the trans-level alignment model. The thesis reaches this area by exploring the impact of an organisation's multi-level influences on outcomes and delving into various literature streams with an interdisciplinary approach (drawing from management, systems, psychology, behaviour, work, and identities). This interdisciplinary perspective seeks to understand factors from different levels of an organisation that can collectively influence overall team outcomes.

Figure 1.1 Overall Research Structure Using Adapted Double Diamond & DRM (UK Design Council, 2005; Blessing and Chakrabarti, 2009)

The subsequent sections of this chapter will provide an in-depth exploration of the background, offering a comprehensive overview of the topic area. Additionally, detailed insights into each stage of the methodology, namely Research Clarification and Research Studies, will be presented. Following this, emphasis will be placed on delineating the specific research problem, accompanied by a clear articulation of its statement and an elucidation of the rationale and scope governing the research approach. Finally, the chapter will draw to a close by underscoring the significance of the research and presenting a roadmap that anticipates the content and progression within the subsequent thesis chapters.

1.2. Research Background

NPD teams are known to play a crucial role within organisations, serving as a vital force for competitive advantage and growth (Cooper, 2017; Mu et al., 2017; Sivasubramaniam et al., 2012). These teams, characterised by their inherent complexity, coalesce members from diverse functions, each contributing distinct expertise, perspectives, approaches, and terminology, with the collective goal of transforming conceptual ideas into marketable products (Edmondson and Nembhard, 2009; Gao and Bernard, 2018; Sarin and O'Connor, 2009).

As the utilisation of NPD teams extends globally to tap into additional knowledge resources (Gao and Bernard, 2018), work arrangements evolve to incorporate a blend of in-person and virtual interactions (Einola and Alvesson, 2019; Marion and Fixson, 2021; Raghuram et al., 2019), the heightened complexity introduced can impact overall effectiveness. However, existing methodologies often fall short in accounting for the multifaceted nature of this complexity. Despite numerous documented research approaches over the years aiming to better integrate diverse expertise within these teams, existing methods are constrained by either being too narrow or overly broad in their organisational perspective, limiting their ability to fully comprehend and address the intricacies of the problem.

To garner a more holistic understanding of organisations featuring teams composed of multiple functions and disciplinary perspectives, the design of the research clarification stage (or literature review) becomes paramount. This stage is critical in appropriately exploring the topic and addressing the complexities inherent in NPD teams.

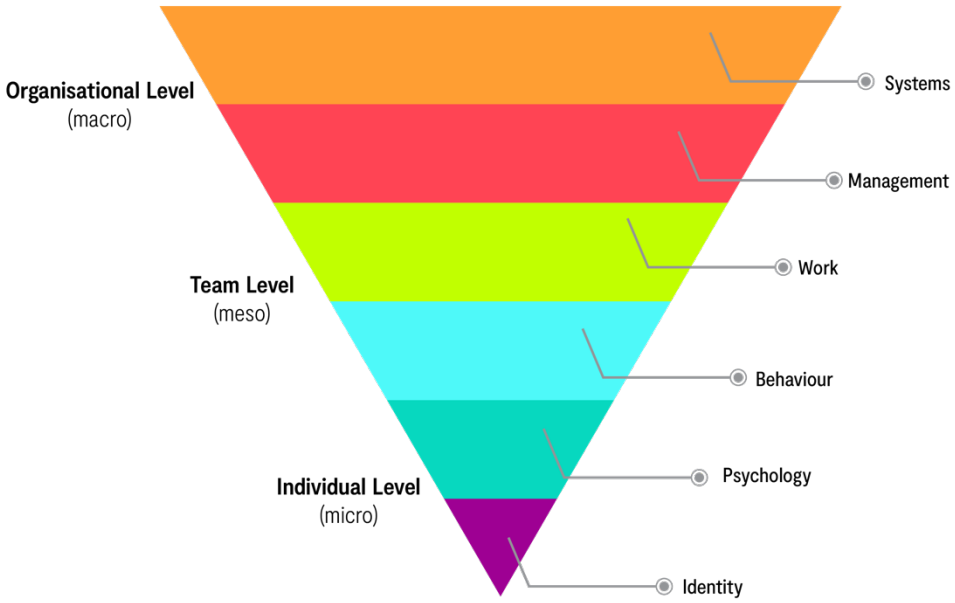
1.3. Research Clarification (1st diamond / DRM Stage)

In consonance with the Research Clarification stage elucidated by Blessing and Chakrabarti (2009), a pivotal role is assigned to literature analysis in formulating a realistic research goal or main research question. The second chapter of this thesis undertook a comprehensive literature review, providing an overarching foundation by framing core arguments based on landmark peer-reviewed literature. This review strategically identified articles with high citation counts, commonly cited studies, and authors with high h-indexes, ensuring the thesis was anchored in a credible foundation (refer to Appendix A1). Termed a mapping review, this literature review approach involves visually synthesizing information and adopting a more question-based orientation. It resembles a scoping review but is distinctly focused on mapping existing literature to identify gaps for subsequent reviews and primary

research, following the framework proposed by Grant and Booth (2009, p94). After completing the mapping exercise, the research transitioned to more detailed and current reviews, leading to the formulation of research sub-questions for each of the main studies outlined in chapters 4, 5, and 6.

The process of mapping the literature, spanning from organisational to team to individual levels, commenced with structured searches that evolved from broad to more specific focuses. This progression aligned with the macro, meso, and micro perspectives in organisations, as articulated by Cunningham and O'Reilly (2018). This mapping technique not only shaped the types of journal articles reviewed but also played a crucial role in establishing the conceptual boundaries for the thesis. Figure 1.2 visually illustrates the systematic narrowing of the literature evaluation areas.

Figure 1.2 Literature Mapping Evaluation Areas



In essence, the literature review played a crucial role in refining research sub-questions, thereby contributing to the comprehensive answer to the overarching research question in the thesis.

1.4. Research Studies (2nd diamond / DRM Stage)

The Design Research Methodology (DRM) devised by Blessing and Chakrabarti (2009) delineates the Research Studies phase as the stage wherein empirical data analysis occurs,

facilitating a deeper understanding and assessment of the primary research question. This thesis encompasses three comprehensive studies comprising a literature review (elaborated in Chapter 2), investigation, and result generation.

The initial study (Chapter 4), referred to as Descriptive Study I in DRM, adopts a qualitative approach to illuminate influencing factors at the organisational environment level. The second study (Chapter 5), termed Descriptive Study II in DRM, also employs a qualitative methodology to synthesise additional insights from the team level. The third study (Chapter 6), identified as the Prescriptive Study in DRM, employs a mixed methods approach to explore the impact on the desired state in New Product Development (NPD) teams at the individual level. The data gathered in this study contributes to the interpretation of the findings from the preceding studies (Chapters 4 and 5). Table 1.1 presents an overview of the studies, methodologies, and chapters employed throughout the thesis that ultimately led to the unveiling of the unified approach in Chapter 7.

Table 1.1 Research Study Overview

Chapter	Basic Means	Research Stage	Research Study	Research Study #	Method	Basic Outcomes
1						
2	Literature Analysis	Research Clarification	Review-based	0	Literature Mapping	Research questions
3						
4	Empirical Analysis	Descriptive Study I	Comprehensive	1	Qualitative	Understanding from Org Level
5	Empirical Analysis / Synthesis	Descriptive Study II	Comprehensive	2	Qualitative	Understanding from Team Level
6	Empirical Analysis	Prescriptive Study	Comprehensive	3	Mixed Methods	Understanding / Examination from Individual Level
7						Unified Approach

In essence, this thesis adopts a holistic approach, incorporating comprehensive studies guided by the Design Research Methodology (DRM). DRM serves as a framework shaping the

overall structure of the thesis, specifically tailored to tackle the unique research problem at hand. This methodology is complemented by the principles of the pragmatic paradigm philosophy, strategically employed to counter some prevalent issues typically associated with design research. These issues, as highlighted by Blessing and Chakrabarti (2009), encompass a lack of existing research overview, limited applicability in industry, and insufficient rigor.

Throughout the project, meticulous attention is devoted to addressing these identified criticisms, a thorough exploration of which is outlined in the methodology chapter (Chapter 3). The subsequent section further elucidates the statement of the problem, providing a clear context for understanding the positioning of the work and the targeted issues that the studies aim to address.

1.5. Statement of the Problem

Existing literature on NPD teams exhibits several limitations, primarily in its tendency to concentrate on a singular level or infrequently include two levels for analysis. However, the intrinsic nature of NPD teams necessitates consideration across three levels. NPD teams inherently involve diverse knowledge at the individual level, encompass various approaches for knowledge integration at the team level, and exhibit diverse working arrangements at the organisational level. The prevailing narrow scope in the current research poses a significant concern as it overlooks contextual factors that can significantly influence team dynamics. Consequently, this limited perspective results in fragmented theories, processes, and methodologies, failing to comprehensively address the challenge of realizing the full potential inherent in functionally diverse team compositions. The significance of this study lies in its aim to fill this critical gap in the literature by providing a more comprehensive evaluation that encompasses all three essential levels of NPD teams, thereby offering a more holistic understanding of their dynamics and performance.

1.6. Rationale: Thesis Main Research Question and Research Sub Questions

In tackling the research problem, this thesis chose to adopt a 'MRQ' (Main Research Question) approach rather than relying solely on the commonly used 'Aims and Objectives' method. The primary rationale for embracing the 'MRQ' approach was to establish a coherent link to the thesis's main focus, interconnect various studies and chapters through research

questions, minimise ambiguity, and ensure the critical arguments of the thesis were effectively addressed. The 'MRQ' underwent refinement over time as the research scope evolved, incorporating additional aims and objectives to guide practical research execution and specify investigations for each chapter and research sub-question. As different themes surfaced during various research phases, including post-literature reviews, studies, and discussions, the questions were adjusted to better align with the thesis's driving force.

To delve deeper, the main research question served as the central inquiry that the thesis aimed to resolve. It was formulated based on the researcher's area of interest, specifically, NPD teams, explored across different literature domains, and evaluated for feasibility within the timeframe of a Ph.D. The initial motivation for the research originated from the researcher's extensive professional involvement within NPD teams, where persistent barriers constrained the full potential of projects and teams.

The preliminary exploration into NPD teams encompassed assessing factors contributing to project failures, key decision points for teams, and the requisite disciplinary expertise throughout product development stages, drawing from the researcher's professional experience. This comprehensive investigation spanned a wide range of areas and gradually narrowed down to an examination of factors influencing the understanding of diverse expertise in teams, particularly during joint decision points. This early iteration of the research question prompted the researcher to investigate tendencies, occupational preferences (e.g., focusing on the most common professions or functions within NPD teams), and the connections each profession or function had with the organisation. It was at this stage that the concept of "alignment" became a central focus.

While the term ‘alignment’ finds application in various contexts within the literature, its fundamental concept revolves around harmonising different elements. For instance, in individual contexts, goal alignment is often simplified to entail a shared understanding of valued outcomes motivating individuals at work (West, 1990). However, this notion overlooks team and organisational components, focusing solely on the needs and preferences of team members. Moreover, the business and information systems literature discusses ‘strategic alignment,’ linking opportunities with organisational resources and priorities, predominantly within executive and top management environments (Ateş et al., 2020; Avison et al., 2004; Walter et al., 2013). While valuable, this concept narrows its focus to a specific organisational area and

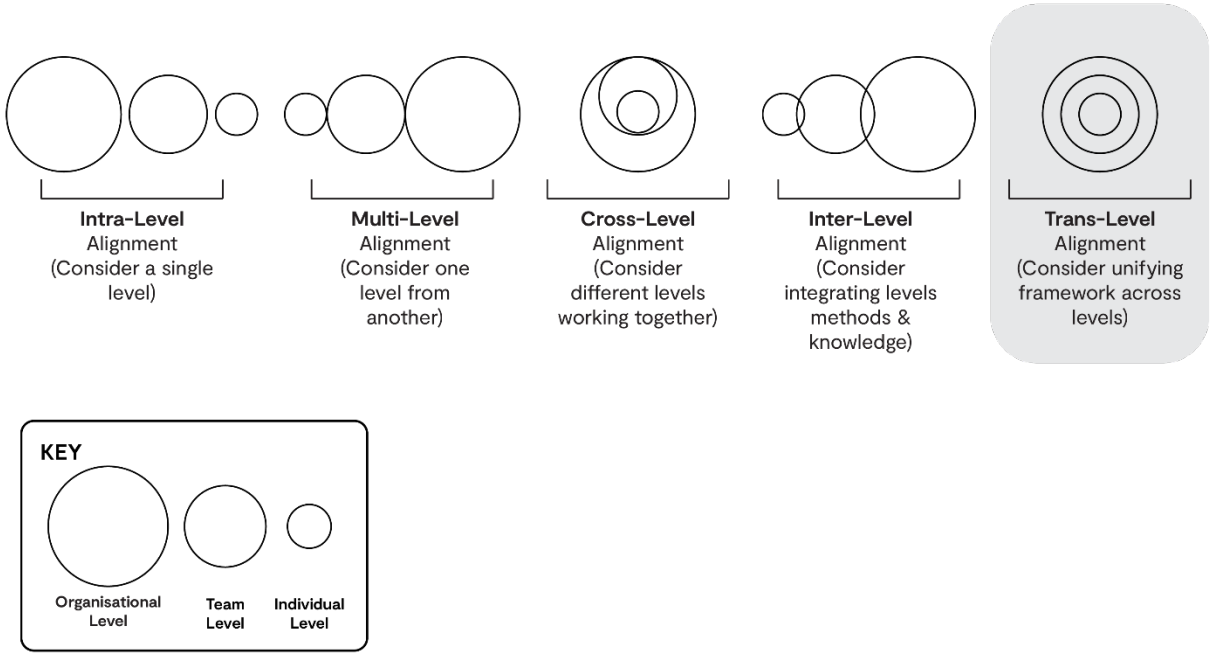
does not encompass the entirety of alignment required in teams. Alignment is also conceptualised in the context of strategic human resources recruiting, primarily concentrating on connecting structural areas (Phillips et al., 2015). In essence, current uses of alignment may address individual or team goals and strategic missions but often overlook the interconnected levels of an organisation viewed holistically. When organisations experience misalignment, it can manifest in various forms and levels, such as dysfunctional teams, high turnover rates, project delays, or underwhelming product launches. These areas of incompatibility can significantly impact an organisation's bottom line but may be challenging to measure or fully comprehend due to their complex interconnectedness. This underscores the necessity for a more comprehensive concept that encapsulates compatibility throughout an organisation.

Thus, this thesis delves into the essence of alignment, aligning it with organisation and effectiveness theories while further investigating alignment across the organisation for modern-day teams operating in diverse working arrangements. To define the type of alignment across the organisation, this study introduces the term ‘trans-level alignment’ as a framework that comprehensively considers all levels of the organisation in a unified manner. The term ‘trans-level’ is inspired by disciplinary approaches in higher education that utilise prefixes such as intra-, inter-, cross-, multi-, and trans- to describe team compositions (Ebrahimy and Jafari, 2019; Med, 2006; Newell and Galliers, 2000). As depicted in Figure 1.3, this thesis adopts these prefixes to emphasise a clear departure from existing research approaches that overlook or fail to integrate all three levels of the organisation in their analyses.

As a case in point, research classified as intra-level alignment primarily assesses organisations either from a bottom-up viewpoint, focusing on individuals served by the organisation, or from a top-down perspective, delving into structures and broader schemes of topics. Other studies, categorised as multi-level, cross-level, and inter-level alignment, put the emphasis on expanded research areas that encompass both team and individual considerations, depending on the degree of integration. However, these research approaches still have limitations in their perspectives, thus lacking the potential for comprehensive impact across the entire organisation.

Therefore, the trans-level alignment approach serves as the lens through which this research closely scrutinises the different organisational levels, aiming to explore the connectivity that occurs at their intersections.

Figure 1.3 Thesis Approach Differentiation



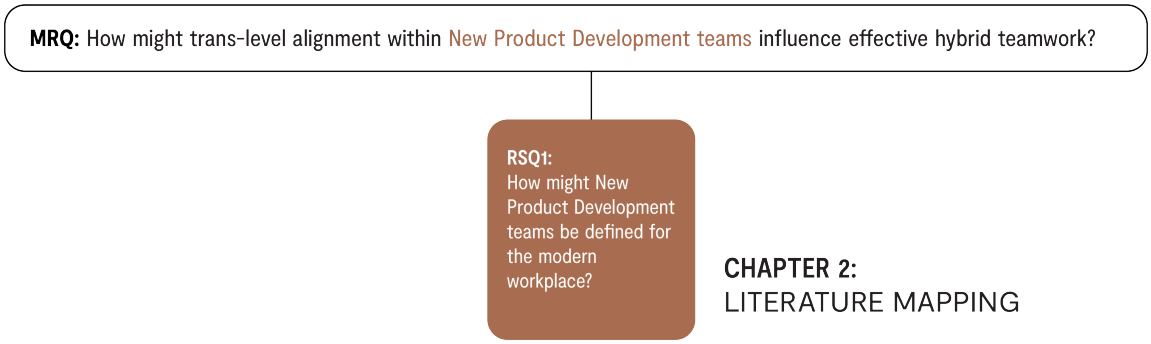
With the concepts expounded upon and after numerous iterations of the MRQ alongside ongoing exploration of literature, the final rendition of the central research question for examination in this thesis arose is as follows: 'How might trans-level alignment within New Product Development teams influence effective hybrid teamwork?' The primary aim of this question was to acquire understanding regarding contextual factors across various organisational levels to unleash the complete potential of functionally diverse team compositions.

The MRQ served as the foundation for generating research sub-questions (RSQs), breaking down the main inquiry into key elements. These elements not only guided the research direction but also led to the discovery of additional relevant literature and indicated the necessary data and methods for collection. The RSQs became the framework for structuring the thesis, linking to each of the chapters. Chapters 4-6 utilised operationalized versions of the RSQs for measurable research. By addressing each RSQ, the thesis established a logical connection to the MRQ, demonstrating the comprehensive exploration of the primary research question.

RSQ1 aimed to address 'How might New Product Development teams be defined for the modern workplace?' and was formulated to enhance understanding of the background of NPD teams (see Figure 1.4). The objectives associated with this question encompassed the following:

1. Define the key components of NPD teams
2. Provide context for NPD teams with regards to the modern workplace
3. Utilise different literature streams to explore NPD contexts within the whole framework of an organisation (e.g., organisational, team, and individual levels)

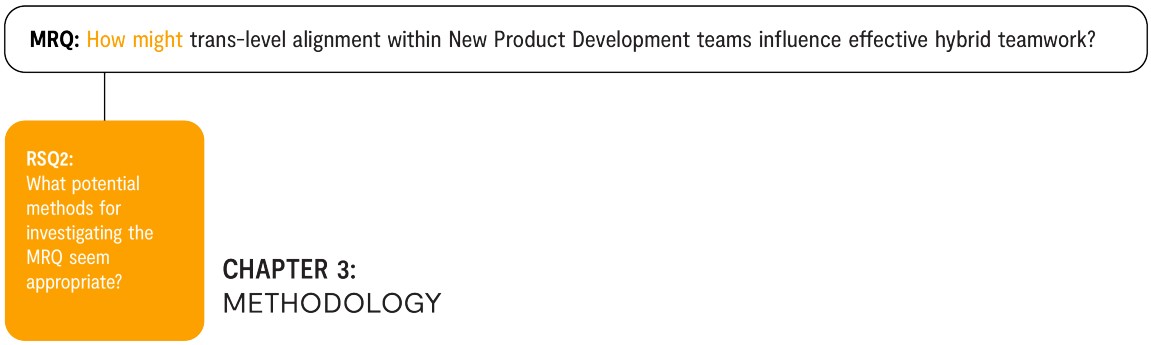
Figure 1.4 RSQ1 Deconstructed from MRQ Key Element (Chapter 2)



RSQ2, designated as 'What potential methods for investigating the MRQ seem appropriate?', stemmed from the goal of determining the suitable methods for investigating issues within NPD teams, as depicted in Figure 1.5. The objectives associated with this research sub-question included the following:

1. Provide the underlying philosophical package that justifies the different research design choices
2. Detail overarching approaches and conceptual perspectives for the studies
3. Discuss practical aspects of the research design (strategy, techniques, and procedures)
4. Discuss research design quality and ethical considerations

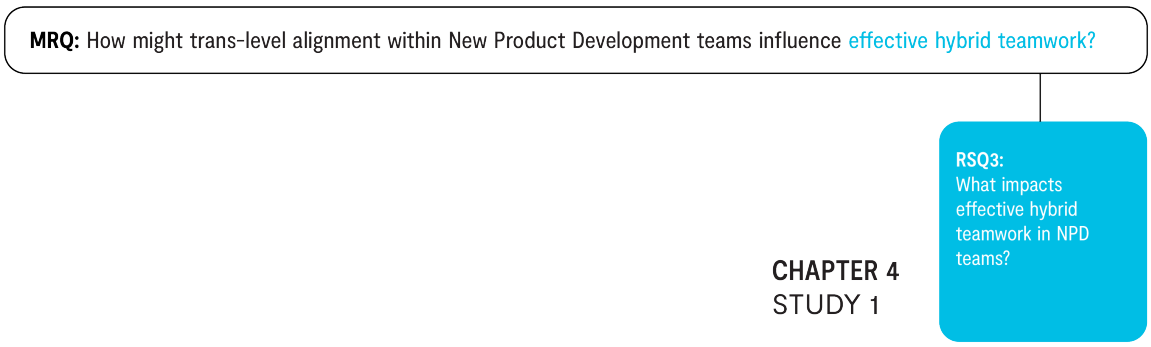
Figure 1.5 RSQ2 Deconstructed from MRQ Key Element (Chapter 3)



RSQ3, identified as 'What impacts effective hybrid teamwork within NPD teams?', originated from the goal of comprehending essential elements of hybrid work at the organisational level, as outlined in Figure 1.6. The objectives associated with this research sub-question for the first study comprised the following:

1. Establish how hybrid work/teams are defined
2. Identify the pain points/disadvantages of hybrid teams
3. Analyse how hybrid teams influence effectiveness from a team's perspective
4. Identify alignment factors from an organisational perspective that impact outcomes in hybrid NPD teams

Figure 1.6 RSQ3 Deconstructed from MRQ Key Element (Chapter 4)



RSQ4, denoted as 'Which factors influence trans-level alignment within NPD teams?', was formulated with the goal of comprehending the pivotal elements contributing to alignment across the organisation, considering the context defined at the team level (refer to Figure 1.7).

The objectives associated with this research sub-question for the second study encompassed the following:

1. Identify how functions within NPD teams align within the organisation
2. Analyse conflict and tension within NPD teams (e.g., misalignment/incompatibility)
3. Provide recommendations/strategy for alignment within NPD teams
4. Identify alignment factors from a team perspective that impact outcomes in NPD teams

Figure 1.7 RSQ4 Deconstructed from MRQ Key Element (Chapter 5)

RSQ5, which was 'Under what scenario is trans-level alignment achieved to influence NPD team outcomes?' was formulated with the aim of comprehending the circumstances under which alignment across the organisation is attained, considering the context defined at the individual level (see Figure 1.8). The objectives associated with this research sub-question for the third study encompassed the following:

1. Identify how functions integrate knowledge in NPD teams (e.g., alignment opportunities)
2. Define trans-level alignment
3. Analyse compatibility in NPD teams (e.g., person-environment fit)
4. Examine alignment factors from an individual perspective that impact outcomes in NPD teams
5. Explore perceived misalignments in NPD teams

Figure 1.8 RSQ5 Deconstructed from MRQ Key Element (Chapter 6)

The linkage between Chapter content and the five key elements of the MRQ is summarised in Table 1.2 to illustrate how the thesis research questions align with these essential elements.

Table 1.2 Research Questions Linked to Thesis Chapters

Chapter	Content	Key Elements	MRQ and RSQs
1	Introduction	-	*MRQ*: How might trans-level alignment within New Product Development teams influence effective hybrid teamwork?
2	Literature Review	Enhancing modern NPD teams	*RSQ1:* How might New Product Development teams be defined for the modern workplace?
3	Methodology	The kinds of methods to be used in investigating these issues	*RSQ2:* What potential methods for investigating the MRQ seem appropriate?
4	Study 1	The key impacts of hybrid teamwork	*RSQ3:* What impacts effective hybrid teamwork within NPD teams?
5	Study 2	The key factors of trans-level alignment	*RSQ4:* Which factors influence trans-level alignment within NPD teams?
6	Study 3	Achieving trans-level alignment	*RSQ5:* Under what scenario is trans-level alignment achieved to influence NPD team outcomes?
7	Conclusions, Recommendations, Limitations, and Future Research	-	-

1.7. Scope

To establish precise boundaries for the thesis, the research questions were confined to New Product Development Teams, specifically those involved in creating physical products for consumers utilizing both asynchronous and synchronous technology tools for communication. This particular type of team was chosen due to its composition of diverse expertise, diverse working arrangements, and the potential for exploration into various areas of misalignment. This encompassed team members responsible for business/marketing aspects, designers and engineers handling the internal and external components of the new product, manufacturers in charge of physical production, various types of managers enabling product market entry, and individuals or teams located in different places. While digital product teams were initially considered, they were ultimately excluded due to the limited variance in expertise, such as the absence of manufacturing or operational experience necessary for digital product teams.

The focus extended to teams predominantly found within Regional Innovation Clusters, which are geographic areas characterised by high concentrations of tech- or creative-driven organisations, researchers, and prominent universities connected to science and technology (Stephens et al., 2019; Wessner, 2014). Notable regional innovation clusters included the Greater London area, the Greater Boston area, New York, and Silicon Valley. These regions shared a commonality of participant experience at various companies, fostering greater similarities across professional disciplines and providing insights beyond the scope of a single company for exploration.

The period of data collection for the three studies spanned from May 2020 to November 2020, December 2021 to January 2022, and December 2022. Demographic factors studied included educational background, professional experience (career stage), and connections to different Regional Innovation Clusters. Demographic elements such as gender, age, race, and ethnicity were explicitly excluded from the scope of this thesis.

1.8. Research Significance

This research endeavours to contribute meaningfully to both academic scholarship and practical industry applications. Academically, it encourages a more comprehensive exploration of complex issues by advocating for a broader and more detailed contextual understanding. A key academic contribution lies in connecting three under-explored factors to team effectiveness theory within an organisational multilevel framework, specifically in the context of hybrid

teamwork arrangements (Chapter 4). This approach addresses a notable gap in the literature by adopting a holistic viewpoint, surpassing the limitations of narrow perspectives from one or two organisational levels. Furthermore, the introduction of an identity perspective in Chapter 5 adds depth to existing discussions on team tensions by emphasizing the significance of allegiances to functional identities and the nuanced relationships between the team and the organisation.

The study also puts forth an alternative approach to NPD theory, proposing strategic positioning of specific roles, such as functional alignment brokers, to maintain the strength of functional boundaries without compromising team members' expertise (Chapter 5). From an empirical standpoint, the research provides valuable insights into integrating new knowledge and team members for person-environment fit, grounded in identified misalignments across the organisational framework (Chapter 6). These empirical findings contribute practical guidance for future research endeavours.

From an industry standpoint, the research offers guidance for designing future team compositions, particularly in the context of hybrid environments. The insights derived from the study can assist organisations in structuring teams effectively, considering diverse expertise, working arrangements, and potential areas of misalignment. The trans-level alignment model and practitioner's flowchart introduced (Chapter 7) in the thesis serve as practical tools for management, leadership positions, and individuals operating in functionally diverse environments. Overall, this research not only addresses critical gaps in the literature but also provides actionable insights for organisations to enhance team effectiveness in modern and dynamic work environments.

1.9. Thesis Structure

As demonstrated earlier (section 1.4), the thesis is structured into seven chapters, each intricately connected to a specific research sub-question (excluding the introductory and concluding chapters), with the intent of addressing these questions in subsequent chapters. Table 1.3 provides an overview of the content expected in each chapter, offering a glimpse into the thematic context explored throughout the thesis.

Table 1.3 Context for Thesis Chapters

Chapter	Context
Chapter 1: Introduction	This chapter presents an overview of the research questions and the thesis's approach, outlining underlying assumptions, research design, and its connection to the three core studies (chapters 4, 5, and 6). It sets the stage for the overall contributions of the thesis.
Chapter 2: NPD Teams in the Modern Workplace – Literature Mapping	The second chapter is focused on providing contextual background for the investigation, this chapter delves into the landscape of New Product Development (NPD) teams. It reviews landmark and current literature, establishing the theoretical foundations for the subsequent core studies conducted in chapters 4, 5, and 6.
Chapter 3: Methodology	This chapter documents the research methods employed to investigate issues within NPD teams. It serves to justify the selection of specific methodologies, laying the groundwork for the subsequent studies conducted in the thesis.
Chapter 4: When Hybrid Teamwork Arrangements Lead to Effective Outcomes Beyond the Individual	Reporting on study 1, this chapter defines the term 'effective' within the thesis context. It shares insights gained from examining factors contributing to the effectiveness of NPD teams, setting the stage for understanding the broader implications of hybrid teamwork arrangements.
Chapter 5: Cutting through the Tension in NPD Teams: The Role of Functional Alignment Brokers	Reporting on study 2, this chapter explores the key factors of trans-level alignment involving team member functions. It provides an overview of these factors and their role in achieving alignment, contributing to the understanding of how tensions in NPD teams can be alleviated.
Chapter 6: Examining the Factors of Trans-level Alignment in NPD Teams for Person-Environment Fit	This chapter reports study 3 and delves into crucial aspects of alignment contributing to team success. Insights from this study are crucial for understanding how effectiveness can be achieved within NPD teams, emphasizing the importance of person-environment fit.
Chapter 7: Conclusions and Recommendations	Chapter 7 consolidates the findings, conclusions, and overall research outcomes. It revisits the MRQ and indicates how each RSQ from the preceding chapters contributes to answering the MRQ. The chapter also discusses theoretical/managerial implications, research limitations and suggests directions for future research.

1.10. Chapter Conclusion

This chapter presented an overview of the research structure, positioning, and rationale for the MRQ approach, serving as the foundation and justification for the thesis. It commenced by elucidating the identified gap in the literature that the research seeks to address and the

rationale for selecting the New Product Development (NPD) context for exploration. Additionally, it delved into the research clarification phase, outlining the interrelation between the three core studies and the chosen methodology. The chapter then dissected the rationale behind formulating the main research question and research sub-questions, which would be the focus of the ensuing studies. In conclusion, the chapter provided a summary of the upcoming chapters and outlined the overall structure of the thesis. The subsequent chapter aims to establish the theoretical underpinnings for each of the three core studies, linking the literature to lay the groundwork for addressing the main research question.

Chapter 2: NPD Teams in the Modern Workplace – Literature Mapping

RSQ1: How might New Product Development teams be defined for the modern workplace?

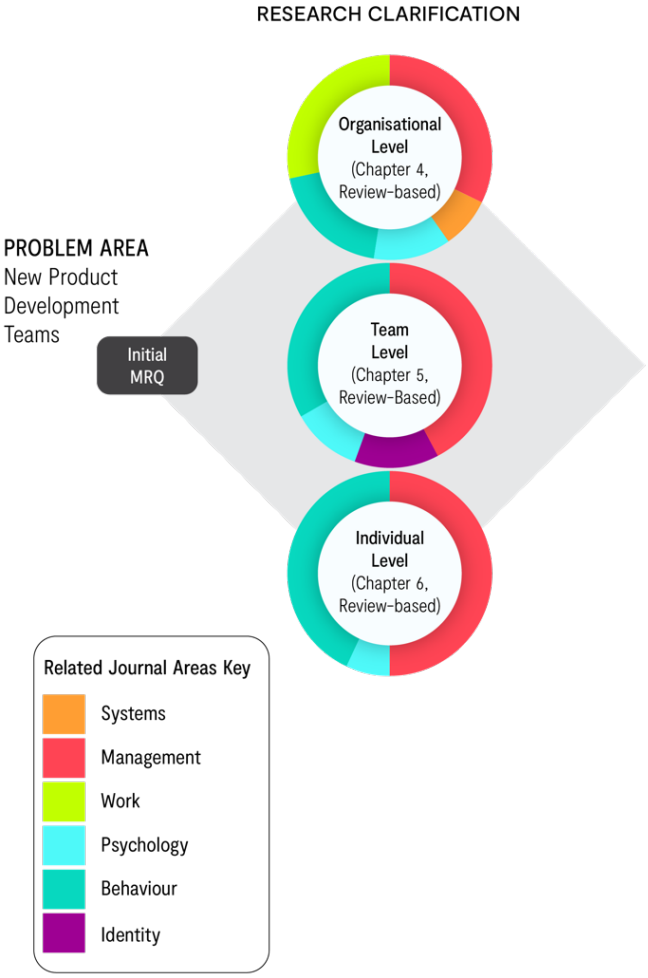
2.1. Chapter Introduction

This chapter undertakes an examination of the existing body of literature on New Product Development (NPD) teams, delineating their key components and contextualising their significance within organisational settings. NPD teams are characterised by "complex business processes" within the organisational environment, comprising "individuals from different functions," and relying on expertise in "design, testing, manufacturing, and marketing" (Gao and Bernard, 2018, p.1546). Despite more than 50 years of research spotlighting the pivotal role of NPD teams in introducing new products, services, and innovations (Cooper, 2017; Lee et al., 2019; Mu et al., 2017; Sivasubramaniam et al., 2012), persistent challenges hinder the full realisation of their potential.

Consequently, the exploration expands beyond the definition to encompass the entire organisational framework, including levels such as organisational, team, and individual. The literature encompasses various concepts related to NPD teams and associated areas, addressing mechanisms within organisations, understanding organisational settings, exploring interactions and behaviours, and evaluating work arrangements and management within NPD domains. Figure 2.1 illustrates the three levels of focus for the literature review, analysing articles from journals pertinent to the field of NPD at each level. Each level guided the formulation of research sub-questions, enabling the exploration of diverse contexts within the comprehensive framework, utilising different literature streams.

This thesis adopts a levels-of-analysis approach (Kozlowski and Klein, 2000), evaluating multiple organisational levels with the potential to impact team function. Throughout the exploration, the literature delves into organisational mechanisms such as systems, comprehension of organisational settings, examination of interactions and behaviours, and assessment of work arrangements and management within NPD areas. The subsequent sections acknowledge landmark and current literature to establish the theoretical foundations for the three core studies outlined in chapters 4, 5, and 6.

Figure 2.1 Literature Levels of Focus



To systematically chart theories, essential concepts, and significant studies relevant to the topic, the literature review employed a mapping approach. This method was selected over alternative types of literature reviews due to its emphasis on specific research questions and its objective of characterising a broader range of areas (Grant and Booth, 2009; Munn et al., 2018; Peters et al., 2015). The exploration of the contemporary and evolving role of New Product Development (NPD) teams, utilising published articles, conference papers, dissertations, and books, aimed to uncover insights into how these teams can be enhanced. Table 2.1 outlines the rationale for choosing a mapping literature review over other approaches.

Table 2.1 Literature Review Type Selection

Literature Type	Basic Descriptions (from Grant and Booth, 2009)	Outcome	Time to execute within Ph.D. Timeline	Relevant to MRQ / Thesis
Mapping review	Map out and categorise existing literature and identify gaps in the research literature	Characterises literatures, may be graphical (question-focused)	Yes	Yes, due to the gap and question focus
Meta-analysis	Statistically combines the results of quantitative studies	Numerical analysis of measures	N/A	No, due to quantitative focus
Rapid review	Assessment of what is already known about a policy or practice issue	Time-limited assessment on the direction of literature	Yes	No, due to limitations
Scoping review	Preliminary assessment of potential size and the scope of available research literature	Characterises literatures, may be tabular (topic-focused)	Yes	No, due to topic-focus
Systematic review	Seeks to systematically search for, appraise, and synthesis research evidence	Comprehensive analysis of knowns, unknowns, and future	No	No, due to areas of evaluation needed
Umbrella review	Refers to review compiling evidence from multiple reviews into one accessible and usable document	Identifies broad conditions for practice and research	Yes	No, due to the broad focus

2.2. Background on New Product Development Teams

The Research Sub Question (1) derived from a key element (New Product Development teams) of the main research question was as follows: 'How might New Product Development teams be defined for the modern workplace?' This question aimed to improve the understanding of the NPD teams' background and guide the literature mapping exercise's direction. For this question, the research objectives are listed in Table 2.2.

Table 2.2 RSQ1 Objectives

#	Objective (as outlined in the Introduction)
1	Define the key components of NPD teams
2	Provide context for NPD teams with regard to the modern workplace
3	Utilise different literature streams to explore NPD contexts within the whole framework of an organisation (e.g., organisational, team, and individual levels)

OBJECTIVE 1:
Define the key components of NPD teams

New product development (NPD) is known to encompass the introduction of a novel product, service, or method into the marketplace (Nonaka and Takeuchi, 1995; Marion and Fixson, 2021). In order to attain a level of 'meaningful uniqueness' (Sethi et al., p74) for such innovations, diverse expertise compositions, notably New Product Development teams, are typically formed. These teams consist of various functional experts spanning across myriad organisational functions. Their goal is to amalgamate diverse opinions and skills to transform conceptual ideas into commercialised products (Sangeetha and Kumaran, 2018; Edmondson and Nembhard, 2009; Gao and Bernard, 2018; Sarin and O'Connor, 2009).

In general, the NPD process commences with the generation of a business case by marketing or business-oriented professionals, thereby detailing project constraints as well as targets (Campbell et al., 2020). Subsequently, designers, engineers, and manufacturing representatives engage in discussions regarding complexity, risks, and uncertainties related to bringing the product, service, or method to the marketplace (Cross, 2021; Anderson, 2020). The level of collaboration, timing of functional involvement, depth of discussions, and visibility of functional needs may vary across phases. However, the level of success in NPD teams is consistently measured by the extent to which the product differs from competing alternatives in a way valued by customers (Sethi et al., p74).

It is essential to differentiate NPD teams from similar cross-functional teams solely focused on technology development and not explicitly for commercialisation tasks, such as innovation teams, tiger teams, and R&D teams (Audretsch and Belitski, 2020; Dempsey, 1964; DeCusatis, 2008). While NPD teams are more prevalent in larger organisations with abundant

resources, they also exist in smaller, technology-based start-ups (Hernandez et al., 2018). This thesis encompasses data from both start-ups and larger organisations meeting the NPD team criteria, though specific discussions and analyses with regard to the influences of organisational structures such as matrix, multidivisional, and network setups will not be covered (Ahmady et al., 2016).

Past investigations into these NPD teams have often centred on procedures, assessing results (Marion and Fixson, 2021), and prematurely zeroed in on the challenges posed by their diverse compositions (Hammermann et al., 2019; van de Brake et al., 2020; Dougherty, 1992; Karau and Hart, 1998). Nonetheless, as processes and outcomes evolve with the changing nature of product types (physical, digital, service), what remains constant in new product development, regardless of product type, is the effective leveraging of diverse expertise throughout the project. This study aims to surpass previous research by examining the efficient utilisation of diverse expertise within the organisational context and exploring multi-level factors that may impact its effectiveness.

Furthermore, earlier research on NPD teams (when focused on challenges arising from diverse compositions) has predominantly concentrated on two dimensions of diversity: social categorisation and informational/functional diversity (Dayan et al., 2017). Social categorisation relates to visible demographic characteristics such as age, gender, and ethnicity of team members (van Knippenberg et al., 2004). In contrast, informational/functional diversity encompasses less apparent differences related to education or occupational function (Østergaard et al., 2011). Given that functional attributes are closely linked to knowledge and experience (Dayan et al., 2017), this thesis specifically prioritises this type of diversity. Additionally, by considering the range of potential teams for research, the focus options are limited to those producing services, methods, physical products, and digital products. Initially, services, methods, and digital product teams were under consideration but were ultimately excluded due to the limited variance in expertise. For instance, digital product teams lack manufacturing or operational experience that diverges from the core team's software expertise (Wulff, 2023; Hadjielias, 2021). Hence, the teams involved in physical product creation exhibited the most significant variance in knowledge/educational background and became the primary focus of the research.

OBJECTIVE 2:
Provide context for NPD teams with regard to the modern workplace

The journey towards commercial innovation through NPD teams is far from straightforward, owing to the dynamic interplay of various factors. These include the ever-changing market landscape, the requisite production capabilities, the integration of functional knowledge to meet initial business objectives, and the social dynamics within the organisational environment to effectively execute the mission (Kline and Rosenberg, 2010). These challenges, spanning market, technical, and social domains, demand a cross-functional team structure that adapts to varying levels of complexity, uncertainty, and risk, which can fluctuate throughout the development process. Managing these areas necessitates a dynamic and proactive approach to maximise positive outcomes from these teams.

However, current methodologies tend to rely on static representations of individuals, teams, and organisations (Morgeson et al., 2015), failing to bridge the gap between the operational mechanics and the underlying principles of NPD team success or failure. Consequently, there exists a gap in existing research, which lacks a dynamic perspective on NPD teams in both practical and theoretical contexts.

Moreover, as NPD teams are increasingly deployed globally to harness enhanced knowledge resources (Gao and Bernard, 2018), and work arrangements evolve to accommodate both in-person and virtual interactions (e.g., hybrid teams) (Einola and Alvesson, 2019; Marion and Fixson, 2021; Raghuram et al., 2019), the complexity of the challenge intensifies beyond the problem's nature and the composition of team members. Consequently, there's a pressing need for research to delve deeper into the additional layer of complexity introduced by these new work arrangements, enabling new product development on a global and flexible scale. This heightened complexity raises persistent questions about effective strategies to support teams in achieving superior commercial innovation outcomes.

A comprehensive understanding of the myriad factors influencing NPD teams is essential at every level of the organisation. This crucial aspect will be further explored in the subsequent sections to provide a holistic perspective on enhancing NPD team performance and driving commercial innovation.

Table 2.3 RSQ1 Objective Check

#	Objective (as outlined in the Introduction)	Complete
1	Define the key components of NPD teams in relation to the modern workplace	Yes
2	Provide context for NPD teams with regard to the modern workplace in organisations	Yes
3	Utilise different literature streams to explore NPD contexts within the whole framework of an organisation (e.g., organisational, team, and individual levels)	No, need further literature mapping

2.3. Organisational Level Literature Mapping (RSQ3)

The Research Sub Question (3), which originated from a pivotal element (effective hybrid teamwork) of the primary research question and was directed at investigating the organisational level, remains unchanged: 'What impacts effective hybrid teamwork within NPD teams?' The objective for this question was to gain insight into the fundamental components of hybrid work at the organisational level and to provide guidance for the literature mapping exercise. The research objectives pertaining to this question are detailed in Table 2.4.

Table 2.4 RSQ3 Objectives

#	Objective (as outlined in the Introduction)
1	Establish how hybrid work/teams are defined
2	Identify the pain points/disadvantages of hybrid teams
3	Analyse how hybrid teams influence effectiveness from a team's perspective
4	Identify alignment factors from an organisational perspective that impact outcomes in hybrid NPD teams

2.3.1. Organisational Level Analysis: Hybrid Environments?

In the wake of the pandemic, organisations are grappling with the decision of either mandating their employees to return to traditional in-person work setups or embracing a hybrid teamwork model that offers ongoing flexibility in terms of where employees work - be it at home, in the office, or a blend of both. While the prevalence of hybrid or virtual teams in the workplace has been steadily increasing (Raghuram et al., 2019; van der Lippe and Lippényi,

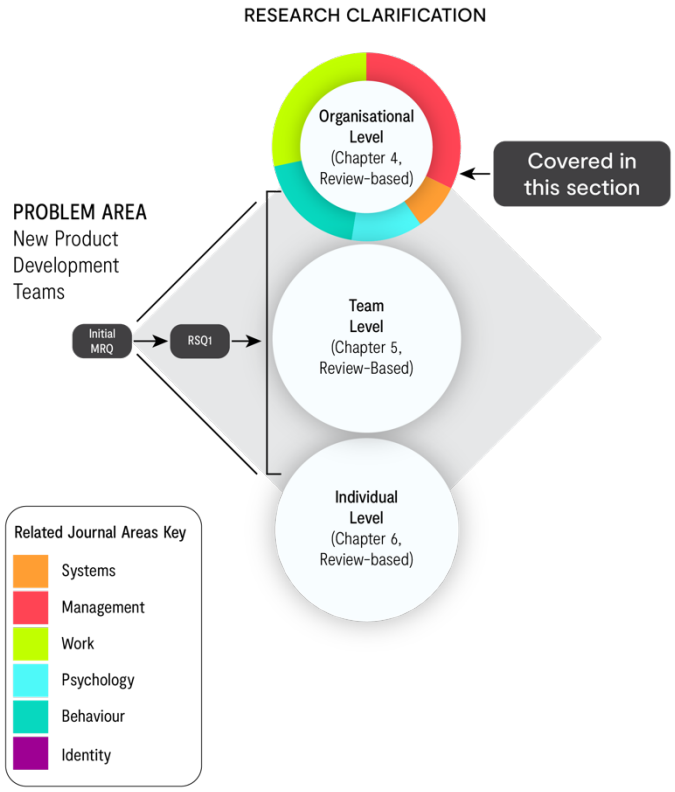
2020), some leaders remain sceptical about its adoption, citing concerns about reduced interactions, limited knowledge sharing, and potentially diminished productivity among employees (Boell et al., 2016; Pyöriä, 2011).

Moreover, the industry-wide discord regarding the effectiveness of hybrid teams mirrors the scholarly debate surrounding whether they confer a genuine advantage (as suggested by Jimenez et al., 2017; Maynard et al., 2012; Wheatley and Bickerton, 2016) or pose a disadvantage (as indicated by Neirotti et al., 2019; Schweitzer and Duxbury, 2010; van der Lippe and Lippényi, 2020). This ongoing debate on whether teams can achieve effectiveness and yield beneficial product outcomes while leveraging the flexibility offered by hybrid or virtual team structures pervades various disciplines including management, work systems, and organisational literature, albeit with limited emphasis focusing mainly on individual benefits.

While there are evident individual benefits associated with these team working arrangements such as heightened job satisfaction (Wheatley, 2017), improved work-life balance (Felstead et al., 2002; Ter Hoeven and Van Zoonen, 2015), enhanced concentration abilities (Biron and Van Veldhoven, 2016), reduced commute times (Wheatley and Bickerton, 2016), and increased access to individual talent (Jimenez et al., 2017), the focus on individual advantages often overshadows potential team benefits stemming from enhanced flexibility in work arrangements.

When discussions turn to hybrid arrangements at the team level, concerns are primarily centred around potential declines in the team's coordination abilities (de Souza Santos et al., 2022) and the potential erosion of trust, collaboration, and effective communication (Cheng et al., 2016). This leaves a significant gap in the literature, calling for further exploration at the team level, particularly by considering the organisational environment within the context of hybrid team work arrangements. As a result, the initial level of analysis for this research centres on the organisational level or the organisational environment concerning NPD teams operating within a hybrid work setup (illustrated in Figure 2.2).

Figure 2.2 Top Level of Analysis

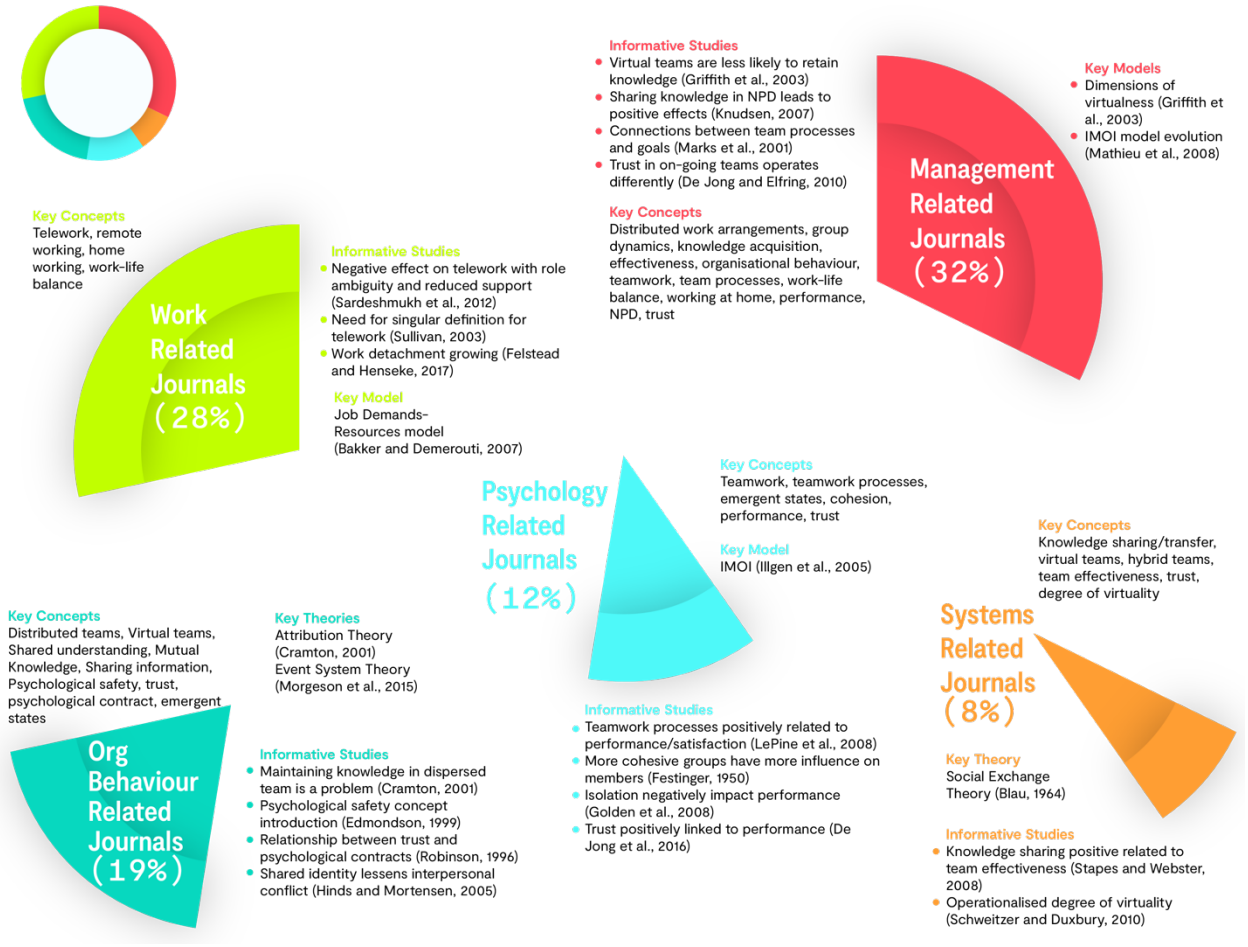


During the course of grasping the organisational milieu, pivotal factors like the intricacy of work arrangements, communication protocols, and the extent of integration with subsystems within the organisation are paramount (Jurkovich, 1974). These attributes act as guiding beacons for the literature mapping exercise, steering the investigation towards specific research domains. Figure 2.3 furnishes an outline of essential concepts, theories, and studies that underpin the Chapter 4 inquiry.

This organisational-level perspective draws extensively from literature on organisational behaviour, management, and work, typically adopting a broader or macroscopic lens on organisational dynamics. This approach facilitates an in-depth exploration of factors pertaining to institutional frameworks, overall operational dynamics, and large-scale components. The subsequent sections aim to refine the understanding of hybrid teams, pinpoint current challenges within these teams, and establish a clearer definition of effectiveness. Such clarity is pivotal for aligning individuals, teams, and organisations towards shared objectives, thereby mitigating issues associated with misalignment and incongruence.

Moreover, delving into the complexities of hybrid team dynamics necessitates a comprehensive comprehension of the organisational context within which these teams operate. By scrutinising the intricate interplay of organisational structures, communication channels, and functional linkages with various subsystems, researchers can glean invaluable insights into the underlying mechanisms driving team performance and organisational effectiveness. This holistic approach not only enriches understanding of hybrid teams but also offers practical insights for optimising their functioning within diverse organisational contexts.

Figure 2.3 Literature Mapping Overview/Breakdown for the Chapter 4 Study



OBJECTIVE 1:
Establish how hybrid work/teams are defined

2.3.2. Defining Hybrid Teams

Hybrid teams, comprised of diverse combinations of employees working both physically in the office and virtually (Alves et al., 2022; Lott and Abendroth, 2022), occupy an intermediary position between the definitions of distributed or virtual teams and traditional (face-to-face) teams. Distributed or virtual teams, where all team members are not physically co-located (Gibbs et al., 2017; Lai and Burchell, 2008; Schweitzer and Duxbury, 2010), are associated with numerous terms in the literature, including telework (Boell et al., 2016; Sardeshmukh et al., 2012; Sullivan, 2003), flexible work (Leslie et al., 2012; Neirotti et al., 2019), remote/mobile work (Felstead and Henseke, 2017), homeworking (Sullivan, 2003), blended work (Gaggioli et al., 2015), smart work (Kim and Oh, 2015), and home-based working (Lott and Abendroth, 2022). Despite the abundance of individual-based terms, a more accurate description of this type of work involves defining the team as a whole (e.g., hybrid teams) or considering the team's degree of virtuality to illustrate how virtual they are collectively (Schweitzer and Duxbury, 2010). Refer to Table 2.5 for a concise summary of definitions.

Table 2.5 Work Arrangement Definitions (Individual and Team)

Term	Definition
Hybrid teams	"Employees and teams work partly at the workplace and partly from other locations" (Lott and Abendroth, 2022; 2)
Distributed/Dispersed/ Global/Virtual teams	"Geographically distributed and electronically dependent" (Gibbs et al., 2017; 5)
Face-to-face teams/Traditional teams/Local	"Teams that do all of their work face-to-face and make no use of technological support." (Griffith et al., 2003; 268) "Teams … whose tasks required face-to-face interactions" (Breuer et al., 2016; 1155)
Telework or telecommuting	"…involves using computer technology to work from home or another location away from the traditional office for a portion of the work week" (Sardeshmukh et al., 2012; 194)
Flexible work	"Various situations related to performing work outside a firm's premises" (Neirotti et al., 2019; 117)

Remote/Mobile work	"Office work which can be conducted using electronic technologies that make possible communication—in word, image, and speech—with those who are geographically remote" (Felstead and Henseke, 2017; 196)
Homeworking	"People doing supplemental work at home" (Sullivan, 2003; 160)
Blended	An "environment that allows students to meet occasionally face-to-face but otherwise use technology to connect to the university and their peers" (Gaggioli et al., 2015; 1)
Smart work	"The work that individuals perform from a physical distance for their organizations in a flexible and innovative manner using mobile devices such as smartphones" (Kim and Oh, 2015; 1038)
Home-based working	"Work performed by employees at home with or without the use of information and communication technologies" (Lott and Abendroth, 2022; 3)
Degree of virtuality	"Include three dimensions: the proportion of work time that the VT members spend working apart (team time worked virtually), the proportion of the team's members who work virtually (member virtuality), and the degree of separation of the team's members (distance virtuality)." (Schweitzer and Duxbury, 2010; 267)

In spite of the numerous terms available, this thesis will predominantly use the terms "hybrid" and "degree of virtuality" as they comprehensively encapsulate the definition of the entire team. The existing literature tends to give less emphasis to how these team arrangements can achieve effective states for favourable team outcomes, in contrast to primarily concentrating on individual benefits. With the definitions established, it became crucial to delve into the coordination challenges present in both in-person settings and hybrid team arrangements.

OBJECTIVE 2:
Identify the pain points/disadvantages of hybrid teams

2.3.3. Disadvantages of Hybrid Teams / Virtuality

There is compelling rationale for embracing virtual or hybrid teams, given their ability to access expertise without geographical constraints, potential time-related advantages, and a seemingly positive impact on overall effectiveness (Jimenez et al., 2017; Maynard et al., 2012; Wheatley and Bickerton, 2016). These advantages are particularly appealing to New Product Development (NPD) teams or teams focused on commercialising new product ideas (Edmondson

and Nembhard, 2009), which thrive on leveraging diverse expertise (Edmondson and Harvey, 2018) and gaining time-to-market benefits (Edmondson and Nembhard, 2009). However, notwithstanding these potential positives, hybrid teams or teams with a virtual component have also been suggested to have adverse effects on effectiveness (Leslie et al., 2012; Neirotti et al., 2019; Schweitzer and Duxbury, 2010; van der Lippe and Lippényi, 2019), leading to disagreement in the literature. To comprehensively understand the drawbacks outlined in the literature, these impacts have been categorised based on how team members relate to each level of the organisation: (a) themselves, (b) each other, and (c) their organisational constraints. Refer to Table 2.6 for a detailed overview. In summary, the literature highlights that some degree of virtuality can result in unsupported or unbounded environments for individuals, lacking mechanisms for effective team interactions that, in turn, strain decision-making processes.

Table 2.6 Disadvantages of Virtual/Hybrid Teams

How team members relate to:		
(a) themselves	**(b) each other**	**(c) their organisational constraints**
-increased isolation/loneliness (Cramton, 2001; Purvanova and Kenda, 2022) -health-related problems (Wöhrmann and Ebner, 2021) -knowledge sharing difficulties (de Guinea et al., 2012; Staples and Webster, 2008) -lack of support (Hodder, 2020)	-lack of connection / impersonal interactions (Collins et al., 2016; Purvanova and Kenda, 2022) -communication challenges (Presbitero, 2021; Staples and Webster, 2008) -conflict/disagreement (Chamakiotis et al., 2013)	-blurred work/home boundaries (Adamovic, 2018; Cavazotte et al., 2014; Dén-Nagy, 2014; Townsend and Batchelor, 2005) -decision-making/leadership challenges (Chamakiotis et al., 2013)

The influence of diverse factors on team effectiveness or performance has been extensively discussed in the existing literature, with contributions from scholars such as Garro-Abarca et al. (2021), Schweitzer and Duxbury (2010), and Wöhrmann and Ebner (2021). While these factors present challenges to teams, the literature also proposes strategies to mitigate some of these drawbacks, as indicated by Chamakiotis and Panteli (2017), Golden et al. (2008), ter

Hoeven and van Zoonen (2015), van der Lippe and Lippényi (2020), and Wöhrmann and Ebner (2021). Despite these valuable insights, there remains a gap in the literature concerning a comprehensive approach that considers team effectiveness within the context of individual and organisational factors in hybrid teams.

Examining the link between the individual and the organisation involves assessing routines or non-routines as crucial characteristics of the organisational environment. This significance stems from the fact that routines dictate how team members access, trust, and utilise information or knowledge within the organisation. The effective application of knowledge poses a challenge within NPD teams but is acknowledged as pivotal for organisational innovation (Gao and Bernard, 2018; Sarin and McDermott, 2003). Concepts related to knowledge transfer, sharing, retention, and understanding the importance of interactions, especially in hybrid environments, were paramount in the research. Thus, the social exchange theory, exploring the cost-benefits of interactions between individuals (Blau, 1964), and empirical work on knowledge exchange (Griffith et al., 2003; Knudsen, 2007; Sardeshmukh et al., 2012; Staples and Webster, 2008) served as a bridge connecting routines, or the lack thereof, to effective outcomes. An exploration of the structures for interactions in NPD teams and how coordination unfolds when confronted with varying work boundaries and limitations to in-person communication was essential for a comprehensive understanding of the challenges within hybrid teams.

OBJECTIVE 3:
Analyse how hybrid teams influence effectiveness from a team's perspective

2.3.4. Evaluating Team Effectiveness Through the IMOI Framework

Gorman et al. (2018: 60) define effectiveness as "the real-time altering of behaviour and interactions to meet the changing demands of a dynamic environment to accomplish the shared team goal." This definition underscores the complexity of achieving effectiveness for New Product Development (NPD) teams, as it involves integrating a diverse range of team member functions that are heterogeneous in their approaches, mental models, and backgrounds to push the boundaries of innovation.

Incorporating a virtual/hybrid arrangement further complicates the task of adapting team member interactions, yet the existing literature on virtual team effectiveness often employs overly simplistic measures. Typically, studies in this realm focus only on performance and/or

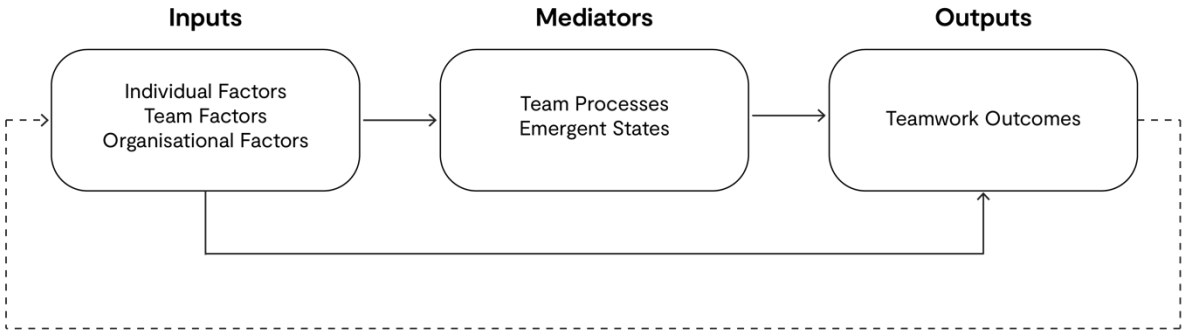
satisfaction (Dixon and Panteli, 2010), neglecting the crucial consideration of the team's ability to work together in the future, a factor significant for traditional teams. To gain a deeper understanding of these teams, an effectiveness approach is employed that centres on how teams collaborate and evolve over time.

The input-mediator-outcome-input framework (IMOI) of team effectiveness, introduced by Ilgen et al. (2005), is a well-recognised contribution in the literature that focuses on how interpersonal relationships contribute to team evolution. Many contemporary research works, recognising its suitability for complex team arrangements, leverage the IMOI model to investigate team dynamics (Grossman et al., 2017; Mathieu et al., 2008).

In the IMOI framework (Ilgen et al., 2005), "inputs" (I) encompass variables derived from individual, team, and organisational factors impacting group behaviour over time. In this context, these would relate to factors specific to hybrid team arrangements, such as individual differences, team interactions, and environmental constraints. The "mediators" (M) represent processes and emergent states, serving as mediating mechanisms for transforming team inputs into team outputs. Team processes involve interactions and actions among team members (e.g., communication, collaboration), while emergent states comprise the cognitive, motivational, and affective states of teams, developing from these interactions (e.g., feelings of trust, attitudes of commitment). Team processes and emergent states are the primary drivers of teamwork outcomes (O), such as performance and satisfaction, and will be the primary focus of this work.

The final "I" in the framework represents outcomes from one cycle acting as input for the next, signifying that team behaviour impacts the next formation of NPD team members. Given that NPD teams often span boundaries for competitive advantage, making formation reliant on relationships, the importance of team member outcomes for the next effort/project is heightened. Thus, the IMOI model is employed to comprehensively evaluate these relationships and emergent states for team effectiveness in this study (see Figure 2.4).

Figure 2.4 Adapted IMOI Model (Ilgen et al., 2005)



To elaborate further, subsystems are sectors within an organisation that can be either organised or unorganised, exhibiting varying degrees of certainty or uncertainty (Jurkovich, 1974). In simpler terms, this characteristic of the organisational environment pertains to how the integration of similar or dissimilar entities takes place. In the context of NPD, this involves understanding the dynamics among different functions within teams. This exploration encompasses topics such as shared understanding (Bechky, 2003), organisational behaviours, mutual knowledge (Cramton, 2001), psychological contracts (Robinson, 1996), and the states, encompassing the feelings and thoughts of team members during teamwork, which will be further elucidated in the following section.

2.3.5. Virtuality's Impact on Emergent States

Emergent states denote the desired conditions wherein shared behavioural patterns persist within the team over time (Marks et al., 2001; Waller et al., 2016). These states typically result from team experiences and interactions (Bowers et al., 2017) and are primarily identified in the literature through individuals' self-reported perceptions (Carter et al., 2018). In literature, emergent states are acknowledged for their impact on team outcomes, with particular emphasis on team trust (De Jong and Elfring, 2010), team cohesion (Bollen and Hoyle 1990), and psychological safety (Edmondson, 1999) in virtual teams (Breuer et al., 2016; Lechner and Mortlock, 2021; Malhotra and Majchrzak, 2014; Peñarroja et al., 2015).

Team trust refers to the shared beliefs and perceptions that team members hold about their teammates (De Jong and Elfring, 2010). Higher team trust is associated with increased collaborative relationships, knowledge sharing, and certainty within teams, contributing to positive performance outcomes (De Jong et al., 2016; Rezvani et al., 2018). Beyond the team, a

similar concept of organisational trust exists, signifying team members' willingness to form long-term relationships with the organisation (Robinson, 1996; Yu et al., 2018). However, unlike team trust, organisational trust is unidirectional, prompting exploration into whether *shared organisational trust*, where not only individuals trust their organisation, but the organisation also trusts the individuals, is a more pertinent concept for virtual teams characterised by increased uncertainty in both directions.

Team cohesion is the sense of inclusion and connection experienced by team members within a group (Bollen and Hoyle, 1990). Festinger's (1950) well-established definition outlines three crucial components of cohesion: group pride, interpersonal attraction, and commitment to the group's objectives, and is widely utilised in research (Rosh et al., 2012). It emphasises that both social and task-related factors affect cohesion. While team-building activities can significantly contribute to fostering cohesion and enhancing performance and effectiveness (Kwak et al., 2018; Yang et al., 2015), virtual teams necessitate a re-evaluation of out-of-work activities, spontaneous communication (Hinds and Mortensen, 2005), and in-person events to evoke the same sense of connection among team members. This raises questions about whether certain aspects of cohesion carry more significance depending on the teamwork arrangement.

Psychological safety is a construct predominantly studied in face-to-face teams (Lechner and Mortlock, 2021) and evaluated at the team level (Edmondson, 1999). It manifests when team members feel valued and can express themselves without the fear of reprisal or ridicule (Edmondson, 1999). Virtual teams pose a unique challenge in establishing the closeness necessary for a safe environment, given the less frequent and more formal nature of conversations due to technical constraints. Specifically, for team members who have never met in person, creating a safe environment within a virtual team may feel akin to conversing with a stranger (Lu, 2015). Understanding the application of this concept in a virtual team remains an essential area for exploration.

The critical studies, concepts, theories, and models concerning organisational environments necessitated a study to explore the factors contributing to the effectiveness of NPD teams in hybrid teamwork arrangements, adopting an organisational-level perspective while considering multiple levels within the organisation. This approach sought to address a literature gap characterised by a predominant single-level focus on evaluating hybrid teams or individuals in hybrid environments. Event systems theory, acknowledging that events at any hierarchy level

can permeate the organisation at single or multiple levels (Morgeson et al., 2015), influenced the rationale for the Chapter 4 study and underscored the importance of considering multiple levels. Refer to Table 2.7 for a progress check through the research-sub question 3 objectives, with Objective 4 remaining an open item, guiding the direction of the descriptive study in Chapter 4 and providing a basis for achieving measurable results.

Table 2.7 RSQ3 Objective Check

#	Objective (as outlined in the Introduction)	Complete
1	Establish how hybrid work/teams are defined	Yes
2	Identify the pain points/disadvantages of hybrid teams	Yes
3	Analyse how hybrid teams influence effectiveness from a team's perspective	Yes
4	Identify alignment factors from an organisational perspective that impact outcomes in hybrid NPD teams	No, need to explore with a study

2.4. Team Level Literature Mapping (RSQ4)

The Research Sub Question (4), derived from a key element of the main research question, focuses on 'Which factors influence trans-level alignment within NPD teams?' This question aims to understand the crucial elements that contribute to alignment across the entire organisation, taking into account the context defined at the team level, and guide the direction of the literature mapping exercise. The research objectives for this question are detailed in Table 2.8.

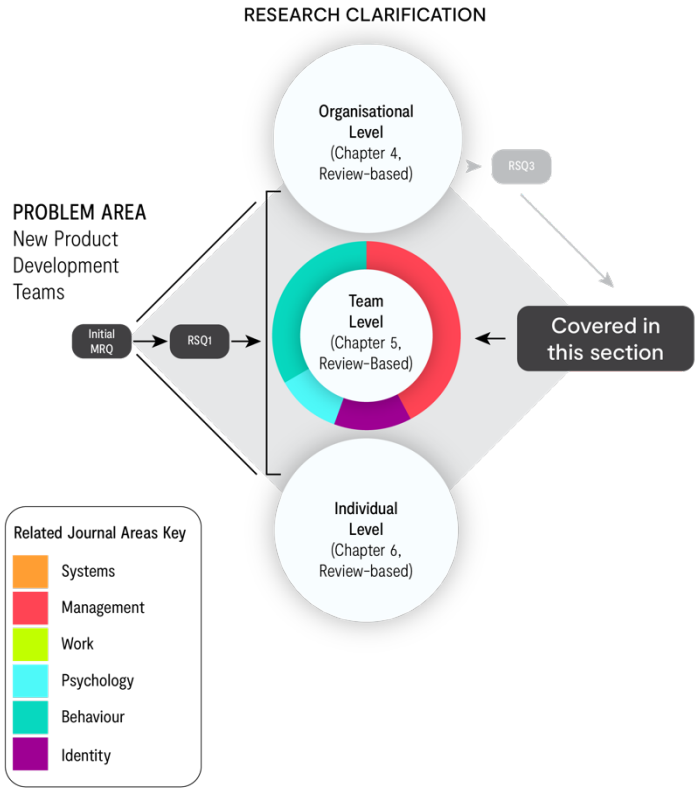
Table 2.8 RSQ4 Objectives

#	Objective (as outlined in the Introduction)
1	Identify how functions within NPD teams align within the organisation
2	Analyse conflict and tension within NPD teams (e.g., misalignment/incompatibility)
3	Provide recommendations/strategy for alignment within NPD teams
4	Identify alignment factors from a team perspective that impact outcomes in NPD teams

2.4.1. Team Level Analysis: Team Compositions

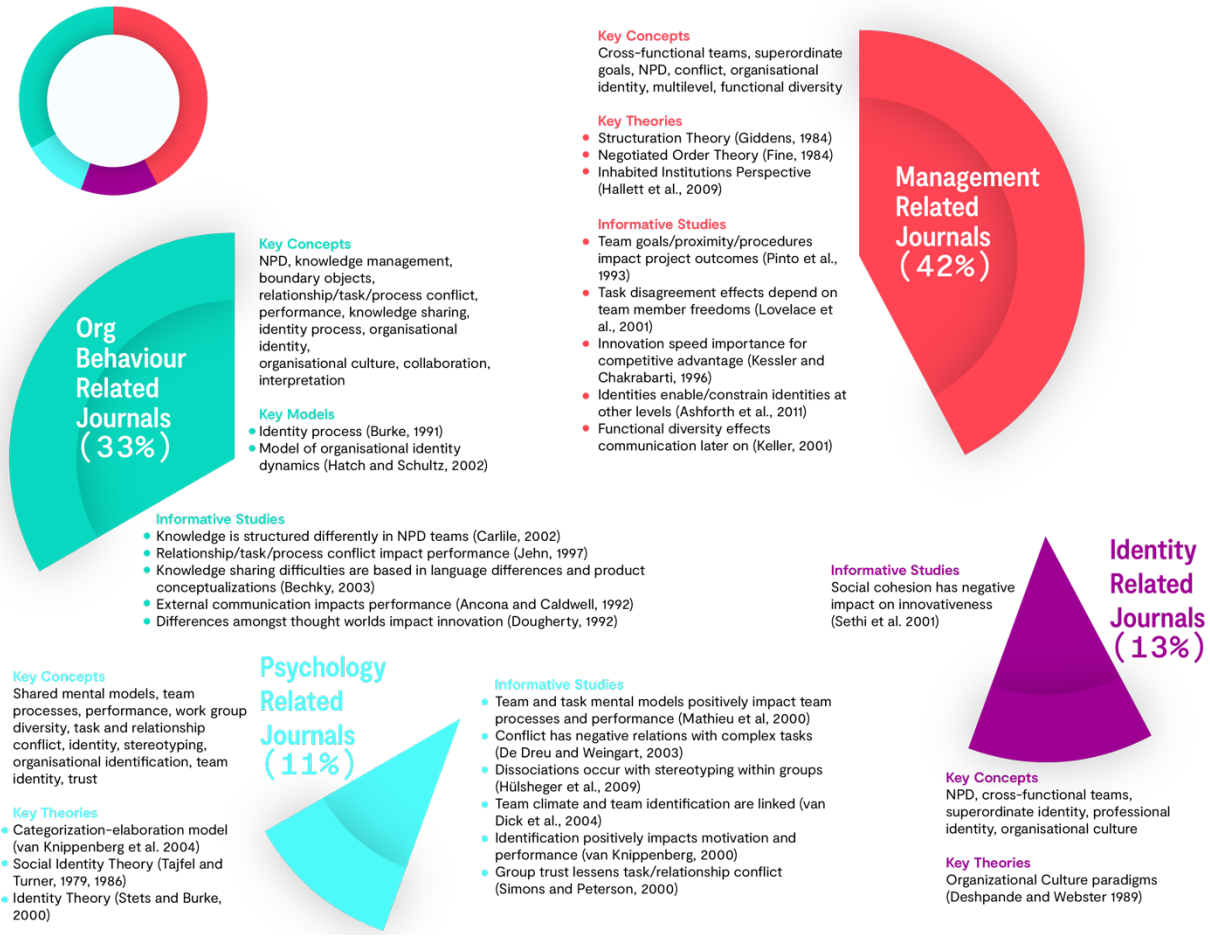
Teams possessing diverse expertise and knowledge play a vital role in the intricate landscape of NPD, dealing with intricate innovation challenges characterised by unclear scopes and ambiguous information boundaries (Mattarelli et al., 2022). The cross-functional diversity inherent in NPD teams is widely acknowledged as a significant source of team tension, often characterised as a "double-edged" sword (Andriopoulos et al., 2018; Lewis, 2000). This tension is considered indispensable for NPD teams, serving as a catalyst for successful innovations that challenge the prevailing norms (O'Neill et al., 2013; Todorova et al., 2014). Conversely, it has the potential to impede communication, collaboration, team morale, and ultimately, the innovation outcomes of the team (Andriopoulos et al., 2018; Hawlina et al., 2019; Mitchell and Boyle, 2015, 2021; Srikanth et al., 2016; Windeler et al., 2015). Consequently, a second level of analysis is necessary, following the organisational level (as illustrated in Figure 2.5), to comprehend how to leverage the innovation benefits arising from cross-functional tension in NPD teams while mitigating its adverse effects.

Figure 2.5 Middle Level of Analysis



Hence, the research delved into understanding the distinctive attributes of NPD teams, including the delineation of boundaries within these specific team compositions, the productivity or compatibility of interactions within those compositions, and the exploration of perspectives within different functions of NPD teams. These attributes have been recognised as influential in overall new product success (Ancona and Caldwell, 1992; Bechky, 2003; Carlile, 2002; Dougherty, 1992; Edmondson and Nembhard, 2009; Sethi et al., 2001; Tang et al., 2014). However, existing studies often face limitations by adopting either a micro, meso, or macro perspective of teams, rather than adopting a unified or transdisciplinary approach. The term "transdisciplinary" was incorporated into this research as an approach surpassing traditional boundaries of investigation (Arthur et al., 1989) to encompass factors existing in the interplay between different organisational levels. While this concept originally emerged in career theory to examine a person's work over time based on different factors, this research applies its high-level aspects to the organisational context. Nevertheless, Figure 2.6 provides an overview of key concepts, theories, and studies informing the foundation of the Chapter 5 study. The team-level perspective for this phase of the research drew heavily from organisational behaviour, management, and identity-related literature, primarily focusing on a meso level within an organisation. This emphasis allowed for capturing factors related to examining the composition of people within teams.

Figure 2.6 Literature Mapping Overview/Breakdown for the Chapter 5 Study



OBJECTIVE 1:
Identify how functions within NPD teams align within the organisation

New Product Development (NPD) team compositions are inherently diverse, characterised as cross-functional. The challenge or impact on innovation associated with this diversity lies in the integration of different communities of knowledge or mental models, as highlighted by various studies and researchers (Bechky, 2003; Carlile, 2002; Dougherty, 1992; Mathieu et al., 2000; Sethi et al., 2001). Understanding the existence of natural boundaries between different functions, the research aimed to gain a deeper understanding of the unique relationships between the various members of the NPD team. It also examined how each function within a team was interconnected with the broader organisation, offering a different perspective on evaluating compositions compared to earlier research.

2.4.2. Functional Identities

The origins of cross-functional conflict and tension are attributed to the misalignment of thought processes or practices across functions, often resulting in "deep-seated differences in approaching NPD" (Beverland et al., 2016, 629). These divergent thought processes and practices are partly linked to the diversity of professional identities associated with functions, hereafter referred to as 'functional identities' (Nelson and Irwin, 2014).[1] Burke (1991), as an underlying concept, defines identity as "a set of meanings […] defining what it means to be who one is" (Burke, 1991: 837). Under Burke's (1991) control-system perspective on the identity process, individuals establish an *identity standard* (how they perceive themselves), receive societal *input* or feedback on this standard, and adjust their behaviour through *meaningful actions* to align their identity standard with others' perceptions. The formation of functional identities occurs through individual development (e.g., early education) and socialisation within one's function, continuously receiving feedback from peers or mentors during professional experiences and acting upon these inputs to construct a prominent functional identity (Lockyer et al., 2016; Monrouxe, 2016). This process may involve incorporating a moral worldview of what is right and wrong (Cech, 2015; Monrouxe, 2016), potentially explaining the intense sentiments expressed by team members from diverse functions. The functional identity formation process parallels the social identity formation process, where individuals believe they belong to a group that shares a common identity (e.g., student, employee, mother) and interacts to pursue common goals (Stets and Burke, 2000; Stets and Serpe, 2013). In cross-functional teams, interactions with members of the "in-group" are anticipated to differ from those with members of the "out-group" (Mackie and Smith, 1998; Turner, 1984). This discrepancy may lead to tension, particularly when the perspectives of out-group members challenge one's core functional values, beliefs, and goals. To better understand how the diversity of functional identities influences tension, literature on functional identities within the most commonly leveraged functions in NPD teams will be explored.

[1] To date, there is no term named "functional identity" that specifically captures the competencies and tasks ingrained in each cross-functional team member. However, the concept of functional identities or partiality to one's own functional subunit was used by Perrow (1970) and further explored by Gregory (1983) using anthropology influences in order to study organisational culture conflicts. The closest related term, "professional identity," is found in the literature on the sociology of the professions (Ibarra, 1999). Professional identity is defined as the "relatively stable and enduring constellation of attributions, beliefs, values, motives, and experiences in terms of which people define themselves in a professional role" (Ibarra, 1999, 764).

Dominant functional identities and their relationship to the NPD team and the organisation

Although prevailing stereotypes of professional identities are evident in everyday organisational interactions, limited attention has been devoted to exploring the professional identities within each function participating in cross-functional innovation or R&D teams within the innovation literature. The most frequently integrated professions or functions in NPD teams encompass industrial design, research and development – predominantly engineering – and marketing (Bonesso et al., 2020).

Designers commonly shoulder the responsibility of transforming a new product brief into a proposal for commercial development. In this context, Beverland et al. (2016) emphasise the "creative" and "shaper" nature of the designer identity, focusing on a future ideal from which designers reverse-engineer to influence current markets and unveil latent customer needs. Liu and Hinds (2012) underscore the challenges designers often face as their identity navigates occupational meanings at the intersection of art, engineering, and business. This continual challenge is likely to drive the dynamic evolution of the designer identity through interactions with other functions (Kunrath et al., 2020) to enhance team goals.

Conversely, the *engineering* functional identity is grounded in tinkering, analysis, technical design, and the pursuit of knowledge grounded in formal engineering education (Choe et al., 2019; Loui, 2005). The majority of literature on engineering identity underscores the role and content of engineering education as pivotal influences on the formation of this functional identity (Lakin et al., 2020). Additional noteworthy dimensions of the engineering identity include 'accepting responsibility' for actions and work (Meyers et al., 2012) and a stronger emphasis on technical skills over soft skills (Cañavate et al., 2015; Cech, 2015; Faulkner, 2007).

Meanwhile, the *marketing* function has experienced a notable shift in its functional identity in recent years, particularly in comparison to designer or engineering identities, attributed to digital transformation (Di Gregorio et al., 2019). Despite the evolving understanding of the marketing identity, a consistent theme revolves around cultivating value for "competitive advantage" in the marketing profession (Terho et al., 2017). Whether the value is financial, political (Kashmiri and Mahajan, 2017), organisational, customer relationship-oriented, or personal (Johnston and Kelly, 2018), this focal point within the function may directly contrast with other members of the NPD team.

Manufacturing or *operations* and *project management* are other functions that are discussed less frequently in the literature regarding a professional identity. Even though the operations or manufacturing function may not have a widely recognised professional identity term, it shares similarities with the engineering identity, with a professional emphasis on internal execution (Song and Swink, 2002) and feasibility (Brettel et al., 2011). Conversely, project management, a consistently mentioned role in contemporary teams, elicits differing perspectives on its professional identity (Hodgson and Paton, 2016). However, a consistent theme in this role revolves around enhancing relationships between multiple parties (Mazur and Pisarski, 2015).

For a comprehensive understanding of functional identities, their positioning in relation to the NPD team and the broader organisation needs consideration. When functional identities align with the NPD team's identity and the organisational identity (Deshpande and Webster, 1989; Hatch and Schultz, 2002), it fosters a shared psychological attachment to both the work team and the broader organisation (Shapiro et al., 2002), contributing to overall innovation (Hülsheger et al., 2009; Sivasubramaniam et al., 2012). Such alignment can integrate individual goals and orientations (Ashforth et al., 2011; Glynn et al., 2010; Mesmer-Magnus et al., 2018), promote positive team states and collaborative behaviours (Jassawalla and Sashittal, 1999; van Dick et al., 2004), and enhance team and organisational performance (Glynn et al., 2010; Frenkel and Yu, 2011; van Knippenberg, 2000). The absence of alignment and tense relationships among functional, team, and organisational identities can lead to friction within the team, an aspect seldom explored in the literature (Denison et al., 1996).

However, to prevent conformity and "isolationist" behaviour resulting from congruence (Ancona and Caldwell, 1992), diversity should be present "as a complementary driver to be able to produce creative ideas that are different from beliefs and values in the team" (Litchfield et al., 2018: 10). Thus, the alignment of functional identities with the NPD team and organisational identity should coexist with the presence of distinct and diverse functional identities, aiming to unlock the innovative and creative potential of the team.

OBJECTIVE 2:
Analyse conflict and tension within NPD teams (e.g., misalignment/incompatibility)

When examining how functions perceive and interact with each other within teams, the research focused on the significant theme of conflict or tension influencing performance (De

Dreu and Weingart, 2003; Jehn, 1997; Mackie and Smith, 1998). To explore this, various theories dealing with individual interfaces in specific environments or similar social structures were considered, with structuration theory (Giddens, 1986) and negotiated order theory (Fine, 1984) serving as influential frameworks for understanding how to impact or penetrate existing perspectives. These theories posit that team members operate and negotiate based on the rules of their pre-existing social structures. Given that NPD teams inherently involve multiple social structures (associated with different functions), changing these perspectives within the team is inherently challenging. Therefore, instead of attempting to merge existing functional categorisations, as suggested by other research (Akgun et al., 2006; Bechky, 2003; Carlile, 2002; Mathieu et al., 2000; Srikanth et al., 2016), this research sought ways for the team to operate or collaborate without imposing changes on the members who form existing fault lines (Lau and Murnighan, 1998; Ndofor et al., 2015).

2.4.3. Cross-functional Tension and Conflict

The common occurrence of incompatible perspectives within functionally diverse NPD teams requires intentional management for integration (Carton and Tewfik, 2016; Tzabbar and Vestal, 2015). This incompatibility arises from the diversity in specialised languages, cognition, or terminology used by team members, as well as different "thought worlds" or understandings based on their experiences and education (Aggarwal and Woolley, 2019; Baunsgaard and Clegg, 2013; Dougherty, 1992). The existence of these different lenses for viewing new product development makes information sharing and knowledge integration challenging (Heath and Staudenmayer, 2000; Majchrzak et al., 2012), contributing to increased tension and frustration within the team.

This heightened tension can further strain relationships between team members, fostering mutual stereotypes and biases about each discipline and function (Enns and Rotundo, 2012). As indicated by the existing literature, conflict over tasks or content has the potential to deteriorate into more destructive relationship conflicts (Hinds and Mortensen, 2005; Keller, 2001; Mooney et al., 2007; Simons and Peterson, 2000). These relationship conflicts or interpersonal differences (Jehn, 1997) may, in turn, result in the tendency to disregard critical insights from other functional areas, hindering the success of new product development (Berger et al., 1980).

The tipping point—from task conflict, which holds the potential to enhance team innovation (Jehn, 1997; O'Neill et al., 2013), to relationship conflict—rests on understanding the

differences between functional interfaces, as explored in the innovation management literature. A significant focus of this literature has been the strained collaboration between R&D and marketing (Brettel et al., 2011; Park et al., 2009). Notably, the differences in engineering and marketing expertise (technical versus non-technical) lead to judgments about each function's meaningful contribution to tasks (Berger et al., 1980), fostering a rivalry between departments and a need to protect function-specific knowledge turf (Moorman et al., 1992).

Misunderstandings often arise due to differing communication styles; for instance, marketing professionals may focus on product benefits and perceptual concepts, while technological professionals use the quantitative language of specifications and performance values (Park et al., 2009: 88). This miscomprehension can lead professionals to overlook the usefulness of their information to other functions or remain unaware that their information is unknown to other functions (Heath and Staudenmayer, 2000). Similar tension is reported in the marketing and manufacturing interfaces, where manufacturing emphasises process-related and execution techniques to a greater extent (Brettel et al., 2011). Strife can also occur between marketing and industrial design, with disagreements over perceptions of "good design" and potential different meanings associated with the same words (Micheli et al., 2012). As a case in point, designers often have a broader view of design, considering non-technical and technical considerations, including human needs, ergonomics, aesthetics, branding, performance, and manufacturing (Crawford and Di Benedetto, 2008; Ulrich and Eppinger, 2015). Additionally, industrial design is often perceived as part of R&D without being distinguished from engineering. Consequently, further exploration is needed regarding multi-functional interface approaches to understanding perspectives in cross-functional teams.

While the innovation literature has developed strategies over the last three decades for managing job-related (i.e., functional) diversity and associated tension in innovation teams (Beverland et al., 2016; Edmondson and Nembhard, 2009; Lovelace et al., 2001; Pinto et al., 1993), these strategies mainly revolve around minimising functional strengths. This approach contradicts the initial purpose of employing an NPD team. Strategies include moderating the strength of functional identities through shared languages (Carlile, 2002), shared cognitive frames (Mathieu et al., 2000), shared understanding (Bechky, 2003), and common knowledge networks (Akgun et al., 2006) to minimise social categorisation processes (Srikanth et al., 2016). Conversely, strategies involving utilising members with high levels of intra-individual job-

related diversity (i.e., diverse educational and functional characteristics in the same person) remain less explored (Weiss et al., 2018). Thus, the relevance, role, and strategies of individuals embracing cross-functional diversity to drive the innovation potential of the team continue to be insufficiently addressed in this crucial area of the literature.

OBJECTIVE 3:
Provide recommendations/strategy for alignment within NPD teams

2.4.4. Managing Cross-functional Tension through Functional Alignment Brokers

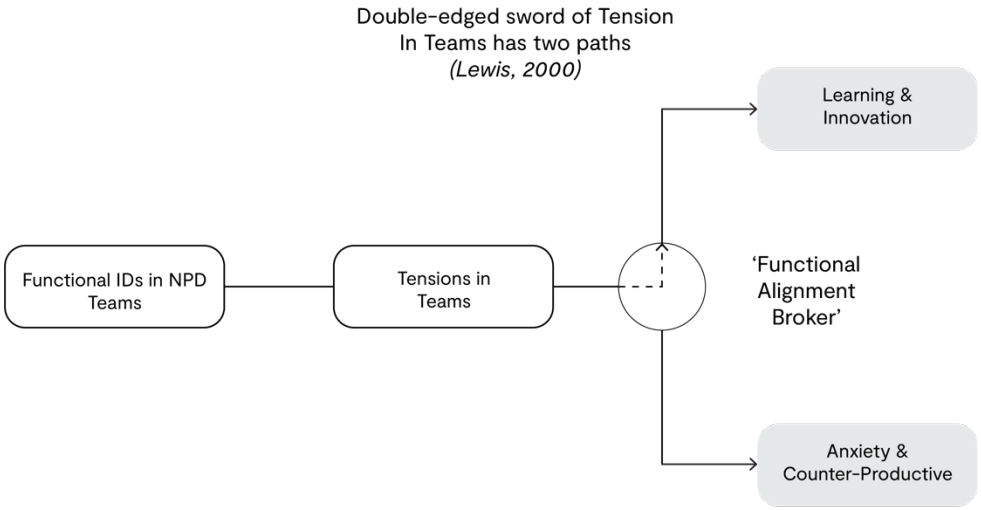
Roles that bridge knowledge gaps and aid in connecting individuals within teams have been a recurring theme in the innovation management literature. These roles are commonly discussed from two key perspectives: social-oriented and task-oriented (Aritzeta et al., 2007). This discourse spans across management, organisation, and communications literature. In the social-oriented realm, these roles focus on individuals with high interpersonal skills, aiming to improve relationships within or outside the team and enhance the overall team environment. Examples of generic terms in this category include "connectors" (Autrey et al., 2019; Mathieu et al., 2015) and "team builders" (Mathieu et al., 2015). Conversely, from a task-oriented standpoint, individuals in such roles are characterised by possessing dual knowledge bases or a comprehensive understanding, such as a grasp of both marketing and engineering knowledge. This dual expertise allows them to effectively link different sub-groups within the team

Terms that fall into this category include such as **“**multi-knowledge team members” (Park et al., 2009), “diversity liaisons” (Weiss et al., 2018) and individuals with “t-shaped skills” (Madhavan and Grover, 1998), particularly alluding to the immense value held by these individuals in NPD teams. Positions endowed with relatively more inherent authority, dedicated to influencing or harmonising diverse perspectives within teams, are exemplified by terms like "transformational leaders" (Hüttermann and Boerner, 2011; Shamir et al., 1993) and project managers (Mazur and Pisarski, 2015). In each of these definitions, the focus is on these individuals supporting the integration of knowledge across different areas within the team. Despite the varied perspectives embedded in each term, these roles share the common attribute of being able to envision potential beyond their specific roles. This ability to perceive how different functional components align, coupled with a heightened allegiance to the entire team or organisation, facilitates steering diverse perspectives towards positive innovation outcomes.

Consequently, this suggests a diminished inherent functional identity in these roles, along with greater experience and understanding of other functional areas, potentially easing the building of relationships and communication across functional lines.

The term "functional alignment broker" is introduced to encompass the spectrum of existing terms and concepts related to individuals addressing tensions within teams, both in social-oriented and task-oriented roles. This term draws from concepts such as "culture brokering," which describes a similar process (though not a person) of linking diverse cultures within a team across nationalities (Jang, 2017), "temporal brokerage" (Mell et al., 2021) referring to linking across distances, and (Hargadon and Sutton, 1997) connecting macro and micro perspectives in innovation. The use of "functional alignment brokers" in the Chapter 5 study denotes individuals who facilitate effective interactions between functional sub-groups. The study in Chapter 5 aims to explore whether functional alignment brokers can leverage the innovation benefits of cross-functional tension in NPD teams while minimising its negative influences (see Figure 2.7).

Figure 2.7 Conceptual Framework



To determine the key factors of alignment across multiple organisational levels when considering the team members' myriad functions from a team-level standpoint, another study was conducted (in Chapter 5) based on these foundational articles and key theories regarding team attributes. For an update on progress related to the objectives of research-sub question 4,

refer to Table 2.9. Objective 4, which is marked as pending in the table, signifies an area yet to be explored. This objective serves as a guiding point for the forthcoming Chapter 5 descriptive study, where it will be put into practice to attain measurable results.

Table 2.9 RSQ4 Objective Check

#	Objective (as outlined in the Introduction)	Complete
1	Identify how functions within NPD teams align within the organisation	Yes
2	Analyse conflicts and tensions within NPD teams (e.g., misalignment/incompatibility)	Yes
3	Provide recommendations/strategy for alignment within NPD teams	Yes
4	Identify alignment factors from a team perspective that impact outcomes in NPD teams	No, need to explore with a study

2.5. Individual Level Literature Mapping (RSQ5)

Research Sub-Question 5, derived from the pivotal element of "influence" within the main research question, 'Under what scenario is trans-level alignment achieved to influence NPD team outcomes?' The objective of this question is to gain actionable insights into the conditions fostering alignment across the organisation, taking into account the individual level context, and to steer the literature mapping exercise accordingly. The research objectives for Sub-Question 5 are detailed in Table 2.10.

Table 2.10 RSQ5 Objectives

#	Objective (as outlined in the Introduction)
1	Identify how functions integrate knowledge in NPD teams (e.g., alignment opportunities)
2	Define trans-level alignment
3	Analyse compatibility in NPD teams (e.g., person-environment fit)
4	Examine alignment factors from an individual perspective that impact outcomes in NPD teams

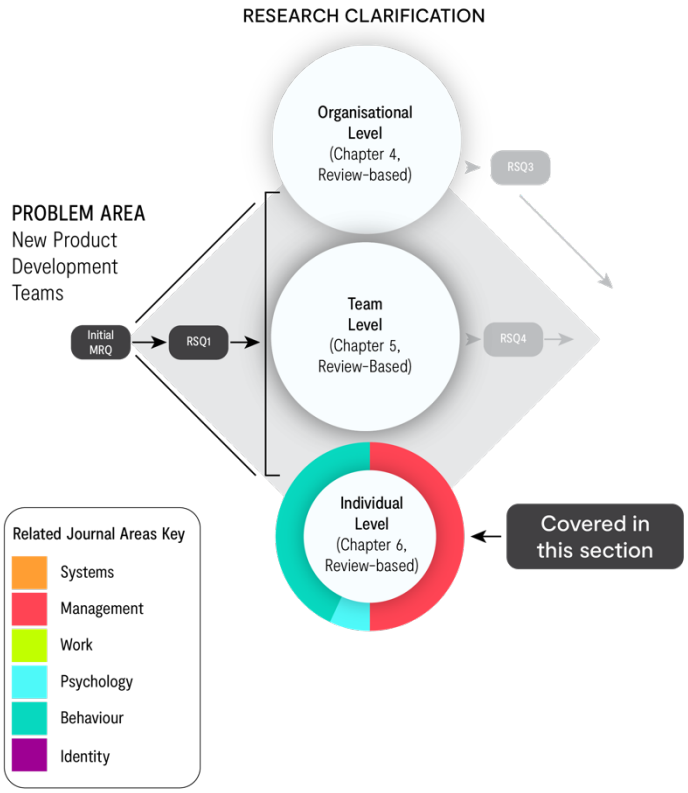
5	Explore perceived misalignments in NPD teams

2.5.1. Individual Level Analysis: Knowledge Integration

Contemporary companies are increasingly facing the costly and pervasive challenge of employee turnover (O'Connell and Kung, 2007). The allied costs, including recruitment, training, and compensation, in conjunction with the adverse effects on team morale, underscore the importance for managers to comprehend the factors contributing to person-environment fit as a strategy for retaining employees (Chiat and Panatik, 2019; O'Connell and Kung, 2007). While turnover rates have been on the rise across various industries in recent years (Chiat and Panatik, 2019), there is a necessity to investigate the concept of person-environment fit, especially within the realm of New Product Development (NPD) teams, which play a pivotal role in organisational success (Badrinarayanan and Arnett, 2008; Edmondson and Nembhard, 2009; Fain and Kline, 2013; Sivasubramaniam et al., 2012).

NPD teams consist of members from various disciplines, collaboratively responsible for bringing a product to market (Tang et al., 2015). While this diversity cultivates innovative thinking and provides access to varied expertise and resources, it also poses challenges in terms of integration due to knowledge boundaries and differences in functional practices and perceptions (Carlile, 2002; Cooper, 2019; Kotlarsky et al., 2015; Nakata and Im, 2010). Challenges such as tenure diversity, disparities in thought worlds, and varying motivations can further impede integration within these teams (Hammermann et al., 2019; van de Brake et al., 2020; Dougherty, 1992; Karau and Hart, 1998). Existing research on knowledge differentiation and integration predominantly concentrates on team-level strategies, neglecting the significance of organisational contexts and the involvement of additional team members. Consequently, a comprehensive understanding of integration in organisations from a whole-systems perspective remains limited. The research identifies a third level of analysis necessary for comprehending, in conjunction with organisational and team-level contexts, the individual level (highlighted in Figure 2.8). Furthermore, the individual level perspective for this segment of the research drew heavily from organisational behaviour and management-related literature, which tended to focus microscopically on an organisation, enabling the capture of factors related to individual and group-level processes.

Figure 2.8 Bottom Level of Analysis



Hence, the research delved into areas pertaining to aligning individual competencies with the prevailing organisational culture and gaining deeper insights into knowledge integration within a team. Given the composition of NPD teams with diverse knowledge backgrounds, an examination of strategies to effectively manage variability within these teams emerged as a pivotal aspect of the thesis. Moreover, upon scrutinising pertinent literature within the management domain and associated streams, a discernible absence of theories that intricately link the various organisational levels, knowledge management, and person-environment fit was noted. Consequently, this thesis seeks to address an additional gap in the extant literature. Figure 2.9 provides an overview of key concepts, theories, and studies that guided the foundational research for Chapter 6.

Figure 2.9 Literature Mapping Overview/Breakdown for Chapter 6 Study

OBJECTIVE 1:
Identify how functions integrate knowledge in NPD teams (e.g., alignment opportunities)

2.5.2. Integrating Knowledge in NPD Teams

Knowledge is commonly acknowledged to exist in one of three forms: explicit, tacit, or embedded (Madhavan and Grover, 1998). Explicit knowledge is readily transferable (Nonaka et al., 1995), whereas tacit knowledge, akin to that possessed by each member of an NPD team, is more intricate to convey (Nonaka et al., 1995; Polanyi, 2009). Embedded knowledge, a fusion of tacit and explicit knowledge, is deemed particularly advantageous for organisations as it embodies distinctive combinations of information (Badaracco and Badaracco, 1991; Madhavan and Grover, 1998). Challenges arise in the integration and management of new knowledge, especially considering variations in knowledge structuring across vital functions within NPD teams (Argote and Ingram, 2000; Bechky, 2003; Carlile, 2002). Carlile's work (2004) advocates the examination of discrepancies within these teams for effective knowledge management, while

other researchers highlight the link between these knowledge management strategies and their impact on performance (Cummings and Teng, 2003; López-Nicolás and Meroño-Cerdán, 2011).

The success of NPD teams has an inextricable correlation with their members' knowledge and expertise (Tang et al., 2015). These teams are purposefully assembled to yield innovative outcomes, amalgamating individuals from diverse functional backgrounds to push boundaries and enhance competitive advantage for their organisations (Edmondson and Nembhard, 2009; Mu and Di Benedetto, 2011; Tang et al., 2015; Gao and Bernard, 2018; López-Nicolás and Meroño-Cerdán, 2011).

Consequently, the expansion of the NPD team or the filling of vacant positions with individuals possessing new knowledge becomes paramount. Despite the pivotal role of NPD knowledge in driving innovation, it also presents challenges (Andriopoulos et al., 2018; Carlile, 2002). The process of new product development can be intricate (Kratzer et al., 2010), and team members bring diverse knowledge structures due to their varied functional backgrounds (Carlile, 2002). Consequently, sharing knowledge and fostering effective collaboration among team members becomes a formidable challenge (Mu et al., 2011; Peng et al., 2013).

Put simply, the diverse composition of NPD teams, where individuals may struggle to comprehend functions beyond their own, makes it challenging to integrate team members (Tang et al., 2015). Each functional area within the team operates with its own unique experiences, terminologies, tools, and incentives, further complicating the integration process (Carlile, 2004). These integration difficulties and the transfer of knowledge among team members lack a well-defined strategy (Argote and Ingram, 2000). Despite various proposed strategies in this field, they often overlook different organisational contexts, especially when new team members are added (Akgun et al., 2006; Bechky, 2003; Carlile, 2002, 2004; Frishammar et al., 2012; Gao and Bernard, 2018; Levina and Vaast, 2005; Sherman et al., 2005; Tang et al., 2015).

According to the literature, overcoming knowledge boundaries in teams can be achieved through four different approaches to integration: cognitive, personalisation, systematised, and shared (Brown and Duguid, 1991). However, a criticism of these approaches is that they often focus on specific levels of the organisational context and only partially address knowledge integration, creating gaps in the literature.

The cognitive approach, gaining prominence in recent literature, involves the use of transactive memory systems (TMS) at the group level, where team members rely on each other's

expertise and trust to share and retrieve knowledge (Jarvenpaa and Keating, 2011; Peltokorpi and Hood, 2019; Wegner, 1987). However, this approach heavily depends on coordination and trust among team members, which may not always be guaranteed (Ringberg and Reihlen, 2008).

The personalisation approach focuses on individual contacts and the distribution of expertise (Tang et al., 2015). It relies on personal connections and trust but lacks the necessary structure and consistency for replication across teams (Akgun et al., 2006; Ouriques et al., 2019).

The systematised approach, prevalent in NPD research, emphasises a formalised and structured strategy using tools to transmit knowledge (Cooper, 1994; Gao and Bernard, 2018; Grant, 2012). However, this approach tends to overlook the social and cognitive aspects of knowledge integration (Tang et al., 2015).

Lastly, the shared approach focuses on transforming, transmitting, and translating knowledge through a shared language or understanding (Carlile, 2004). However, this approach has limitations in terms of team member learning time and accommodating an increased number of functions in fast-paced environments.

Notably, these approaches do not fully consider all levels of the organisation, as noted in Table 2.11. Therefore, there is a need for an integrated approach to knowledge integration that addresses the limitations of existing approaches and encompasses all organisational levels.

Table 2.11 Knowledge Integration Strategies Summarised

Approach	Definition	Organisational Context	Approach Criticism
Cognitive	TMS (Wegner, 1987): uses cognitive divisions of team members (Akgun et al., 2006; Tang et al., 2015)	Team Level	-Requires team trust -Difficult to operationalize
Personalisation	Uses personal contact (Ancona and Caldwell, 1990, 1992; Tang et al., 2015)	Individual & Team Level	-Lacks structure -Needs method for repeatability
Systemised	Uses formal processes and hard tools (Cooper, 1994; Gao and Bernard, 2018)	Organisational Level	-Ignores social and cognitive elements

Shared	-Transforming (pragmatic): employs co-creation to develop new language -Translating (sematic): employs knowledge of various meanings (methods and objects) -Transferring (syntactic): makes use of new language (Carlile, 2004; Levina and Vaast 2005)	Team Level	-Limited team member capacity for common understanding -Potential for knowledge loss in transfer, transmission, and translation

OBJECTIVE 2:
Define trans-level alignment

2.5.3. Trans-level Alignment in NPD Teams

This thesis introduces the concept of "trans-level alignment" to overcome the limitations of existing approaches in understanding and managing knowledge integration within NPD teams. The term "trans-level" draws on a transdisciplinary approach, emphasising a holistic view that goes beyond traditional organisational boundaries and incorporates multiple levels, distinguishing it from concepts focusing solely on macro, meso, or micro aspects of organisations or teams (Arthur et al., 1989).

While the term ‘alignment’ finds application in various contexts within the literature, its fundamental concept revolves around harmonising different elements. For instance, in individual contexts, goal alignment is often simplified to entail a shared understanding of valued outcomes motivating individuals at work (West, 1990). However, this notion overlooks team and organisational components, focusing solely on the needs and preferences of team members. Moreover, the business and information systems literature discusses ‘strategic alignment,’ linking opportunities with organisational resources and priorities, predominantly within executive and top management environments (Ateş et al., 2020; Avison et al., 2004; Walter et al., 2013). While valuable, this concept narrows its focus to a specific organisational area and does not encompass the entirety of alignment required in teams. Alignment is also conceptualised in the context of strategic human resources recruiting, primarily concentrating on connecting structural areas (Phillips et al., 2015). In essence, current uses of alignment may

address individual or team goals and strategic missions but often overlook the interconnected levels of an organisation viewed holistically. When organisations experience misalignment, it can manifest in various forms and levels, such as dysfunctional teams, high turnover rates, project delays, or underwhelming product launches. These areas of incompatibility can significantly impact an organisation's bottom line but may be challenging to measure or fully comprehend due to their complex interconnectedness. This underscores the necessity for a more comprehensive concept that encapsulates compatibility throughout an organization.

The introduction of the concept of trans-level alignment aims to address these gaps in the literature by providing a comprehensive framework that considers all levels of the organisation to foster effective teamwork and knowledge integration. This concept facilitates a whole-framework approach, encompassing various components and factors derived from research, including structural aspects (e.g., systems approach), social dynamics (personalisation approach), and cognitive factors and expertise requirements (shared approach) at the micro, meso, and macro levels. Via the consideration of these elements, the goal is to enhance understanding of knowledge integration needs and ultimately achieve more effective outcomes in NPD teams. Trans-level alignment, with its multifaceted approach, is designed to better fit teams by considering multiple dimensions of integration.

OBJECTIVE 3:
Analyse compatibility in NPD teams (e.g., person-environment fit)

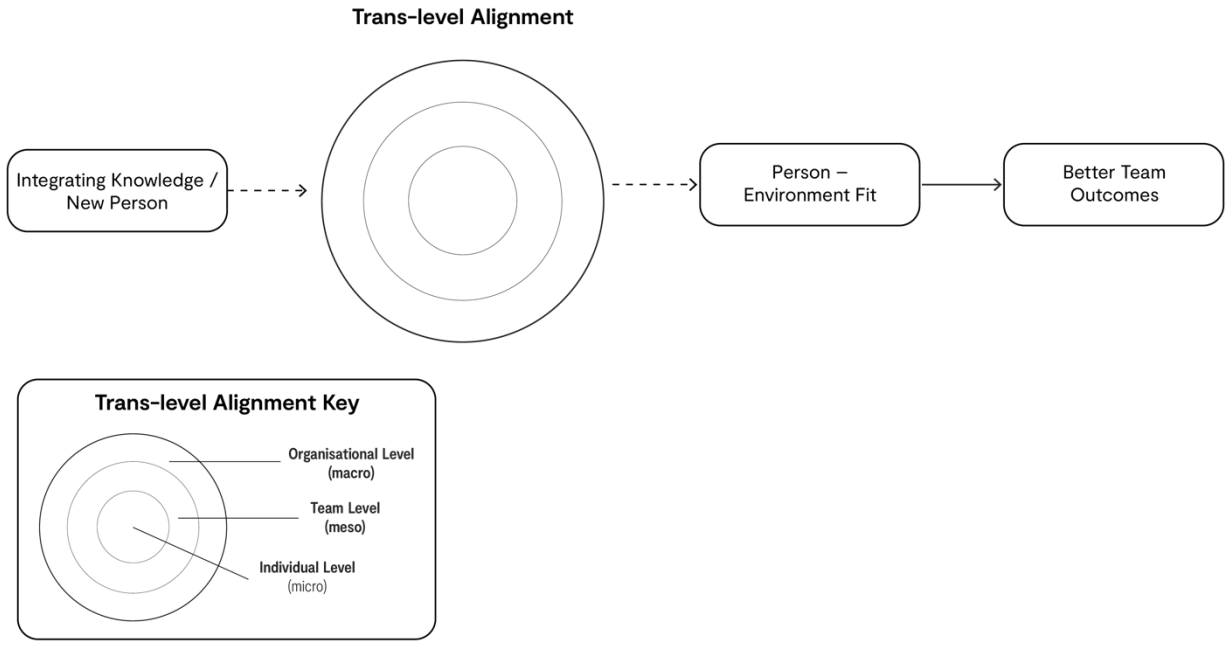
2.5.4. Person-Environment Fit in NPD Teams

The theory of Person–Environment Fit, rooted in organisational psychology literature, aims to align individuals with their environment for improved behaviour (Lewin, 1951; Van Vianen, 2018). This theory is crucial as it potentially correlates with identifying the optimal team compositions for better New Product Development (NPD) outcomes. Defined in the literature (Junker et al., 2022; Kristof-Brown et al., 2005; Rounds and Tracey, 1990; Van Vianen, 2018), Person-Environment (P-E) fit theory underscores the compatibility between individuals and their surroundings. This compatibility has demonstrated positive effects on project outcomes (De Cooman et al., 2016; Hajarolasvadi and Shahhosseini, 2022; Herkes et al., 2019; Seong et al., 2015), interpersonal interactions (Edwards and Cable, 2009), and performance in terms of cost and schedule (Hajarolasvadi and Shahhosseini, 2022).

P-E fit comprises two components: complementary fit, focusing on individual abilities (Van Vianen, 2018), and supplementary fit, focusing on shared values and preferences (Van Vianen, 2018). Although this concept has evolved over time in understanding individuals, behaviours, and outcomes (Su et al., 2015) and has been examined from a multilevel perspective in some cases (Su et al., 2015; Werbel and Gilliland, 1999), this upcoming study contends that for fit to be fully realised, the entire organisation must be aligned and understood as a whole system, considering both complementary and supplementary aspects.

Therefore, the introduced concept of "trans-level alignment" forms a crucial foundation for determining fit within an organisation, particularly when integrating new knowledge and team members. Refer to Figure 2.10 for the model depicting the utilisation of person-environment fit in NPD teams.

Figure 2.10 Trans-level Alignment for Person-Environment Fit in NPD Teams Model



Thus, having established the significance of integrated knowledge management, the forthcoming study detailed in Chapter 6 sought to delve deeper into key aspects related to individual alignment with the organisation, with the potential to influence performance and effectiveness. In essence, this comprehension of aligning the most suitable individuals with a

scenario that considers multiple organisational levels is particularly essential in NPD teams, where functional diversity or an increase in specialisations is increasingly vital to tackle more intricate problems (Tang et al., 2021). Refer to Table 2.12 for an overview of progress through the objectives of research-sub question 5. Objectives 4 and 5, which are still open items in the table, guide the prescriptive study in Chapter 6 and will be operationalized to achieve measurable outcomes.

Table 2.12 RSQ5 Objective Check

#	Objective (as outlined in the Introduction)	Complete
1	Identify how functions integrate knowledge in NPD teams (e.g., alignment opportunities)	Yes
2	Define trans-level alignment	Yes
3	Analyse compatibility in NPD teams (e.g., person-environment fit)	Yes
4	Examine alignment factors from an individual perspective that impact outcomes in NPD teams	No, need to explore with a study
5	Explore perceived misalignments in NPD teams	

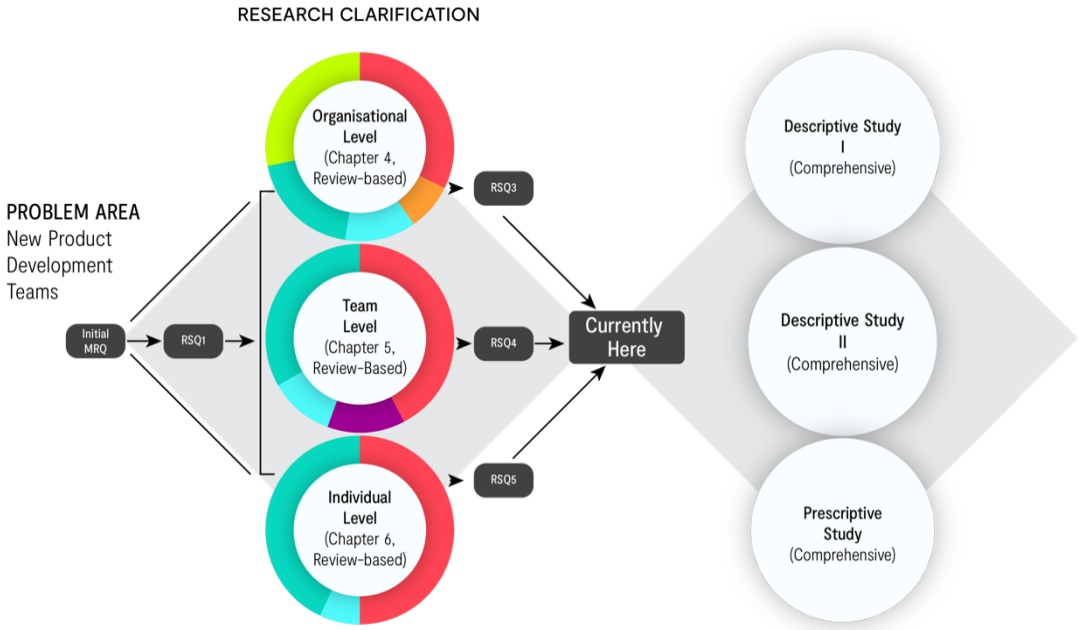
2.6. Chapter Conclusion

This chapter contextualises the research on New Product Development (NPD) teams in the contemporary landscape by navigating the NPD definition through seminal and current literature across organisational, team, and individual levels. The identification of a gap opportunity and formulation of overall research sub-questions set the early rationale for each level, paving the way for the three core studies in the thesis. At the organisational level, the challenge of NPD teams operating through hybrid work arrangements, influenced by ICT and work flexibility, introduces complexities in communication and information flow, raising questions about team integration and effectiveness. Subsequently, at the team level, exploration into the functional diversity of NPD teams and how team members' perspectives shape trust and information processing become pertinent. The focus shifts to understanding conflict within these dynamics and strategies to leverage perspectives without compromising functional identities. At

the individual level, strategies for managing team information/knowledge within the influences of organisational and team contexts are explored.

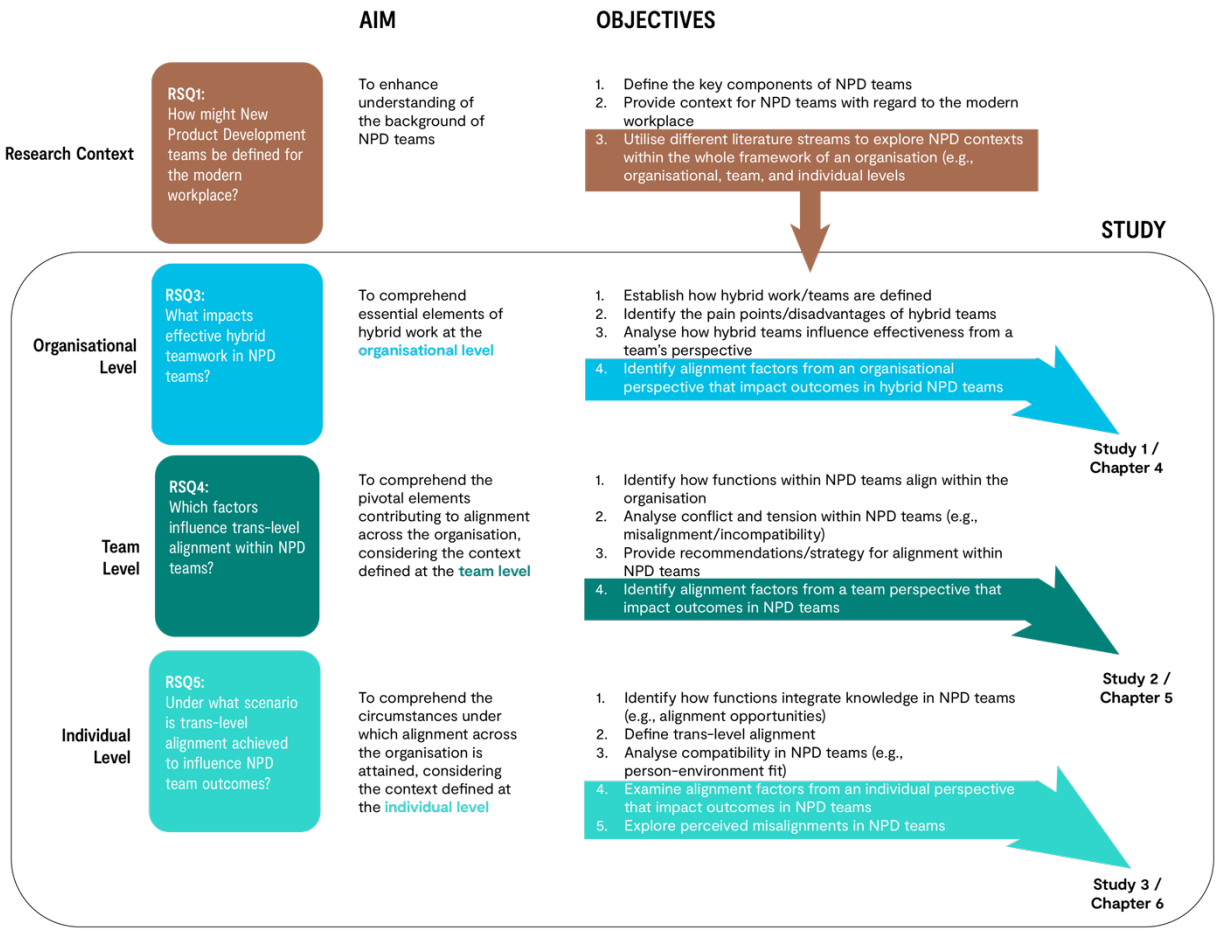
Literature crucial to the research questions and instrumental in delineating the research gap includes the theoretical framework of Event System theory, highlighting the influence of events across hierarchical levels in an organisation (Morgeson et al., 2015). This theory underscores the importance of viewing the organisation as a whole system and necessitates a multilevel perspective, contrasting with Kozlowski and Klein's (2000) emphasis on independence between levels. To ground the work, the psychological insights from Illgen et al.'s (2005) foundational effectiveness model, Input-Mediator-Outcome-Input (IMOI), offer a layered examination of organisational structure, guiding the identification of essential organisational factors. Complemented by a systems thinking approach with behavioural leanings, the IMOI enables exploration of interactions throughout the organisation. However, the IMOI's limited scope prompts the inclusion of other frameworks, particularly the evaluation of tension as a paradox in organisations requiring management strategies for fostering learning and creativity (Lewis, 2000; Andriopoulos et al., 2018). Carlile's (2004) organisational work encourages scrutiny of mismatches within teams to manage knowledge, while Burke's (1991) sociological perspective provides a lens for evaluating identity and alignment within functions, teams, and organisations. This synthesis of key authors and studies presents an opportunity to fill a knowledge gap by focusing on multiple organisational levels and analysing them in a unified manner, employing an interdisciplinary perspective. As the research questions evolved through iterations and further literature review, they converged and were refined, marking the transition to the next stage of the research—the empirical studies. Refer to Figure 2.11 for a visual representation of the thesis journey and evolving thinking.

Figure 2.11 Research Positioning Exiting Research Clarification Stage



As the research progressed, several open objectives from various research questions required further investigation to comprehensively understand and analyse organisational, team, and individual contexts. Figure 2.12 illustrates the interconnection between the research questions, studies, and the adopted approach. Leveraging traditionally composed New Product Development (NPD) teams as a foundational reference, the findings aim to provide recommendations for dynamically enhancing team compositions.

Figure 2.12 Overall Aims, Objectives, and Study Connections



This area of study remains pertinent as individual specialisation levels within teams escalate to tackle more onerous problems. In essence, the objective is to comprehend overall knowledge management through complex organisational coordination, considerations of person-function-environment fit, and multi-level analysis, shaping the opportunity gap and refining the Main Research Question (MRQ) to be explored in this thesis.

The upcoming Chapter 3 commences by identifying appropriate methods to investigate the open objectives and issues within NPD teams.

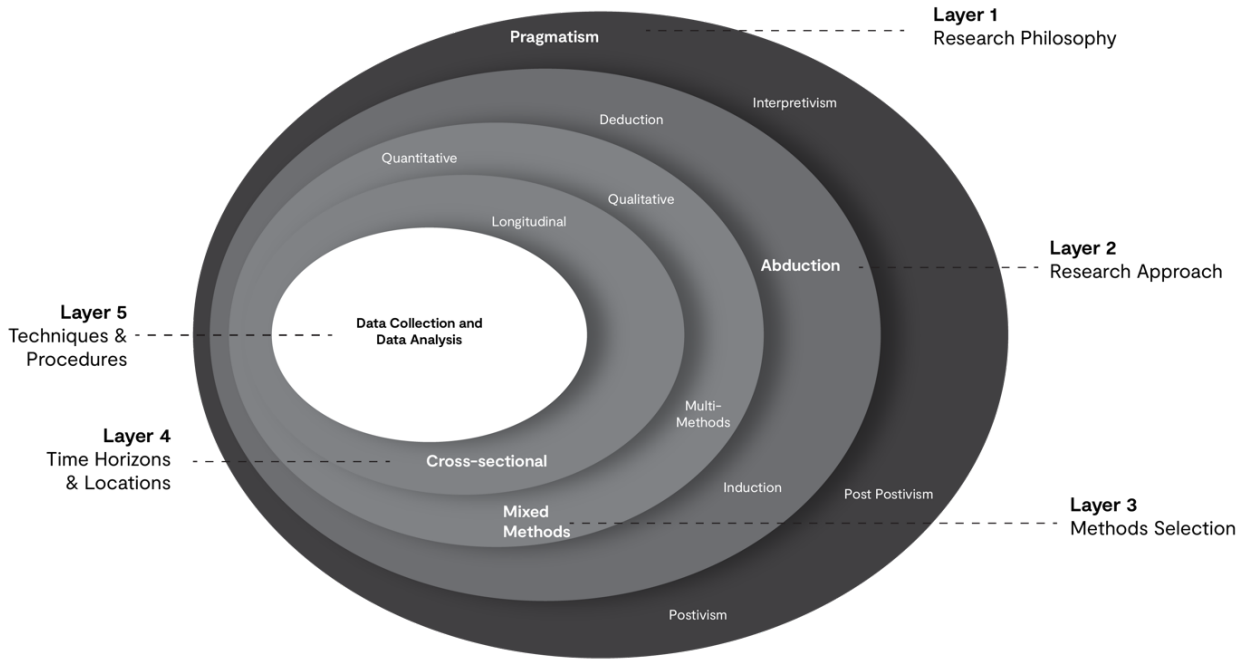
Chapter 3: Methodology

RSQ2: What potential methods for investigating the MRQ seem appropriate?

3.1. Chapter Introduction

The aim of this chapter is to ascertain appropriate methodologies for investigating issues within NPD teams, thereby justifying the varied research design decisions made in chapters 4, 5, and 6. Employing a modified version of the "research onion" (Saunders et al., 2007, 2012), Figure 3.1, each step in the evolution of the research methodology is explicated. The chapter commences by evaluating research philosophies or worldviews (Creswell and Clark, 2017) and elucidates the rationale behind adopting the principles of the pragmatic paradigm in this thesis. Subsequently, the conceptual aspects of research choices are examined, elucidating the reasons for opting for an abductive approach in the three conducted studies. A subsequent section delves into the practical dimensions of the research design, encompassing strategy, specific techniques, and procedures (e.g., sampling strategy, data collection, and data analysis). Finally, the chapter concludes with a discourse on the quality of research design and ethical considerations in the research.

Figure 3.1 Adapted "Research Onion" (Saunders et al., 2007, 2012)



Stemming from a pivotal element of the primary research question, the Research Sub Question (2) stays the same: "What potential methods for investigating the MRQ seem appropriate?" The question aimed to determine suitable methods concerning the thesis investigation. Table 3.1 details the research objectives related to this question.

Table 3.1 RSQ2 Objectives

#	Objective (as outlined in the Introduction)	Section(s)
1	Provide the underlying philosophical package that justifies the different research design choices	3.2
2	Detail overarching approaches and conceptual perspectives for the studies	3.3, 3.4
3	Discuss practical aspects of the research design (strategy, techniques, and procedures)	3.5, 3.6
4	Discuss research design quality and ethical considerations	3.7, 3.8

3.2. Layer 1: Research Philosophy

The philosophical paradigm, as defined by Kuhn (1962), represents a shared set of beliefs and agreements among scientists regarding how problems should be comprehended and addressed. In essence, these shared principles delineate grouped philosophical choices, such as a framework, guiding the researcher in constructing a coherent path to address the main research question while shaping their worldview (Kankam, 2019). Furthermore, for a comprehensive interpretation, it is essential to evaluate each of the three dimensions of the philosophical paradigm—ontology, epistemology, and axiology (Aldawod and Day, 2017). Ontology pertains to the perception of truth or the nature of reality, acknowledging the potential existence of single or multiple views of reality contingent upon the observer's perspective (Blaikie and Priest, 2019). Epistemology involves the examination of how knowledge is acquired or defines the extent of what is knowable (Hallebone and Priest, 2017). Lastly, axiology serves as the linkage between the preceding dimensions, indicating how contributions and values in the research can be applied within the given context (Aliyu et al., 2015). In some cases, rhetoric or the language employed throughout the research and methodology (e.g., means for executing the research) are included as common elements to distinguish each paradigm (Creswell and Creswell, 2017; Kaushik and Walsh, 2019; Lincoln et al., 2011); however, these additional dimensions will be elucidated in

subsequent sections outlining the design choices. Nonetheless, these principles constitute the groundwork for the research. Refer to Table 3.2 for a breakdown of the common elements of various philosophical paradigms, ultimately guiding the selection of the most suitable framework for the research foundations. While there exist numerous research philosophies, the most widely employed paradigms encompass pragmatism, interpretivism, positivism, and post-positivism (Kankam, 2019).

Table 3.2 Breakdown of the Philosophical Paradigm's Common Elements

Paradigm	**Ontology** *What do we see?*	**Epistemology** *What do we think?*	**Axiology** *What do we value?*
Pragmatism	Reality is unclear; researcher involvement and intersubjectivity are needed (Creswell and Clark, 2017; Morgan, 2007, 2013)	Knowledge is not fixed (unique to individual experiences) and is acquired by using the best methods of solving the problems (Kaushik and Walsh, 2019; Morgan, 2013; Tashakkori et al., 1998)	Values play a role in interpreting results (Kaushik and Walsh, 2019; Saunders et al., 2012)
Interpretivism	Reality differs from person to person - it is subjective. The researcher and reality are intertwined (Guba and Lincoln, 1994)	Influenced by social and cultural factors, knowledge comes from people's thoughts and ideas, (Crotty, 1998; Grix, 2018)	Value-bound/biased present (Saunders et al., 2012)
Positivism	Only one objective reality can be observed through science – independent researcher (Cohen et al., 2017; Scotland, 2012)	Knowledge is gained through research and measurement tools (neutral). It is true/false or meaningless (Crotty, 1998)	Value-free/unbiased (McGregor and Murnane, 2010; Saunders et al., 2012)
Post-positivism	Multiple realities and objectives exist; the researcher may have some influence (Crossan, 2003; Toloie-Eshlaghy et al., 2011)	Knowledge is socially constructed, not neutral (Henderson, 2011), and beyond scientific methods (McGregor and Murnane, 2010)	Value-bound and biases are separated (McGregor and Murnane, 2010)

Following the analysis of the fundamental elements of philosophical paradigms presented in Table 3.2, it was determined that the principles of the pragmatism paradigm closely aligned with both the primary research question and the researcher's convictions. To elaborate, positivism was deemed unsuitable for the main research question due to its absolute stance on

knowledge (Saunders et al., 2012), which limits the exploration of nuances in interpretation. Post-positivism, an iteration of positivism (Kankam, 2019), although slightly more flexible, remains heavily focused on numerical precision and generalizability (Kaushik and Walsh, 2019). These philosophies proved unsuitable for the research as they rely on objective data, neglecting the vital observations and participant tendencies crucial to the main research question.

Conversely, interpretivism's principles were more aligned with the needs of the thesis, allowing an understanding of how participants attributed meaning to their reality. However, interpretivism lacked flexibility in selecting the most suitable tools for investigating the problem. Consequently, the pragmatic paradigm guided the research methodology, dictating how exploration could transpire to attain knowledge. It facilitated a heightened emphasis on meaning, real-world practical orientation, experimentation with diverse methods, and the assessment of optimal connections between qualitative and quantitative data (Scott, 2016; Tran, 2016). In general, research methods such as interviews, case studies, and surveys, typical for this worldview (Žukauskas et al., 2018), were consistently reflected in the paradigm package across the three core studies. A combination of methods was employed based on the specific requirements of the research sub-questions constituting the main research question. Lastly, design research, which seeks to comprehend various challenges and provide support in practice and/or education (Blessing and Chakrabarti, 2009), aligns with the objectives of this thesis and is associated with multiple paradigms, including pragmatism, sharing common perspectives (Feast and Melles, 2010; Goldkuhl, 2012).

3.3. Layer 2: Research Approach

The overarching methodological rationale employed in this research is abductive, which involves exploring theories and data, identifying patterns, and proposing a plausible explanation (Mitchell and Education, 2018), with active researcher involvement (Morgan, 2007). To elaborate on this choice within the research context, the abductive approach was deemed fitting when examining the relationship between existing theories on New Product Development teams and the insights derived from interviews and surveys. Alternative approaches, such as exclusive deductive reasoning (Johnson-Laird and Byrne, 1991), were dismissed as the research goal was not to test an established theory using solely objective data. Similarly, exclusive inductive reasoning (Hayes et al., 2010) was ruled out, as extensive theory development was not the

primary focus for making broader generalisations. In essence, the research questions necessitated the flexibility to navigate between both types of reasoning, as facilitated by an abductive approach (Morgan, 2007).

Regarding existing theories on the research topic, the literature has spotlighted challenges within New Product Development teams, examined conflicts or tensions among team members, and extensively discussed the advantages/disadvantages of hybrid environments. However, certain facets of these research topics are missing, hindering the attainment of the most comprehensive explanation for the primary challenges within these environments. These gaps can provide insights into the factors limiting a team's innovation potential. Therefore, the abductive approach strategically integrates the strengths of both induction and deduction, as outlined in Table 3.3 by Dudovskiy (2016).

Table 3.3 Comparative Approaches (reference: Dudovskiy, 2016)

	Deduction	Induction	Abduction
Logic	In deductive inference, when the premises are true, the conclusion must also be true.	In inductive inference, known premises are used to generate untested conclusions.	In abductive inference, known premises are used to generate testable conclusions .
From/To	Generalise from the general to the specific.	Generalise from the specific to the general.	Generalise from the interactions between the specific and the general.
Use of Data	Data collection is used to evaluate propositions or hypotheses related to an existing theory	Data collection is used to explore a phenomenon, identify themes, and patterns, and create a conceptual framework	Data collection is used to explore a phenomenon, identify themes and patterns, locate these in a conceptual framework, test this through subsequent data collection, and so forth
Theory	Theory falsification or verification.	Theory generation and building.	Theory generation or modification; where appropriate, incorporating existing theory to build new theory or modify the existing theory.

3.4. Layer 3: Methods Selection

Building upon the abductive approach (3.3), two distinct data analysis methods were applied to investigate the primary research question. Initially, a qualitative method, involving semi-structured interviews, was introduced in studies 1 and 2 (chapters 4 and 5) to extract insights related to interactions within New Product Development teams. The data for this analysis were derived from the evaluation of interview transcripts involving active members of New Product Development teams. This analysis aimed to delineate perspectives on individual roles, team dynamics, environmental constraints, and factors influencing effectiveness at each organisational level. Additionally, this study illuminated different facets of existing theories that remained pertinent and identified areas where additional knowledge could enhance understanding of these team dynamics. The descriptive nature of the research aligned with the objectives of the research sub-questions, focusing on delineating the characteristics (Nassaji, 2015) or factors shaping these team dynamics. Consequently, seven key conceptual elements with varying degrees of impact on the effectiveness of these team structures were identified.

In Chapter 6 (study 3), the second data analysis method involved mixed methods, primarily qualitative but also incorporating quantitative analysis. This phase of the research adopted a more solution-oriented approach by gathering comprehensive data through the evaluation of 64 questionnaires, comprising both open-ended and closed-ended questions. These questionnaires were designed to test the framework components derived from studies 1 and 2. Notably, the distribution of questionnaires to participants associated with the original regional innovation clusters from the interviews allowed for logical insights that contributed additional perspectives and addressed gaps in existing theories. This methodological choice aimed at offering a different angle on the research problem and providing complementary insights to enhance the overall understanding of New Product Development team dynamics.

3.5. Layer 4: Time Horizons and Location

The research's strategy concentrated on a singular point in time, opting for cross-sectional data collection from participants. Due to the inherent nature of the research and practical constraints concerning the thesis completion timeline, adopting a longitudinal approach with data collection at multiple intervals was deemed impractical. Nevertheless, in line with the pragmatic approach, the research honed in on specific regional innovation clusters, namely Silicon Valley, London, New York, and the Greater Boston area. Diverse data collection tools

were utilised, facilitating multiple data points from the same regions without exerting undue influence on the participants over an extended period.

Regional Innovation Clusters denote geographical zones marked by high concentrations of tech- or creative-driven organisations, researchers, and esteemed universities linked to science and technology (Stephens et al., 2019; Wessner, 2014). These clusters are pivotal for innovation firms seeking specialised expertise and resources (Turkina et al., 2019). Each selected regional cluster represented a distinctive working environment for high-tech companies and served as a significant hub for NPD teams. Silicon Valley, encompassing the greater San Francisco Bay area, stands out as an innovation hotspot with access to top-tier talent and creative ecosystems (Berger and Brem, 2016). The inclusion of London was predicated on its post-2008 financial crisis surge in creative and tech businesses, featuring an intersection of digital and creative teams (Foord, 2013). Lastly, the Greater Boston area and New York, acknowledged as east coast "entrepreneurial ecosystems" with robust research influences, were also considered (Stephens et al., 2019, p. 267). By focusing on participants in these areas, the research facilitated comparisons across organisations in similar professions, capturing experiences from diverse working influences and enhancing the potential for a more expansive research impact.

3.6. Layer 5: Techniques and Procedures

The key considerations for the practical aspects of the research methods encompass the sampling strategy, data collection methods, and data analysis methods. The sampling strategy employed for the thesis, determining whom to study or collect data from, involved a non-probability purposive sampling method (Etikan and Bala, 2017). Non-probability sampling was chosen over probability sampling due to the impracticality, considering the complexity, time, and cost, of accounting for every member of the targeted population (e.g., those working within New Product Development teams) for generating generalisations through probability sampling. Instead, a non-randomised approach was adopted, as objectivity and the number of participants were not crucial factors (Etikan et al., 2016). Therefore, specific researcher-identified characteristics, based on the literature review and research question, were used in line with the purposive sampling design, which is "...based on the judgement of the researcher as to who will provide the best information to succeed for the objectives study" (Etikan and Bala, 2017, p.1). This approach, aligning with pragmatic paradigm principles, resulted in 97 participants (33 interviewees and 64 survey participants).

The inclusion and exclusion criteria for all three studies (interviews and surveys) remained consistent, as outlined in Table 3.4; however, the recruitment methods varied by study. Specifically, for studies 1 and 2, interviewees utilised the lead researcher's professional network (LinkedIn) to identify participants meeting the specified criteria, while study 3 employed a cloud-based professional network (SurveyMonkey) to target qualified participants. In both these cases, emails or social media messages were distributed to assess interest in participation. Overall, 461 individuals were contacted, resulting in a 21% response rate. Once qualified, contacted, and interested individuals were identified, appropriate consent forms were distributed, as detailed in section 3.8 on Ethical Considerations.

Table 3.4 Sampling Inclusion and Exclusion Criteria

Inclusion Criteria:

- Experience in New Product Development teams
- Experience with asynchronous and synchronous technology tools to communicate
- Experience(d) with the early stages of product development for physical product(s)
- At least one full year of professional work experience
- Professional or school experience in at least one out of four identified regional innovation clusters

Exclusion Criteria:

- NPD experience with developing digital-only products
- Homogeneous team experience (e.g., all engineers) only
- Experience with a team(s) that consist of three members or less
- Participants who are under 21 years of age

Table 3.5 shows the overview of participants in the study samples.

Table 3.5 Participant Sample Overview

Study	Participant Code	Participant Description	Participant Region(s)	Study Method	Duration (minutes)
1 & 2	INV-001	Male, 10+ years' experience	Boston, NY	Zoom Video	41
1 & 2	INV-002	Male, 9 years' experience	Silicon Valley, NY	Zoom Video	43
1 & 2	INV-003	Male, 15 years' experience	Silicon Valley	Zoom Video	50
1 & 2	INV-004	Male, 14+ years' experience	NY	Zoom Video	70
1 & 2	INV-005	Male, 21 years' experience	NY	Zoom Video	24
1 & 2	INV-006	Male, 2 years' experience	NY	Zoom Video	51
1 & 2	INV-007	Male, 5 years' experience	Silicon Valley, NY	Zoom Video	44
1 & 2	INV-008	Male, 2 years' experience	London, Silicon Valley	Zoom Video	58
1 & 2	INV-009	Female, 8 years' experience	London, Silicon Valley, and NY	Zoom Video	25
1 & 2	INV-010	Male, 12+ years' experience	Boston	Zoom Video	39
1 & 2	INV-011	Male, 8 years' experience	NY	Zoom Video	49

1 & 2	INV-012	Male, 5+ years' experience	Silicon Valley, NY	Zoom Video	58
1 & 2	INV-013	Male, 2 years' experience	Silicon Valley	Zoom Video	33
1 & 2	INV-014	Female, 7 years' experience	Boston, NY	Zoom Video	43
1 & 2	INV-015	Female, 6 years' experience	London, Silicon Valley, NY, and Boston	Zoom Video	37
1 & 2	INV-016	Male, 8 years' experience	Silicon Valley, NY	Zoom Video	57
1 & 2	INV-017	Male, 5 years' experience	Boston, NY	Zoom Video	30
1 & 2	INV-018	Male, 1.5+ years' experience	Boston, NY	Zoom Video	29
1 & 2	INV-019	Female, 12 years' experience	Silicon Valley	Zoom Video	55
1 & 2	INV-020	Male, 6 years' experience	Silicon Valley	Zoom Video	53
1 & 2	INV-021	Male, 4 years' experience	NY	Zoom Video	41
1 & 2	INV-022	Male, 2.5 years' experience	Boston, NY	Zoom Video	35
1 & 2	INV-023	Male, 11 years' experience	London, NY	Zoom Video	36
1 & 2	INV-024	Male, 5 years' experience	London	Zoom Video	42
1 & 2	INV-025	Male, 16+ years' experience	London, NY	Zoom Video	40
1 & 2	INV-026	Female, 8 years' experience	London, Boston	Zoom Video	41
1 & 2	INV-027	Male, 5 years' experience	Silicon Valley, NY, Boston	Zoom Video	83
1 & 2	INV-028	Female, 2 years' experience	Boston, London	Zoom Video	41
1 & 2	INV-029	Male, 5 years' experience	Boston, London	Zoom Video	31
1 & 2	INV-030	Male, 25 years' experience	Boston	Zoom Video	70
1 & 2	INV-031	Male, 10 years' experience	London	Zoom Audio	39
1 & 2	INV-032	Female, 11 years' experience	Silicon Valley	Zoom Video	28
1 & 2	INV-033	Male, 20+ years' experience	London	Zoom Video	26
3	SURV-1	Male, 8 years' experience	New York	SurveyMonkey	-
3	SURV-2	Male, 8 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-3	Male, 3 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-4	Female, 2 years' experience	London	SurveyMonkey	-
3	SURV-5	Female, 3 years' experience	New York	SurveyMonkey	-
3	SURV-6	Male, 2 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-7	Female, 5 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-8	Female, 25 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-9	Male, 10 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-10	Male, 10 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-11	Male, 17 years' experience	Boston	SurveyMonkey	-
3	SURV-12	Female, 2 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-13	Female, 25 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-14	Female, 25 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-15	Female, 25 years' experience	New York	SurveyMonkey	-
3	SURV-16	Female, 3 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-17	Female, 10 years' experience	London	SurveyMonkey	-
3	SURV-18	Female, 7 years' experience	London	SurveyMonkey	-
3	SURV-19	Female, 5 years' experience	London	SurveyMonkey	-
3	SURV-20	Male, 8 years' experience	London	SurveyMonkey	-
3	SURV-21	Female, 2 years' experience	London	SurveyMonkey	-
3	SURV-22	Female, 15 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-23	Female, 9 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-24	Male, 5 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-25	Male, 2 years' experience	London	SurveyMonkey	-
3	SURV-26	Female, 4 years' experience	London	SurveyMonkey	-
3	SURV-27	Female, 3 years' experience	New York	SurveyMonkey	-
3	SURV-28	Female, 7 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-29	Female, 15 years' experience	New York	SurveyMonkey	-
3	SURV-30	Male, 24 years' experience	Boston	SurveyMonkey	-

3	SURV-31	Female, 1 year experience	Silicon Valley	SurveyMonkey	-
3	SURV-32	Female, 4 years' experience	New York	SurveyMonkey	-
3	SURV-33	Male, 2 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-34	Male, 3 years' experience	Boston	SurveyMonkey	-
3	SURV-35	Female, 2 years' experience	Boston	SurveyMonkey	-
3	SURV-36	Male, 25 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-37	Male, 2 years' experience	London	SurveyMonkey	-
3	SURV-38	Female, 10 years' experience	London	SurveyMonkey	-
3	SURV-39	Female, 1 year experience	London	SurveyMonkey	-
3	SURV-40	Female, 2 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-41	Female, 1 year experience	Silicon Valley	SurveyMonkey	-
3	SURV-42	Male, 15 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-43	Male, 10 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-44	Male, 2 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-45	Male, 12 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-46	Male, 24 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-47	Male, 17 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-48	Male, 2 years' experience	New York	SurveyMonkey	-
3	SURV-49	Female, 5 years' experience	Boston	SurveyMonkey	-
3	SURV-50	Female, 10 years' experience	Boston	SurveyMonkey	-
3	SURV-51	Male, 8 years' experience	London	SurveyMonkey	-
3	SURV-52	Female, 3 years' experience	London	SurveyMonkey	-
3	SURV-53	Female, 3 years' experience	London	SurveyMonkey	-
3	SURV-54	Female, 2 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-55	Male, 4 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-56	Male, 10 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-57	Male, 9 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-58	Female, 8 years' experience	New York	SurveyMonkey	-
3	SURV-59	Male, 10 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-60	Female, 2 years' experience	Silicon Valley	SurveyMonkey	-
3	SURV-61	Female, 25 years' experience	Boston	SurveyMonkey	-
3	SURV-62	Female, 3 years' experience	London	SurveyMonkey	-
3	SURV-63	Male, 9 years' experience	London	SurveyMonkey	-
3	SURV-64	Female, 7 years' experience	London	SurveyMonkey	-

The approach to data collection for interviews began with the formulation of questions within an interview guide (See Appendix A2) rooted in existing literature, designed to elicit participants' thoughts and feelings about working in NPD teams comfortably. This involved a strategic combination of structured interview questions (Fontana and Frey, 2005) for specific baseline information and unstructured interview questions (Fontana and Frey, 2005) for flexibility and follow-up inquiries (Zhang and Wildemuth, 2009). Zoom served as the communication platform for conducting and recording interviews, acknowledged for its suitability in qualitative or mixed methods research (Archibald et al., 2019), providing a quality connection between the researcher and interviewee in the absence of face-to-face interactions. Additionally, online interviews facilitated data collection from four different regional locations

within a short timeframe. Post-interviews, audio recordings were transcribed using the rev.com transcription service, with subsequent verification by the researcher for accuracy.

The survey data collection method mirrored the interview process, aligning literature, existing research, and research sub-questions to develop a questionnaire assessing insights from prior studies (Appendix A9). Following a similar structure to interviews, the questionnaire incorporated a mix of open and closed questions relating to the study's research sub-question. SurveyMonkey, an online platform, facilitated access to a broad participant pool beyond the researcher's network, enabling quick targeting and qualification based on inclusion and exclusion criteria (Kimball, 2019). Responses were obtained, retrieved from the platform, and formatted for overall comparisons.

In the analysis of transcribed data from studies 1 and 2, an interpretation-focused coding strategy was employed to identify themes and significant information for addressing the research sub-question (Adu, 2019). This strategy, chosen over descriptive-focused and presumption-focused coding, aligns with a balanced approach, emphasising neither a purely narrative study nor claims/judgments (Adu, 2019). The data was represented and analysed by creating a data structure based on the Gioia approach (Gioia et al., 2013), generating 1st and 2nd order concepts. Appendices A3 and A4 show the aggregated dimensions presented in Chapters 4 and 5, demonstrating rigor.

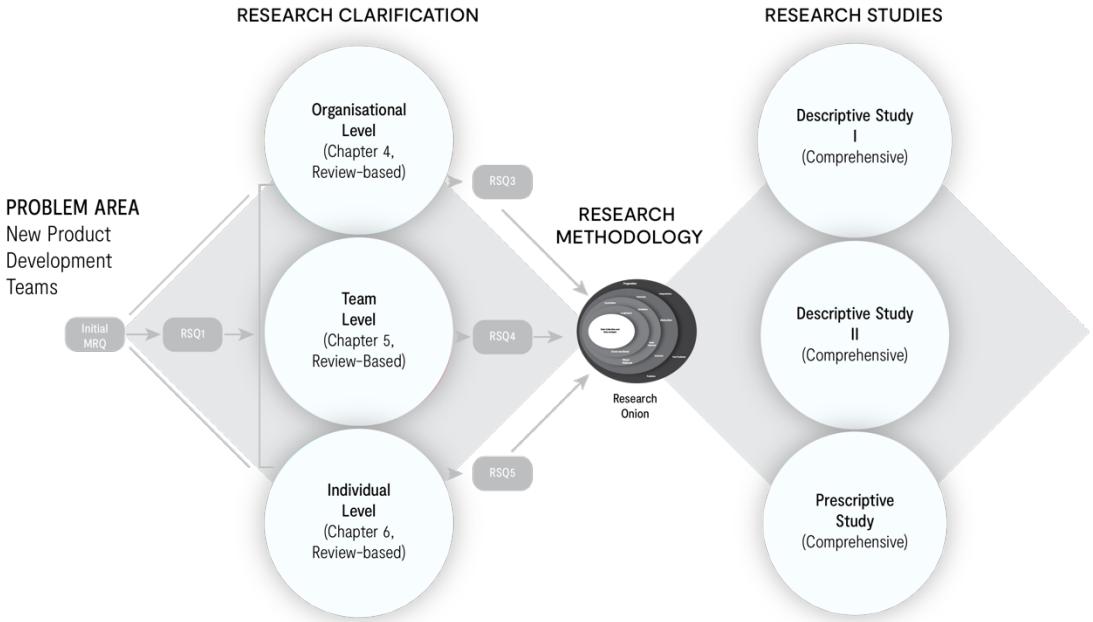
The analysis of the last dataset in Study 3 (Chapter 6) adhered to pragmatic principles, leveraging a mix of general quantitative evaluations (e.g., standard deviation, weighted mean (Pimentel, 2010), and Cronbach's alpha (Tavakol and Dennick, 2011)) to assess data reliability and tendencies. Data visualisation techniques (Onwuegbuzie and Dickinson, 2008) and coding analysis (Adu, 2019) for qualitative elements of the questionnaire were also employed to interpret information obtained from participants (Appendix A10).

3.7. Validity, Reliability, and Rigour

The fundamental concepts for evaluating research quality or rigor are validity and reliability (Cypress, 2017). Although these terms are often interchangeably referred to as 'trustworthiness' (Lincoln and Guba, 1985), this thesis will specifically employ the terms validity and reliability to establish confidence in the data.

Rigor, in the context of this thesis, is expounded as the robustness of the research design and the appropriateness of the tools and methods employed to address the main research question (Morse et al., 2002). To systematically capture knowledge throughout the research, two frameworks influenced the research design. These frameworks were inspired by the main phases outlined in the Design Research Methodology (DRM) (Blessing and Chakrabarti, 2009), encompassing Research Clarification and various types of Research Studies. The Research Clarification phase involved formulating goals through literature analysis, aligning with more conceptual themes. This phase then transitioned into the Research Studies phase, which comprised a Descriptive Study I (DS-I), a Descriptive Study II (DS-II), and a Prescriptive Study (PS) based on practical considerations. Collectively, this framework provided a comprehensive structure for research, emphasising both understanding and practical support (Blessing and Chakrabarti, 2009). The second framework incorporated an adapted version of the 'Research Onion' (Sanders et al., 2007, 2012), grounding the various decisions in developing the overall research methodology and connecting the conceptual and practical aspects of the DRM. Figure 3.2 illustrates how these frameworks merged to reinforce the structure and guide decisions related to the research philosophy, ensuring consistent and high-quality foundations for the research.

Figure 3.2 Research Design Utilising Adapted Frameworks for Rigour
(Blessing and Chakrabarti, 2009; Sanders et al., 2007, 2012)



According to Christensen et al. (2011, p.273), validity "refers to the correctness or truthfulness of the inferences that are or can be made from the results of a research study." Six validity strategies were employed throughout the research to ensure rigour and avoid researcher bias. Table 3.6 displays these strategies, which are based on the work of Maxwell (1992, 2012).

Table 3.6 Validity Strategies Employed During the Thesis
(Descriptions adapted from Christensen et al. (2011))

Strategy	Description	Implementation in the Thesis
Data Triangulation	Using multiple data sources to understand the research being undertaken	Multiple interview participants (2-4/company) were drawn from 13 different companies in order to benefit from a range of sources to inform the study
External Audit	Obtaining feedback from outside experts regarding study quality	Periodic, informal discussions were employed with external examiners as well as industry contacts regarding the relevance of each study
Methods Triangulation	Using multiple methods for understanding the research being undertaken	Qualitative and mixed methods were employed during the study

Participant Feedback	Obtaining feedback from participant discussions to verify researcher insights (e.g., 'member checking' (Christensen et al., 2011, p274))	Following interviews (INV-001 through INV-033), open-ended questions were asked of participants in order to confirm their understanding of the main themes and to determine if they had any additional commentary on the topic
Peer Review	Conducting peer discussions regarding research insights and conclusions	Bi-weekly or monthly discussions with peers and/or supervisors discussing interpretations of the data and the direction of the research
Reflexivity	Understanding potential researcher biases and self-awareness regarding their impact on research conclusions	Early recognition of positionality and potential for personal values and industry background to influence perspectives, outlook, and the role in interviewing/ analysis.

Concerning reliability, typically defined as the capacity to replicate research or ensure the stability of results in the research (Golafshani, 2003), its application is not always straightforward in studies of human behaviour and interactions. Assessments involving human subjects are seldom identical, making reliability, when linked to the measurement method, an inadequate criterion for determining quality (Cypress, 2017). Conversely, in methods other than quantitative ones, reliability should be grounded in "consistency and care in the application of research practices" (Cypress, 2017, p.256). In the context of this thesis, reliability is tied back to the meticulous attention and care devoted to the research design, as discussed in sections 3.1-3.6 and depicted in Figure 3.2.

3.8. Ethical Considerations

Ensuring ethical principles to safeguard the human subjects involved is imperative in any research study (Arifin, 2018), and such considerations were anticipated at the outset of this research, encompassing the interviews and surveys conducted. Ethical compliance was obtained through the Imperial College Research Ethics Committee (ICREC) and given the non-health-related nature of the studies, they were deemed low-risk. Throughout the ethics approval process, multiple documents were submitted for committee review, including the internal research protocol outlining the studies and participant entry procedures. External documents intended for participants comprised the participant information sheet providing general details about the studies, an informed consent form granting permission for audio Zoom recording of interviews

and delineating participant rights, and an interview guide with preparatory questions for the interviewee (See Appendix A6, A7, and A8). This ensured adherence to the principles outlined in the UK Policy Framework for Health and Social Care Research, as well as compliance with the protocol, the Data Protection Act 2018, the General Data Protection Regulations (Europe), and other relevant regulatory requirements.

Addressing data protection and confidentiality concerns, two ethical considerations were identified at the study's inception. Firstly, the research involved potentially sensitive data about individuals within teams, necessitating the protection of participants' identities and feelings. To address this, only the participant's undisclosed signature on the Informed Consent Form was considered identifiable data, with each participant assigned a unique ID (INV-###) for anonymisation in field notes and recordings. Secondly, general research ethics regarding identity protection and data security were addressed by implementing a coding method to shield identifying information such as company and participant names. Confidentiality was preserved, meeting transparency requirements under the General Data Protection Regulation for design-related research. Post-interviews, participants received shielded transcripts with unique IDs and no identifiable information, affording them an opportunity to review and make adjustments if necessary. Data and associated documentation will be stored for a minimum of 10 years post-study completion, with the lead researcher retaining original documentation, field notes, any identifiable data, and Zoom recordings.

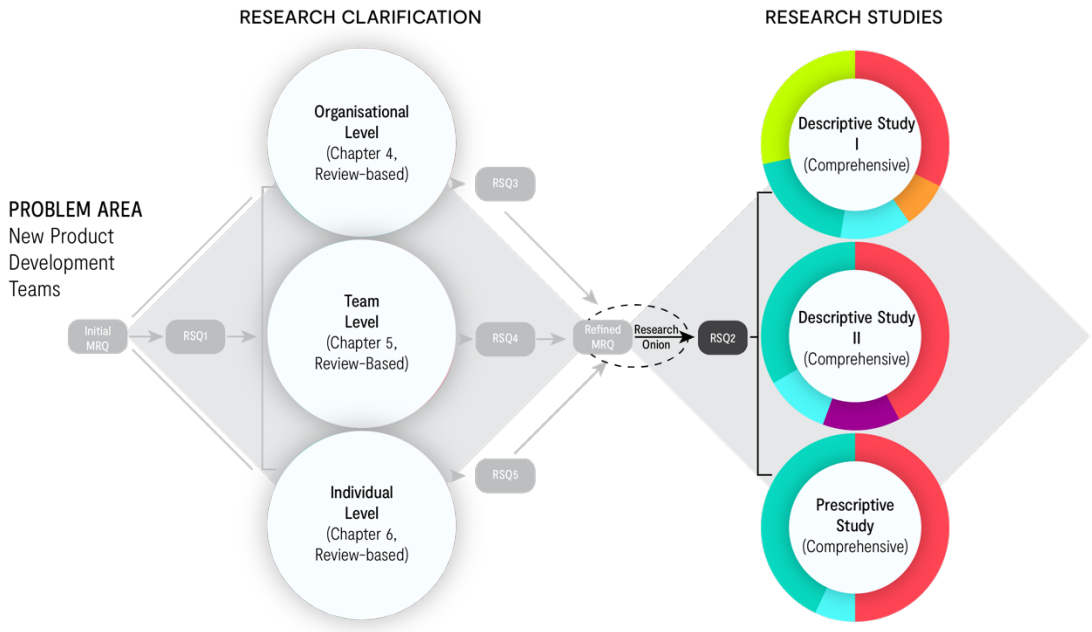
Furthermore, the distributed surveys adhered to European data protection laws, supervised by the Irish data protection authority and GDPR. No identities were recorded, and participants were coded solely based on years' experience, location, and sex using a unique identifier (SURV-##). These guidelines served as a comprehensive roadmap, ensuring the research was conducted with due respect to the anonymity and confidentiality of the participants.

3.9. Chapter Conclusion

The aim of this section was to provide a comprehensive discussion on the methodological philosophy and the rationale behind selecting the research design for the three primary studies in this segment. The primary objective was to determine the suitable methods for investigating the Main Research Question (Figure 3.3), shedding light on aspects we now understand that were previously unclear. Leveraging Sanders et al.'s (2007, 2012) "Research Onion" systematically

exemplified the philosophical principles guiding the research and bridging between the Research Clarification Stage and Research Study Stage from the Design Research Methodology (DRM). In essence, the pragmatic paradigm principles, employing abductive reasoning, were foundational to the thesis. All three studies adhered to this approach, employing qualitative and mixed methods for data collection and analysis. A total of 33 semi-structured interviews and surveys from 64 New Product Development (NPD) team members in four regional innovation clusters were conducted, ensuring comparable experiences through inclusion and exclusion criteria. Thorough analysis involved interpretation-focused coding (Adu, 2019), data structures (Gioia et al., 2013), general quantitative evaluations, and data visualisation techniques (Onwuegbuzie and Dickinson, 2008). The research methodology adhered to rigorous standards, emphasising a quality research design to ethically obtain, validate, and ensure the reliability of the data. The subsequent three chapters will delve into the specifics of the three core studies presented in this thesis.

Figure 3.3 Research Clarification to Research Study Stage Linkage



Chapter 4 initiates a Descriptive Study I, aiming to grasp fundamental aspects of hybrid work at the organisational level.

Chapter 4: When Hybrid Teamwork Arrangements lead to Effective Outcomes Beyond the Individual

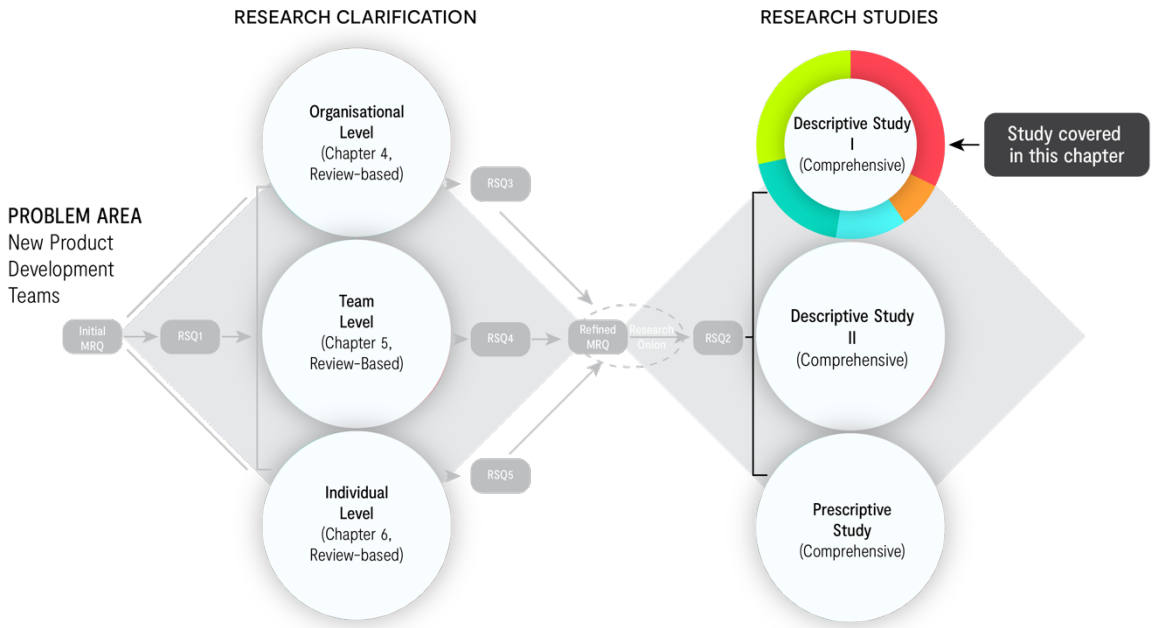
RSQ3: What impacts effective hybrid teamwork within NPD teams?

4.1. Chapter Introduction

This initial descriptive study within the planned trilogy of studies (see Figure 4.1) employs the foundational Input-Mediator-Outcome-Input framework (IMOI) (Ilgen et al., 2005) to gain a more comprehensive understanding of team effectiveness within a broader multi-level context. Drawing from existing literature on hybrid teams, particularly New Product Development (NPD) teams in these configurations, the study delves into team dynamics and interactions across the organisation to explore the collective benefits of employing such hybrid team structures. The impetus for this exploration emerged after a thorough literature review mapping exercise, revealing lingering questions about identifying factors that influence outcomes in hybrid NPD teams from an organisational standpoint.

The study is strategically positioned to enhance understanding at the organisational level, intending to integrate insights from this perspective into a cohesive approach for assessing the current effectiveness of NPD teams. The focus of data collection, analysis, and review is on NPD team members engaged in producing physical products for consumers within prominent regional innovation clusters.

Figure 4.1 Research Structure Highlighting Study 1



The upcoming segments in this chapter will furnish comprehensive information on the study design, its evolution, and pertinent context. Subsequently, the study findings will be explicitly articulated and subjected to critical discussion in connection with the existing literature, data interpretations, and any limitations inherent in the study. Conclusively, the chapter will summarise key findings and delineate what aspects are to be transitioned to the succeeding chapter.

4.2. Study Design

The design of this study employed conventional qualitative methods, specifically semi-structured interviews, as part of design research, involving a dataset comprising 33 participants engaged in New Product Development (NPD) teams. Design research, characterised by its focus on understanding and support (Blessing and Chakrabarti, 2009), aligns seamlessly with the overarching objectives of the thesis and the direction set for Study 1. Notably, existing literature in organisational and broader contextual domains predominantly employed surveys, interviews, and field studies to investigate various teams and organisations. The choice of semi-structured interviews for Study 1 was influenced by the alignment of key studies' methods with the proposed research, with a deliberate preference for more exploratory and less structured

techniques at this stage. Field studies were deemed impractical due to restricted access to organisational environments.

The study comprises two main components: first, insights garnered from the literature review in Chapter 2, addressing Research Sub-Question 3 (RSQ3) objectives 1-3, and second, the identification of factors from an organisational perspective that could influence team outcomes, addressing RSQ3 objective 4. To elaborate further, the first component utilised a foundational framework in order to investigate aspects of hybrid team arrangements, aiming to comprehend team transition points from the initial arrangement through interactions to eventual outcomes. The second component involved evaluating statements from NPD team members regarding project outcomes, and these findings are detailed in the results section.

4.2.1. Study Aim, Objective, and Research Question

In addition to gaining deeper insights into organisational contexts, considering the environmental attributes of work arrangements, communication routines, and the extent of connection with subsystems within the organisation (Jurkovich, 1974), the primary objective of Study 1 was to comprehend fundamental aspects of hybrid work at the organisational level. This objective is delineated through the exploration of Research Sub-Question 3: 'what impacts effective hybrid teamwork in NPD teams?' Therefore, the research objective which remained after the literature mapping exercise (chapter 2) to undergo exploration was as follows:

- ***OBJECTIVE 4***: Identify alignment factors from an organisational perspective that impact outcomes in hybrid NPD teams

In order to address the question and accomplish the objective, the study will centre its attention on NPD teams, aiming to comprehend the specific areas where hybrid arrangements impact team dynamics and collaboration.

4.2.2. Methods: Context and Development

The effective application of knowledge poses a challenge within NPD teams, yet it is recognised as a pivotal factor for innovation within organisations (Gao and Bernard, 2018; Sarin and McDermott, 2003). Hence, there was a need to investigate the organisational structures governing interactions in NPD teams and understand how coordination functions when confronted with diverse work boundaries and limitations in in-person communication. In the

realm of NPD, the interplay between different functions within teams prompted an exploration of emergent states (such as the feelings and thoughts of team members) within hybrid/virtual teams formed through collaborative efforts. The three predominant emergent states that significantly influence various types of virtual teams include team trust, team cohesion, and psychological safety (Breuer et al., 2016; Lechner and Mortlock, 2021; Malhotra and Majchrzak, 2014; Peñarroja et al., 2015), warranting further investigation for their linkage to contextual factors. The foundational model employed to explore these team states and behaviours resulting from interactions is the Input-Mediator-Outcome-Input (IMOI) effectiveness model (Ilgen et al., 2005; Mathieu et al., 2008), serving as the basis for further evaluation.

The chosen perspective for examination aimed to assess these NPD teams engaged in hybrid teamwork arrangements, considering multiple organisational levels. This approach sought to address a literature gap characterised by a predominant single-level focus when evaluating hybrid teams or individuals working in hybrid environments. This theoretical framework influenced the rationale for Study 1, emphasising the significance of considering multiple levels. Participants were selected with this contextual understanding in mind.

Recruitment and Participants

Prospective participants were initially contacted via email or LinkedIn, a professional networking platform. A total of 253 individuals were approached based on specific attributes identified by the researcher for sampling. Upon showing interest, participants received a formal invitation for the study, along with an interview guide and consent forms (see Appendix A6, A7, and A8). Around 13% (n = 33) of those contacted actively participated in extensive interviews. These interviewees, who had been actively involved in NPD teams in hybrid setups for at least one year, underwent interviews lasting an average of 45 minutes. They were associated with companies having international connections to virtual teams or with team members working remotely for varying periods. The sample comprised 13 consumer electronics companies, detailed in Table 4.1. Participants had worked for at least two of these companies, with many having experience in three or more. This extensive cross-company experience reflected high labour mobility, shared characteristics, and similar processes within the consumer electronics sector, consistent with observations in other technology sectors (Casper, 2007). This extensive overlap allowed the researcher to identify consistencies in perspectives across various

technology clusters. Furthermore, the selected companies showed a wide range in annual revenue, from 20 million to over 60 billion dollars.

This diversity accounted for potential differences arising from experiences in relatively smaller firms to larger multinational organisations. The "mature firms" category in the sample comprised established, older corporate entities such as robotic companies, leading research and development firms, and home innovation companies. Conversely, the "start-ups" category included newly established, young organisations in the sector, like drone, wearable, and Internet of Things (IoT) companies. Lastly, the "larger multinational organisations" category brought a global perspective, encompassing recent innovation areas in digital platforms utilising big data (Stulz, 2019).

Table 4.1 Sample Companies

Type	Company	Annual Revenue	No. of Employees	No. of Participants Associated with Company
Start-up	A	$20 million - $80 million	50–1K	3
	B			2
	C			2
Mature, smaller	D	$300 million - $2 billion	1K–5K	3
	E			3
	F			4
Mature, larger	G	$3 billion - $9 billion	5K–10K	2
	H			3
	I			2
	J			3
Multinational, larger	K	$60 billion+	10K+	3
	L			2
	M			2

All participants had exposure to at least one of the four Regional Innovation Clusters: Silicon Valley, London, New York, and the Greater Boston areas, highlighting the global nature of the sector and reinforcing the hybrid setup of teams and organisations. Each participant confirmed that their respective companies operated with virtual components, utilising both

asynchronous and synchronous technology tools such as video conferencing, emails, and chat messages even before the COVID-19 pandemic. This included collaboration with international manufacturing team members and/or colleagues in different locations. While the level of virtual work intensified during the pandemic, participants were already familiar with varying work arrangements beforehand. Hence, their experiences mirrored those of hybrid teams, providing a valuable basis for study. Despite disruptions caused by lockdowns, participants could offer feedback based on their prior experiences, aligning with pragmatic epistemology. Interviews were predominantly conducted between May 2020 and November 2020, with some additional sessions held between December 2021 and January 2022 to further explore specific themes. All interviews were conducted using the video-conferencing platform Zoom.

Interview Protocol

Interviewees were initially prompted to share details about their professional background, encompassing years of experience, formal education, product-type expertise, and team size, in order to establish a foundational context for the discussion. Subsequently, the conversation delved into their experiences within teams, specifically addressing challenges and barriers, followed by an exploration of their perspectives and values. The interview structure adhered to the outlined questions in the Interview Guide (A2). Approximately 60% of the questions in the guide pertained to Study 2 (to be detailed in the next chapter), while the remaining 40% focused on Study 1, specifically probing experiences within hybrid environments.

The design of the interview guide aimed to initiate the discussion with more open-ended questions, fostering a sense of comfort and encouraging participants to gradually open up about their individual perspectives. The middle section of the interview then covered topics such as team effectiveness, the impact of the Covid environment (if applicable), and a discussion on values contributing to the sustainability of beneficial organisational cultures from a broader perspective. These questions sought to extract information at individual, team, and organisational levels throughout the conversations. Additional insights into the interview guide and its rationale, linked to relevant literature, can be found in the appendix (A2). Follow-up questions were also prepared and selectively used only when a participant's initial response did not sufficiently address the core of the question, ensuring a consistent approach and equal opportunity for each participant.

Data Coding and Analysis

Upon transcribing the digitally recorded interviews, the data extracted from the interview transcripts underwent coding, as outlined by Adu (2019). Initially, a free-form first-order analysis was conducted to identify categories or themes within the data. Subsequently, a second-order theme analysis was employed to introduce structure (Gioia et al., 2013) and facilitate the development of concepts. Sixteen second-order themes emerged from the interviews, further condensed into nine dimensions during the aggregation process. These dimensions were thoroughly analysed through the IMOI framework, exploring concepts highlighted in the literature and establishing connections with the research question. The coding frameworks are succinctly summarised in the results section, with a more detailed breakdown of the coding structure by theme available in Appendix A3, and an illustrative example of a coded interview transcript presented in Appendix A5.

4.3. Results

The primary objective of this study was to scrutinise the influence of hybrid team arrangements on the effectiveness of NPD teams. The evaluation of interview data focused on understanding the impact of hybrid team arrangements at various organisational levels, including individual, team, and organisational constraints. The ensuing results, presented below, are aligned with the Input-Mediator-Outcome-Input (IMOI) framework derived from the literature review. This framework aids in exploring how contextual hybrid factors manifest into effective outcomes through the lens of emergent states.

4.3.1. Impact of Virtuality on the Individual

The analysis of coded transcripts revealed two prominent themes regarding the individual impacts of a virtual/hybrid environment: (1) participants articulated the effects *of boundaryless environments*, and (2) the mental and physical challenges stemming from being *overworked resources.* These themes shed light on the nuanced experiences of individuals navigating virtual and hybrid work settings within NPD teams. The first theme underscores the significance of boundaryless environments, emphasising how participants perceived and coped with the absence of distinct boundaries in their work context. The second theme delves into the mental and physical challenges participants faced as a consequence of being overworked resources. Both

themes contribute valuable insights into the multifaceted impact of hybrid team arrangements on the individual level within NPD teams.

To elaborate further, 73% of respondents indicated that their involvement in these hybrid teams resulted in environments where the boundaries between work and personal life became blurred, requiring a constant state of focus. Participant INV-021 observed: “it's more work now. A lot more work now, where people are working through lunch, working way past their normal hours because there's no commute. I feel like the commute breaks up the transition from work to home, but that doesn't exist. People are very tired …I'm exhausted.” This situation led to experiences of feeling "overworked," loneliness, and burnout, potentially impacting the overall success of the team. The persistent nature of work suggested a potential overcompensation, with employees working more to offset the flexibility offered by remote work. Notably, around 30% of participants explicitly expressed this sentiment, emphasising the importance of clear expectations in remote work arrangements. INV-026 stated about working remotely, “actually, I hate it. I hate working at home by myself. I find it quite lonely…. Additionally, some participants expressed a decrease in efficiency, with several mentioning demotivation and reduced productivity when exclusively working remotely. However, it's worth noting that not all interviewees shared this sentiment. Interestingly, there were participants, like INV-013, who reported an increase in productivity, underscoring the varied responses to different team working arrangements: “I’ve gotten a lot more productive in my personal life and in my work life working from home. That's really just optimising my time and just not wasting a lot. I'm putting less hours, but getting more done. That's really the big takeaway. So in those fewer hours, I can go and talk to my fiancé or play with my dog.”

Most participants noted experiencing "Zoom fatigue," as indicated by INV-15, 21, and 23, or described the virtual environment as mentally exhausting (INV-4, 7-12, 14, 15, 24-26, 28, 29). This mental strain was attributed to continuous communication with team members exclusively through online modalities. INV-028 said: "always just being on video, there's nothing holding you to maintaining eye contact and focus…. And for me eye contact in a meeting is very powerful because it really keeps you locked in on what someone is saying, so I really miss that for sure." Over a period of time, these fatigue-related aspects can impact the collective productivity and the team members' willingness to depend on each other and the organisation fostering this work setup. As participant INV-021 expressed regarding establishing

trust among team members in a hybrid team structure, "it's about the flexibility" and "we recognize the boundaries …and we respect that." These remarks from participants pointed to a concern about bidirectional trust within the organisations, such as a shared organisational trust issue.

4.3.2. How Hybrid Structures Influence Team Member Interactions

Two key themes surfaced from the analysed transcripts regarding the effects on the team within a virtual/hybrid environment: (1) participants encountered limitations in real-time communication feedback with colleagues, and (2) a breakdown in communication occurred when trying to comprehend the diverse functional languages used by team members in this environment. Notably, 45% of participants expressed concerns about an increased likelihood of "misunderstandings" at the team level in this context, potentially affecting project timelines due to additional efforts required for clarification or alignment. For instance, INV-011 noted that "tone can be misread in certain instances," leading to tense interpersonal interactions within the team. INV-013 highlighted the difficulty in building rapport, even in virtual social gatherings, stating, "It's definitely harder to build that rapport even doing a virtual happy hour. I just don't think it works even close." These comments were frequently echoed by participants, emphasising the impact on team environments and the added stress of not understanding others' communication styles. Interaction emerged as a crucial factor influencing the effectiveness of hybrid teams. All participants stressed the significance of spontaneous, informal conversations with team members for bonding, underscoring how the absence of these in-person interactions results in a forced work format that diminishes the human experience. As INV-029 observed:

> *"It's extremely challenging. I think because I'm a people person, it's that human interaction and engagement that I think excites me and my job and keeps me motivated. Again, I think it's helped me hone in on some other things, but I think for me, it's been an overall challenge. I think overall as a team, we've done exceptional, but it is not... I mean, I look forward to going back to being in an office and seeing people face to face and having discussions and catching up on people's lives in the hallways. I miss the "How's the kids?" I think I miss the human interaction more than the work part. I think that helped. I think it helps me. I think a lot of my good relationships at work come from*

getting down to that raw life things than just like, you know what I mean, I need this, I need that, where's this update, that kind of thing. I like to know more."

Put differently, the participants opined that constraints in real-time feedback could exacerbate the communication loss confronted in teams.

Participants also provided feedback indicating a lack of empathy for the benefits experienced by other team members. This was evident when some participants specifically highlighted attributes that contribute to team effectiveness. As a case in point, INV-032 mentioned: "empathy and understanding where other groups are coming from and understanding they have their best intentions and you know what they're thinking about as opposed to like, "No, they hate me, blah, blah, blah. Why are they trying to ruin everything?" Just coming with an empathetic heart, being able to also question why things are done a certain way, making sure you're not settling for the status quo, if you will."

Participants frequently raised concerns about the potential adverse effects of a lack of workplace compassion or respect among team members, which they believed could impede team spirit and extend project timelines. The comments from participants underscored that in a virtual setting, the impact on the social aspect of team cohesion was more pronounced due to limited face-to-face interactions or inconsistent virtual interactions. This diminished regular interaction eroded the sense of group belongingness and had potential repercussions on both task-related aspects and the level of respect and empathy among team members (e.g., team cohesion issues). Participants opined that in order to enhance team cohesiveness in a hybrid team environment, where natural interactions are reduced, it may be necessary to introduce stimuli that promote effective collaboration and address not only traditional team challenges, but also additional challenges posed by virtual factors. According to their viewpoints, the stimuli can help maintain team members' desire to work together and foster a sense of togetherness despite the physical distance and limitations of virtual communication.

4.3.3. Organisational Challenges Through Virtuality

There were five themes that surfaced from the analysed transcripts concerning the effects on the organisation in a virtual/hybrid environment. The initial two were (1) participants highlighted a problem with *goal clarity,* and (2) there was a *disconnected* environment when

trying to integrate different perspectives. The subsequent three themes pertained to an account of emergent states resulting from team communication/interactions. These descriptions reflected states more commonly recognised as team cohesion, psychological safety, and a variant of team trust.

A significant majority of participants (70%) also conveyed their discontentment with working in virtual contexts by articulating a *disconnection* from their actual team members. As mentioned by INV-001:

> *"...it comes down to I guess more of a communication thing and because I'm a little bit separated from the core engineering teams, a lot of decisions can be made easily just between a team of engineers, and then I find out after the fact which may or may not cause something to be redesigned at that point, or a here it is and this is what it is. Which can be frustrating."*

The participants commonly raised the issue of inclusion or the lack of access to decision-making forums in the context of hybrid team arrangements. Additional challenges were expressed, such as "...people for the first time being exposed to being in this fully digital world, I think they're having a hard time coping with that, and there's a learning curve there," as voiced by INV-012, or "people are so used to all working in the same office, where they can walk to people's offices to ask a question, that they were not good at communication on the computer to begin with," as expressed by INV-014. Moreover, one of the consequences of eliminating (or reducing) "the most effective mode of communication," which is face-to-face, is the impact on communication clarity (INV-007), as understanding through virtual forms can be limited to sometimes only one sense. To expound, INV-007 stated, "...in person is always best. Always. 100% of the time you can read someone's body language, you get a feel for the room, you can move around the room, you can own the room by moving. They can do the same, right? So in person is always best. It works. There are no situations where it does not, in my opinion." The absence of non-verbal communication elements can lead to additional disparities in understanding goals or goal clarity, a point specifically raised or described by 52% of participants. This suggests that when individual differences accumulate, such as varying learning curves, participants perceive an increased sense of separation and note the presence of goal

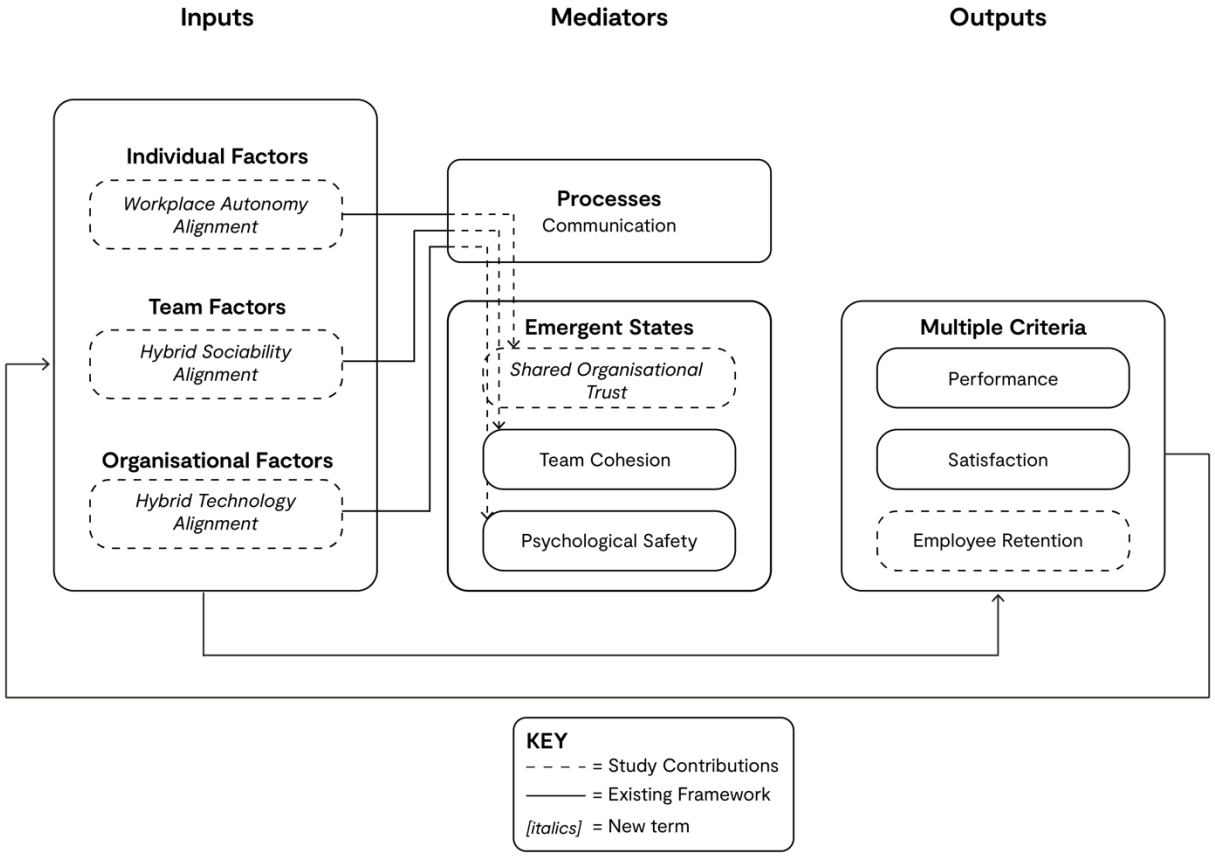
misalignment (e.g., psychological safety issues). Participants also point out potential discrepancies in how the team might react when a team member speaks up, indicating that psychological safety in a face-to-face teaming arrangement relies on the comfort fostered by individual team members. In a hybrid or virtual environment, psychological safety depends on team members but also requires organisational infrastructure to establish more intentional connections for comfort and reduce technology-induced frictions.

Finally, participants concurred that, as observed by INV-011, "…. the most important thing is communication. When you have a communication breakdown, the whole team breaks down… [the impact] would be time… communication is very important in team dynamics." This suggested that ongoing breakdowns might lead to an increase in instances of team member disengagement, team members showing disregard, and communication lacking transparency. Furthermore, upon further inquiry into participants' interactions and communications, three main themes were identified concerning goal communication (e.g., alignment across functions – fostering team cohesion), open communication (enabling the exchange of ideas – promoting psychological safety), and uncomfortable communication (discussions about work environment boundaries – a form of team trust or shared organisational trust). More than 70% of participants described these communication states when discussing positive outcomes. In general, the criteria for outcomes or positive results communicated by participants consistently related *to performance* and *satisfaction*, with an additional criterion emerging—*employee retention* beyond the project. An indication of participants exiting the organisation was also observed if "teamwork has been pretty much non-existent" (INV-027), with dissatisfaction with the environment.

Additional measures are needed to assess the effectiveness of these environments—which may include taking proactive steps/providing additional support to resolve any issues—and evaluate areas to help push teams into effective states. Figure 4.2 shows the **three levels** of contextual inputs that demonstrated areas of misalignment throughout the whole organisational framework. The identified areas throughout the study have been re-termed from the communicated dimensions to demonstrate where an alignment or point of adjustment is needed. Each alignment area could be related to a specific emergent state highlighted earlier in the Chapter 2 literature review and that appeared throughout the interviews. With that said, it appears that individual contextual factors (boundaryless environments and overworked resources), which will be termed **Workplace Autonomy Alignment** more readily led to an

emergent state (shared organisational trust) that developed at the individual level. The team contextual factors (feedback constraints and communication loss), which will be termed **Hybrid Sociability Alignment** more readily led to an emergent state (team cohesion) that developed at the team level. Finally, the organisational contextual factors (goal clarity and disconnection), which will be termed **Hybrid Technology Alignment** more readily led to an emergent state (psychological safety) that developed at the organisational level. Each of these levels needs to be addressed and aligned in order to impact hybrid team arrangements for positive team outcomes based on the study results.

Figure 4.2 IMOI Framework Representing the Study Results



4.4. Discussion

Organisations are currently confronted with the decision of whether to persist with the enhanced flexibility afforded by virtual work or revert to the traditional face-to-face work setup post-pandemic. However, existing literature offers a fragmented perspective on the overall merits of increased flexibility in team working arrangements (Jimenez et al., 2017; Maynard et al.,

2012; Wheatley and Bickerton, 2016), as well as the associated disadvantages (Neirotti et al., 2019; Schweitzer and Duxbury, 2010; van der Lippe and Lippényi, 2019). Moreover, much of this research concentrates on individual aspects (Leslie et al., 2012; Lott and Abendroth, 2022; Sardeshmukh et al., 2012; Sullivan, 2003) and the singular benefits to team members under these working arrangements (Biron and Van Veldhoven, 2016; Felstead et al., 2002; Jimenez et al., 2017; Ter Hoeven and Van Zoonen, 2015; Wheatley, 2017; Wheatley and Bickerton, 2016).

Some studies have attempted to extend their focus beyond the individual, such as the work of van der Lippe and Lippényi (2019) on the effects of interacting with virtual team members. However, the presented work distinguishes itself by examining how interactions within a hybrid team arrangement impact not only the individual but also the team and the organisation. A more holistic approach was employed to evaluate hybrid team arrangements, utilising the IMOI framework to examine how contextual factors from the organisation, team, and individual levels translated into overall effective outcomes.

From these findings, the conclusion was drawn that overall effectiveness can be attained when multiple level factors (e.g., those pertaining to the organisation, team, and individual) are taken into account when designing workplace flexibility. Specifically, at the individual level, it was observed that boundary-less environments and overworked resources were linked to the individual's perception of the organisation. This implies that when designing for agreement over workplace autonomy, considerations at the individual level should be taken into account. This evolved into ***Workplace Autonomy Alignment***, denoting an organisation's confidence in its employees, specifically in establishing boundaries for optimal working conditions in the context of hybrid team arrangements. At the team level, it was discovered that constraints in feedback and communication loss were connected to the effectiveness of team collaboration. Therefore, considerations for ***Hybrid Sociability Alignment*** should be taken into account. This involves recognising the significance of informal social interactions that can be advantageous in allowing team members to transcend functional labels and stereotypes, particularly in virtual environments.

Subsequently, at the organisational level, it was identified that goal clarity and disconnection were linked to the expectations and comfort levels experienced by team members. This underscores the necessity to design for ***Hybrid Technology Alignment***, referring to consensus on the organisational infrastructure needed or implemented to overcome technical

constraints in hybrid environments, ensuring comfort levels and maintaining connection throughout the organisation.

The overarching discovery aligns with the observations of researchers who have highlighted potential benefits in the utilisation of hybrid/virtual team working arrangements (Jimenez et al., 2017; Maynard et al., 2012; Wheatley and Bickerton, 2016).

4.5. Theoretical Implications

Delving deeper into the mediating mechanisms for effectiveness, particularly the emergent states, utilising the IMOI framework, it is asserted that further exploration of diverse team experiences and interactions across the organisation is essential for understanding hybrid team working arrangements. This conclusion aligns with the preliminary connections identified between individual, team, and organisational constraints and the three emergent states commonly associated with impacting types of virtual teams: team trust, team cohesion, and psychological safety (Breuer et al., 2016; Lechner and Mortlock, 2021; Malhotra and Majchrzak, 2014; Peñarroja et al., 2015). Each emergent state was found to be linked to different alignment factors previously highlighted. Specifically, workplace autonomy alignment was associated with shared organisational trust developed at the individual level, hybrid sociability alignment showed a connection to team cohesion developed at the team level, and hybrid technology alignment related to psychological safety developed at the organisational level.

In the context of team trust, the research aligns with De Jong and Elfring's (2010) proposition regarding shared beliefs and perceptions among team members concerning organisational trust. This builds upon Robinson's (1996) definition of organisational trust, expanding it to encompass a two-way approach, acknowledging not only employees' trust in the organisation but also the organisation's trust in its employees. The term "shared organisational trust" is introduced to capture this concept. Effectively communicating work expectations for flexibility and encouraging breaks from technology usage are highlighted as key factors contributing to positive outcomes, as participants reported different arrangements resulting in productivity.

The study also underscores the significant impact of social cohesion on the task-oriented aspects of cohesion within virtual teams in a hybrid setting. While some researchers categorise cohesion into social and task types (Rosh et al., 2012), this study argues for a greater emphasis

on social cohesion, particularly in hybrid team arrangements. To foster team cohesiveness in a virtual environment with limited natural interactions, the introduction of stimuli encouraging social interactions is suggested, maintaining team members' desire to collaborate.

Furthermore, the concept of psychological safety, traditionally studied in face-to-face teams (Lechner and Mortlock, 2021), should be expanded to address technological constraints in hybrid arrangements. Drawing from Edmondson's (1999) definition, which emphasises team members feeling safe to voice their opinions without fear, this concept is extended to the virtual context, where technological learning curves and limited access to team members can pose additional barriers. This suggests that deliberate efforts and thoughtful organisational infrastructure are necessary to establish a sense of psychological safety in hybrid teams.

4.6. Managerial Implications

Individuals in managerial roles have the opportunity to contemplate these three emergent states concerning hybrid team working arrangements, offering effective outcomes not only to individuals but also to the team as a whole. The study also recognizes broader impacts beyond the transient nature of performance and satisfaction outcomes, extending to the enduring influence on employee retention. This discovery surpasses the conventional perspective on virtual team effectiveness, which predominantly focuses on short-term outcomes for teams (Dixon and Panteli, 2010). Moreover, based on these findings, it is deduced that evaluating the implementation of a hybrid team should involve considering criteria at multiple levels, such as workplace autonomy alignment, hybrid sociability alignment, and hybrid technology alignment. These criteria are linked to emergent states that take into account factors from the entire system's framework, encompassing the individual, team, and organisation. These findings also align with the insights of Raghuram et al. (2019), highlighting the tendency for research to be compartmentalised around virtual teams or those engaged in virtual work. In other words, as some level of virtual work becomes the norm, the definition of these teams should be consistent and encompass a comprehensive understanding of the entire organisational framework for both research and practical guidance.

4.7. Limitations and Future Research

The study's limitations are intertwined with participants sharing individual experiences rather than discerning various experiences within the same team or organisation. The absence of

diverse perspectives within teams or organisations may restrict the generalisability of the findings. While the study did not aim for validation evidence, the insights gleaned from the qualitative study provide a foundation for future research. Nevertheless, the reliance on individual experiences may limit the broader applicability of the conclusions.

Additionally, the study acknowledges the challenge in capturing the authenticity of emergent states, which are inherently individual perceptions. The difficulty lies in accurately representing and interpreting these subjective discernments. Despite this limitation, the utilisation of long-form interviews allowed participants to articulate their thoughts and feelings about team interactions and experiences. While this method was deemed the most effective for capturing individual perceptions, it inherently introduces subjectivity and potential bias into the data.

The study's findings emphasise the significance of three emergent states, but it is acknowledged that future research is imperative to explore additional emergent states that might influence team effectiveness in hybrid team arrangements. A more comprehensive understanding of emergent states could provide a nuanced perspective on the dynamics of hybrid teams.

Furthermore, the study suggests that future work should delve into ways to operationalize emergent states and evaluate their impact under varying degrees of virtuality. This entails developing practical measures and frameworks to quantify and assess emergent states, facilitating a more systematic and objective analysis of their influence on team dynamics. Addressing these limitations would contribute to a more robust understanding of the complexities associated with hybrid team arrangements and enhance the practical applicability of the research findings.

4.8. Chapter Conclusion

This study has comprehensively addressed Research Sub Question (RSQ) 3, elucidating the factors that influence effective hybrid teamwork in NPD teams. Following the literature review in Chapter 2, which laid the foundation for defining 'effective' and highlighting distinctions between traditional teams and virtual or hybrid teams, Study 1 identified organisational factors with the potential to impact outcomes. These factors, assessed within the broader organisational environment, were termed workplace autonomy alignment, hybrid

sociability alignment, and hybrid technology alignment, subjects that will be further explored in Chapter 6.

The study positioned itself within team effectiveness theory, adopting multilevel perspectives and drawing on the literature on hybrid teams. The overarching finding suggests that effectiveness is attainable when multiple-level factors are considered in designing workplace flexibility. The primary theoretical contribution lies in linking three under-explored factors to team effectiveness theory, employing a multilevel perspective within an organisation, particularly in the context of hybrid teamwork arrangements. However, a team-level perspective is deemed essential for a more in-depth analysis of the effectiveness and the potential for improved team outcomes. Chapter 5 initiates this evaluation at a lower level to capture an additional perspective on overall effectiveness and the factors associated with alignment from the team level. Key factors for aligning NPD team members will be discussed in the forthcoming Descriptive Study II.

Chapter 5: Cutting through the Tension in NPD Teams: The Role of Functional Alignment Brokers

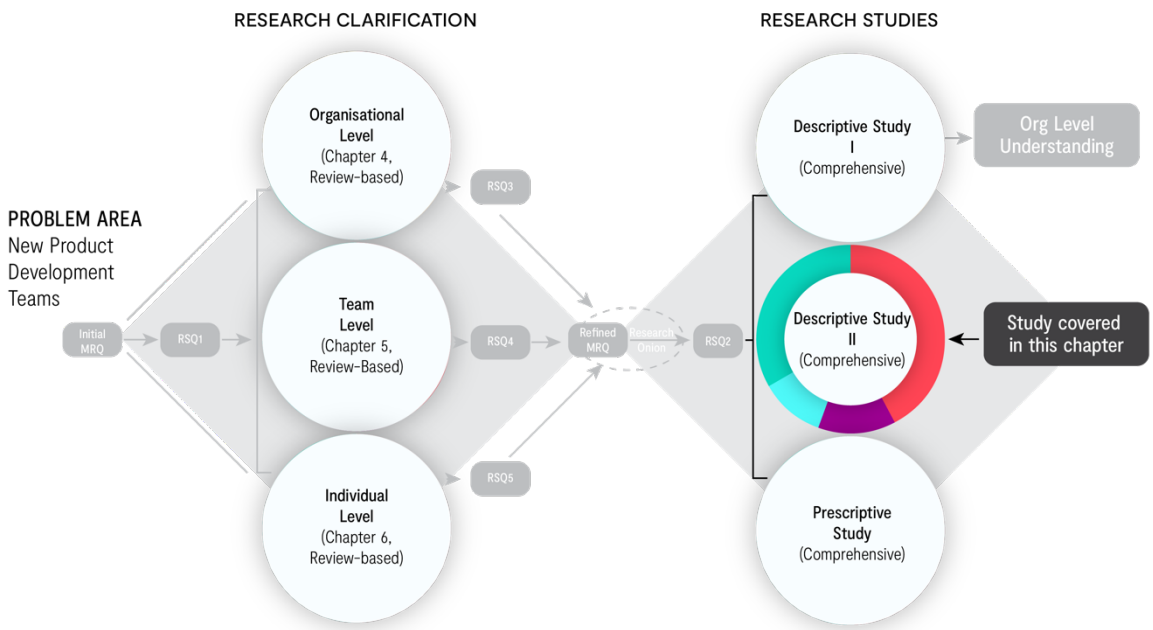
RSQ4: Which factors influence trans-level alignment within NPD teams?

5.1. Chapter Introduction

The second descriptive study in the planned series of three studies (Figure 5.1) employs the concept of identity (Burke, 1991) and tension paradoxes within organisations (Lewis, 2000) to enhance the comprehension of team effectiveness. This study takes a distinctive approach by concentrating on team compositions and patterns of professional or functional alignment at the team level, presenting an alternative strategy regarding NPD theory. This chapter and approach are rooted in, and extend upon, existing literature that scrutinizes functional identities, cross-functional tension, and current management strategies aimed at alleviating such tension. However, the primary goal of this study is to discern the factors necessary for aligning team members within the NPD environment, considering the pronounced allegiances to respective functional identities.

This study emerged as a response following the literature review mapping exercise in Chapter 2, where lingering questions persisted regarding the identification of factors impacting outcomes from a team perspective. The study is strategically positioned to contribute insights from the team level, with the aim of integrating these insights into a comprehensive approach to assess the current effectiveness of NPD teams. Data collection, analysis, and review will be centred on NPD team members engaged in producing physical products for consumers within notable regional innovation clusters.

Figure 5.1 Research Structure Highlighting Study 2



The upcoming sections in this chapter will furnish information regarding the study's design, development, and pertinent context. Furthermore, the study's findings will be explicitly presented and subsequently examined critically in connection with the literature, data interpretations, and study limitations. Lastly, the chapter will conclude by summarising key findings and indicating the transition to the next chapter.

5.2. Study Design

In this study, comprehension was drawn from the experiences and characteristics of 33 participants, aiming to scrutinize conjectures from existing NPD theory from a team-level perspective. Consistent with this approach, qualitative data collection and analysis were employed to capture participants' thoughts and feelings through interviews, incorporating both structured and semi-structured components. The structured segments sought to establish a baseline or background for all participants, while the semi-structured portions allowed for flexibility, encouraging further exploration of the topic (Bryman, 2016). Notably, many key works in team literature involved empirical or ethnographic studies, and surveys and interviews were commonly used in studies across multiple disciplines, deemed suitable methods for consideration.

Initially, the plan was to conduct ethnographic research within one company for a more extended case study. However, due to the timing of data collection, approximately in March 2020, and the subsequent Covid-19 lockdowns, online interviews became the chosen method for data collection.

The study comprises two main components: (1) insights and knowledge derived from the literature review in Chapter 2, addressing RSQ4 objectives 1-3, and (2) identification of factors related to the team perspective with the potential to impact team outcomes, addressing RSQ4 objective 4. To elaborate, the first component of the study utilised literature focused on the bi-functional interface of non-technical and technical team members, expanding to multi-functional interfaces for deeper insights. Additionally, it explored strategies within teams using specific functional roles. The results section reports the findings of the second study component, evaluating NPD team members' statements regarding project outcomes.

5.2.1. Study Aim, Objective, and Research Question

In this study, the attempt is made to answer the following question: How might we harness the innovation benefits of cross-functional tension in NPD teams, whilst minimising its negative effects? To address this question, the primary focus lies on the role and strategies of team members identified as "Functional Alignment Brokers." These individuals leverage their diverse functional backgrounds and experiences to overcome functional boundaries, fostering a positive team environment conducive to innovation. This specific question was operationalised based on the research sub-question 4, which explores the factors influencing trans-level alignment within NPD teams. The term "trans-level" in this context refers to the research perspective, encompassing contextual considerations throughout the organisation but specifically targeting the team level. Thus, the research objective that persists from the literature mapping exercise in Chapter 2 and is to be explored in this study is as follows:

- ***OBJECTIVE 4***: Identify alignment factors from a team perspective that impact outcomes in NPD teams

To address the question and achieve the objective, the study will concentrate on NPD teams to comprehend crucial elements that contribute to alignment across the organisation. The focus will specifically consider the context defined at the team level.

5.2.2. Methods: Context and Development

Teams possessing diverse expertise and knowledge play a vital role in NPD, tackling complex innovation challenges characterised by unclear scopes and ambiguous information boundaries (Mattarelli et al., 2022). The cross-functional diversity inherent in NPD teams is widely acknowledged as a significant source of team tension, often described as a "double-edged" sword (Andriopoulos et al., 2018; Lewis, 2000). This tension is crucial as it serves as a driving force behind successful innovations that challenge the status quo (O'Neill et al., 2013; Todorova et al., 2014). However, it also carries the potential to undermine communication, collaboration, team morale, and, ultimately, the innovation outcomes of the team (Andriopoulos et al., 2018; Hawlina et al., 2019; Mitchell and Boyle, 2015, 2021; Srikanth et al., 2016; Windeler et al., 2015). This dichotomy presents an opportunity to explore ways in which positive tension within teams can be effectively harnessed, given the current compositions (Mattarelli et al., 2022; Andriopoulos et al., 2018; Lewis, 2000; O'Neill et al., 2013; Todorova et al., 2014; Hawlina et al., 2019; Mitchell and Boyle, 2015, 2021; Srikanth et al., 2016; Windeler et al., 2015).

Over the past three decades, the innovation management literature has significantly expanded its theoretical and empirical insights into handling job-related (functional) diversity and the associated tension within innovation teams (Beverland et al., 2016; Edmondson and Nembhard, 2009; Lovelace et al., 2001; Pinto et al., 1993). While much research has focused on the bi-functional interface of technical and non-technical functions, such as R&D versus marketing, there are gaps in understanding how each function (marketing, engineering, operations/manufacturing, design, and project management) uniquely contributes to creating and resolving tensions within multi-functional interfaces with NPD teams (Park et al., 2009; Weiss et al., 2018).

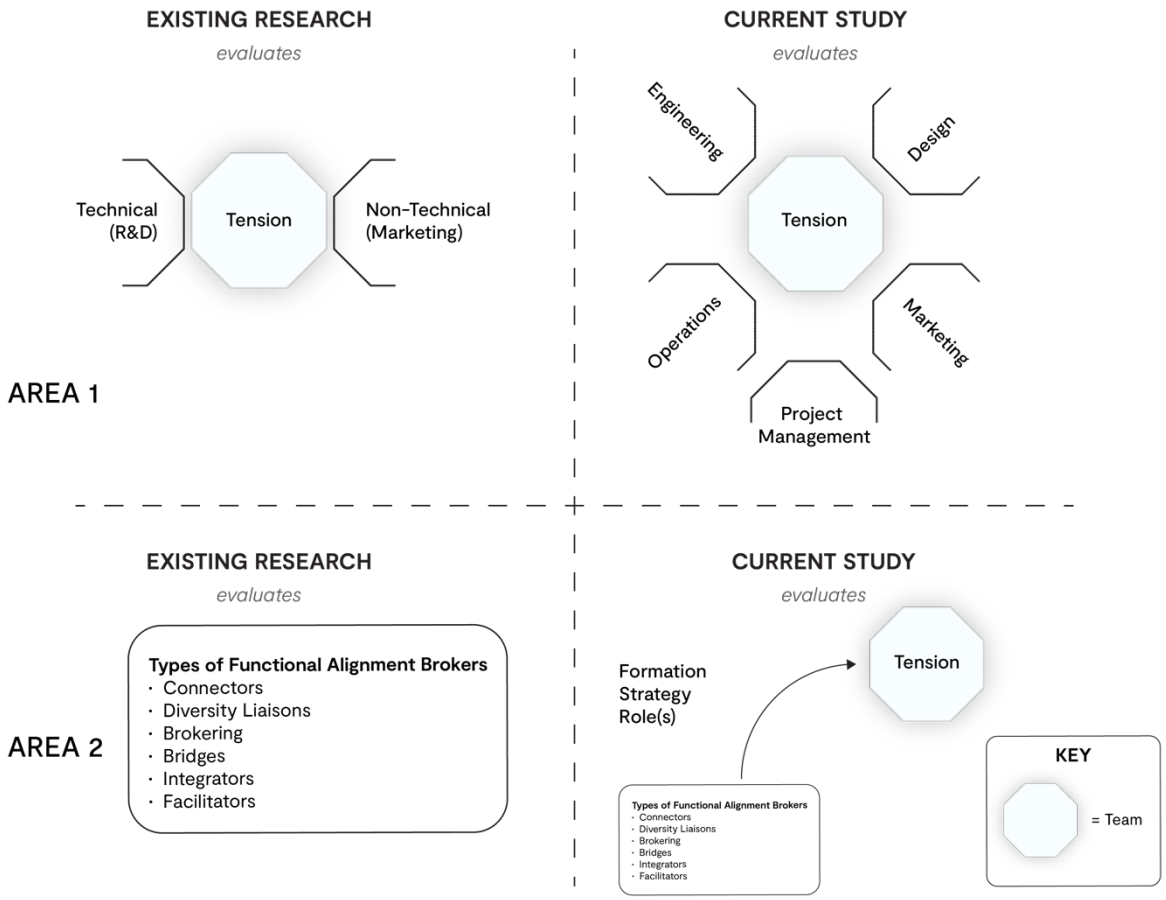
Despite extensive research on effective NPD team management strategies, there's a less-explored area involving the utilisation of individuals with high levels of intra-individual job-related diversity, encompassing diverse educational and functional characteristics in the same person (Akgun et al., 2006; Carlile, 2002; de Oliveira et al., 2015; Edmondson and Nembhard, 2009; Mathieu et al., 2000; Weiss et al., 2018). Referred to as "connectors" and "diversity liaisons," these individuals, known for "brokering," hold the potential to transcend functional

boundaries due to their diverse job-related qualities and credentials (Hargadon and Sutton, 1997; Mell et al., 2021).

This study introduces the term "functional alignment brokers" to encompass various similar terms found in the literature and underscores their vital role in teams. Building on the ongoing discourse in innovation management literature exploring the benefits of team diversity, the study delves into the sources of tension in NPD teams from the perspective of "functional identities." This refers to the inclination to define oneself in terms of overarching values, strategy, and norms associated with a functional area (Ashforth and Mael, 1989; Sethi et al., 2001). Going beyond the technical versus non-technical function divide, the research investigates the distinctive identification patterns of each function and their impact on tension creation and resolution in NPD teams. Subsequently, the study explores the formation, role potential, and strategies of team members in the position of a "functional alignment broker" to navigate functional siloes and manage cross-functional tension to drive innovation.

The study goes beyond the commonly employed analysis of “technical versus non-technical functions” duality and fosters a better functional diversity as well as implications for tension by examining each function’s self-identification in relation to (1) *other functions*, (2) *the NPD team* and (3) *the broader organisation*. Furthermore, the research brings attention to the function, significance, and placement of individuals who act as bridges, integrators, or facilitators within NPD teams (Hüttermann and Boerner, 2011; Park et al., 2009; Weiss et al., 2018). It explores how these individuals navigate diversity and tension to foster positive innovation outcomes. Figure 5.2 illustrates the gaps in the existing literature and highlights the distinctive contributions of this study in addressing those gaps.

Figure 5.2 Gaps in Literature Regarding Interface Tension and Functional Alignment Brokers



Recruitment and Participants

Participant recruitment employed the purposive sampling method, as outlined by Etikan and Bala (2017), involving the identification of participant attributes before selecting study sites, following the approach suggested by LeCompte and Schensul (2010). These attributes specifically included individuals with a minimum of one year of professional experience in new product development, involvement in cross-functional technology teams, and engagement during the early phases of physical product development. Potential participants were reached through email or LinkedIn, a professional networking site. The selection process involved reviewing participant LinkedIn profiles for relevant experiences, years of experience, and industry sector details (e.g., consumer electronics). For instance, functional alignment brokers were initially identified based on diverse experiences noted on their profiles. A total of 253 individuals were contacted based on the specified sampling criteria. To assess interest, a general message

introducing the researcher and providing study information was sent. Formal invitations, interview guides, and consent forms were then provided to those expressing interest (Refer to Appendix A6, A7, and A8).

The final sample (n = 33) included six designers, six engineers, five marketing professionals, six project management professionals, four operations specialists, and six non-function-specific team members (categorised as functional alignment brokers). These participants represented 13 consumer electronics companies in the region. Although participants had worked for at least two of the 13 companies, many had experience in three or more, reflecting the high labour mobility and similar processes within the consumer electronics sector, akin to other technology sectors (Casper, 2007). This extensive cross-over experience allowed for the identification of consistencies in functional perspectives across various technology clusters.

Highlighting the global nature of the sector, all participants had direct and/or indirect experience in at least one of the four Regional Innovation Clusters: Silicon Valley, London, NY, and the Greater Boston areas. Further details on participant characteristics are provided in Table 5.1 in the study.

Table 5.1 Participant Characteristics

Participant Function / Participant #	Experience Range (years)	University Degree	Professional Title	Cross-Functional Experience	Professional Experience	Gender
Design / INV-002; 016; 017; 022; 023; 033	2.5–20	83% Industrial / Innovation Design, 33% Human-Cantered Interface degree	100% "Designer" in job title (current or previous roles)	Mature, Multinational and Start-up	Broad experiential backgrounds	100% male
Engineer / INV-003; 018; 019; 027; 030; 031	1.5–25	100% Engineering degree (electrical or mechanical)	100% "Engineering" in job title (current or previous roles)	Mature, Multinational and Start-up	Similarities across technical backgrounds (aerospace, 3D, manuf.)	83% male, 17% female
Marketing / INV-009; 010; 015; 021; 002	4–12	80% Business / Marketing degree, 20% other	100% "Marketing" in job title (current or previous roles)	Mature, Multinational and Start-up	Interests connected to other fields (design, art, mechanical)	60% male, 40% female

Project Manager / INV-005; 007; 012; 014; 020; 026	5–21	50% Engineering degree, 50% various disciplines	100% "Manager" in job title	Mature, Multinational and Start-up	Majority had technical backgrounds	67% male, 33% female
Manufacturing / Operations / INV-004; 006; 011; 013	2–15	100% Engineering degree	75% "Manufacturing" in job title, 100% "Engineer" in job title	Mature, Multinational and Start-up	All had Mech. Eng. formal training or previous experience	100% male
Functional Alignment Brokers / INV-008; 024; 025; 028; 029; 032	2-16	83% Engineering degree (innovation, design, mechanical or civil)	100% non-function specific roles in titles (Developers, Founders, Explore Team, Interaction Designer, Insights)	Mature, Multinational and Start-up	Broad experiential backgrounds in technical, business, and creative capacities (different from training)	67% male, 33% female

The term "project management" is employed to encompass roles commonly referred to in the industry as "Program Managers," "Project Managers," and "Technical Project Managers" in this study.

The majority of interviews were carried out between May and November 2020, with a limited number of additional interviews conducted between December 2021 and January 2022 to further clarify certain themes. These interviews were conducted using the web conferencing platform Zoom, with each session lasting between 24 and 83 minutes, averaging around 45 minutes.

Interview Protocol

Interviewees were prompted to discuss their professional background, covering years of experience, formal education, product type experience, and team size, as a baseline for the conversation. The discussions then delved into their experiences within teams, focusing on challenges, barriers, perspectives, and values. The interview structure adhered to the outlined questions in the Interview Guide (A2), with approximately 60% of the questions relating to this study (Study 2) concerning team member interactions, tensions, and viewpoints, while the other 40% pertained to Study 1.

The interview guide was designed to initiate conversations with more open-ended questions to help participants feel at ease, gradually progressing towards discussing their individual stances more freely. The middle part of the interview focused on questions about team effectiveness, interactions, and criteria for success from a team standpoint. Given the sensitive nature of questions about team members and their professions, the interview questions were crafted to encourage participants to share their feelings about other functions without directly asking about specific functions. This was achieved by inquiring about participants' interests and aspirations, followed by matching those interests to other functions and discussing challenges with those interactions, utilising probing techniques (Kelly et al., 2010). The questions aimed to extract information at individual, team, and organisational levels throughout the conversations. Further details on the interview guide and its rationale, linked to the literature, can be found in the appendix (A2). Each interview allowed the interviewer flexibility for distinct follow-up questions not included in the guide, enabling the exploration of unexpected data and ensuring consistency in questioning for each participant (Jacob and Furgerson, 2012: 4).

Data Coding and Analysis

After recording the interviews, an automated transcription software was utilised, and the resulting transcripts were meticulously reviewed by a researcher for accuracy. To ensure confidentiality and adhere to transparency requirements, participant and company names were subsequently redacted from the transcripts. Anonymity was maintained by assigning a unique code (e.g., INV-###) to each participant in the reporting of findings.

Following the transcription of the digitally recorded interviews, the data within the transcripts underwent coding, as outlined by Adu (2019), and an initial free-form first-order analysis was conducted to identify categories or themes. Subsequently, a second-order theme analysis, in line with the approach by Gioia et al. (2013), was employed to introduce structure and facilitate the construction of concepts. A total of 36 second-order themes emerged from the interviews, which were further aggregated into an equal number of dimensions. These dimensions were then analysed, examining concepts referenced in the literature and linking them back to the research question. The coding frameworks are summarised throughout the results section. For a detailed breakdown of the coding structure by theme, refer to Appendix A4, and for an example of a coded interview transcript, consult Appendix A5.

5.5. Results

During the interviews, participants were asked to share their thoughts and feelings regarding their own job functions and their experiences collaborating with team members from different functions. Interestingly, individuals from the same function, irrespective of their organisation, tended to express similar perspectives on tasks, performance standards, and influences within the NPD team, indicating a general alignment within each function. Participants' narratives suggested that tensions within teams primarily stem from allegiances to functional identities. Further exploration uncovered distinct identification patterns of functions toward the NPD team and the organisation, reinforcing the tendencies of team tension. Lastly, participants underscored the significance of roles resembling those of functional alignment brokers in effectively managing tension within NPD teams.

5.5.1. Strength of Functional Identity as a Source of Tension in NPD Teams

Those within the same functional group consistently expressed unique perspectives in three key areas in the discussions with NPD team members from various functions: (1) goal orientation, (2) performance orientation, and (3) performance influencers.[2] The coded transcripts yielded 15 themes that associated a function with these three components of functional perspectives. Together, these functional perspectives in the mentioned areas collectively outline what can be termed as functional identity. As distinct functional identities took shape within NPD teams, the divides between functional groups intensified, leading to heightened tension. The subsequent section elaborates on the correlation between functional identities and team tension.

Differing goal orientations across functions

In this study, every function examined exhibited a distinct objective, indicative of the prevailing training, education, and/or professional culture inherent to each function. For instance, among the first group, designers, 70% explicitly identified themselves as visually and/or artistically inclined individuals, perceiving their functional objectives as *user-oriented* "…a lot

[2] These three areas are aligned with the three assumptions that define functional perspective, as outlined in Wittenbaum et al. (2004, 19): "(1) groups are goal oriented; (2) group performance varies in quality and quantity and can be evaluated; and (3) internal and external factors influence group performance via the interaction process."

of design work is visual, something that lives, something that other people interact with…" (Design / INV-022). The same percentage of engineers, on the other hand, referred to their functional goal as being the *problem solvers* of the team: "…engineers naturally like solving problems that people think were impossible…" (Engineer / INV-003). Other technically oriented disciplines, much like the engineers, associated with operations/manufacturing understood their functional goal as being *responsible* for ensuring the smooth running of the process: "I take pride in my work … knowing that you had some level of contribution into a product that people use" (Operations / INV-011). In contrast to designers, engineers, and other technical roles, all operations participants characterised themselves in a similar manner. For marketing and business-oriented participants, their functional goal stemmed from their roles as *authoritative* figures within the organisation. They perceived themselves as pivotal drivers of revenue and brand awareness. "Marketing is the master creative role within the business and department…" (Marketing / INV-009). As such, their functional goal aligned most closely with the broader organisational goals. Finally, a significant majority of individuals linked to the project management domain perceived their functional goal as serving as a "channel" for communication, both technical and non-technical, among team members. Additionally, they saw themselves as the overseer of the innovation process, as highlighted by Project Manager / INV-026: "I can understand exactly what is being asked for. And then I'm able to address that with each different team in a slightly different way."

Despite operating in functionally diverse NPD teams, most of the participants remained strongly "function-oriented" with their goals.

Differing performance evaluation standards across functions

Members of different functions presented little visible overlap in the discussions of what constitutes "success," "achievement" or "criteria for how well the group performed." As an example, 90% of technical roles, encompassing engineering and manufacturing/operations, prioritising accuracy, precision, or project deliverables, associated success and accomplishment directly with functionality: "If it works and it functions, that to me is great success" (Engineer / INV-027). By specifically noting the *production capabilities* of the functionality as "…being able to successfully manufacture and put together your parts and be able to ship them to customers and not have a drastic fallout rate or big scrap rate…", the participants from

operations took things one step further (Operations / INV-006). Less-technical functions, like marketing, had a unanimous 100% agreement that success was closely connected to broader business objectives, including market acceptance, the bottom line, or public recognition: "It's about business value in the end. Company cannot be sustainable if there's no money coming in through it" (Marketing / INV-009). Designers (83%), meanwhile, utilised a more *altruist* definition of success; they considered the benefits provided to the end-users: "the success of the product is like how well it really helps people in their life" (Design / INV-016). Project managers (83%) fell in between groups in terms of their evaluation standard of performance, with a notable desire for *fulfilment* in multiple areas. As described by Project Manager / INV-005, success is "... to meet all regulatory requirements and all of our internal expectations and satisfy our customer." While there was a degree of agreement among members from various functions regarding the definition of success, there were subtle indications of indifference towards other functions and their criteria for good performance. As highlighted by Operations / INV-004 in the context of a more technically oriented setting: "The engineers are really making the decision on what needs to be done, how it's going to [work]… the form fit function of it, and it's not so driven by the guesswork of marketing." Such attitudes towards the perspectives of other functions created a divergence between functions, potentially acting as a catalyst for tension within the team.

Differences in performance influencers across functions

The majority of NPD team members from various functions consistently emphasised that interactions with other functions played a crucial role in influencing performance. While the data also revealed positive aspects of such interactions, a significant portion of inter-functional engagements indicated the presence of conflict and tension. Specifically, functions tended to polarize into "technical" categories (e.g., engineering and manufacturing/operations) and "non-technical" functions (e.g., marketing/business and design), with participants acknowledging this distinction without considering the subtleties within each function, as self-described by the participants (e.g., Engineer / INV-030 and Engineer / INV-019). Nevertheless, perceived negative influences on other groups were noted. Design / INV-001 participant observed: "…engineers will want to do something that deviates from what we as designers think is best. It may be from a- what an engineer thinks is best from a mechanical standpoint, or that their idea is best for the end user, so that can typically have an effect on the end product."

Disagreements often revolved around "deadlines" (Design / INV-016) and specific functional capabilities, such as "draft angles on injection moulding" (Design / INV-017). Designers acknowledged the importance of constraints presented by engineers but felt that these constraints prematurely limited design options or hindered them from providing user benefits during the early stages of the project. In a parallel manner, engineers frequently expressed concerns about receiving designs that "encroach on functionality" (Engineer / INV-019), where "physics doesn't stop people from asking for things" (Engineer / INV-003). Hence, their impediment to successful performance stemmed from other groups disregarding functionality. Participants from the operations function echoed a similar sentiment: “I really like aesthetics, but sometimes they'll design something, you look at it and say, ‘Oh, this is just not really going to work.’ It's beautiful but needs five more things around here” (Operations / INV-013). Regarding Operations, the primary source of stress was a disregard for production considerations. In the case of the marketing group, the stress arising from interactions primarily stemmed from engineering, according to assertions made by several participants: “…it stops at engineering” (Marketing / INV-021), where encounters with rigid team members resulted in pauses in either project pursuits or decisions.

Eventually, the role of the project manager entailed a balance between individuals considered part of technical and non-technical functions, moderating or guiding diverse perspectives toward the desired outcome. Project Manager / INV-014 expressed this role by stating: "... you're oftentimes … the babysitter, and you're the bad cop or like the parents, and you're like, ‘This isn't realistic’.” For instance, engineers may desire a “technically designed, amazing product” (Project Manager / INV-026); the design may “challenge us to think, create more creatively” (Project Manager / INV-005). According to the statements of Project Manager / INV-007, marketing may have intermittent involvement: “... [they] show up one week and then you don't see them until four weeks later.” Therefore, the challenge for project management lies in balancing the inconsistent approaches of team members toward the finish line.

A summary of the nature and direction of the forces within NPD teams by function is shown in Table 5.2.

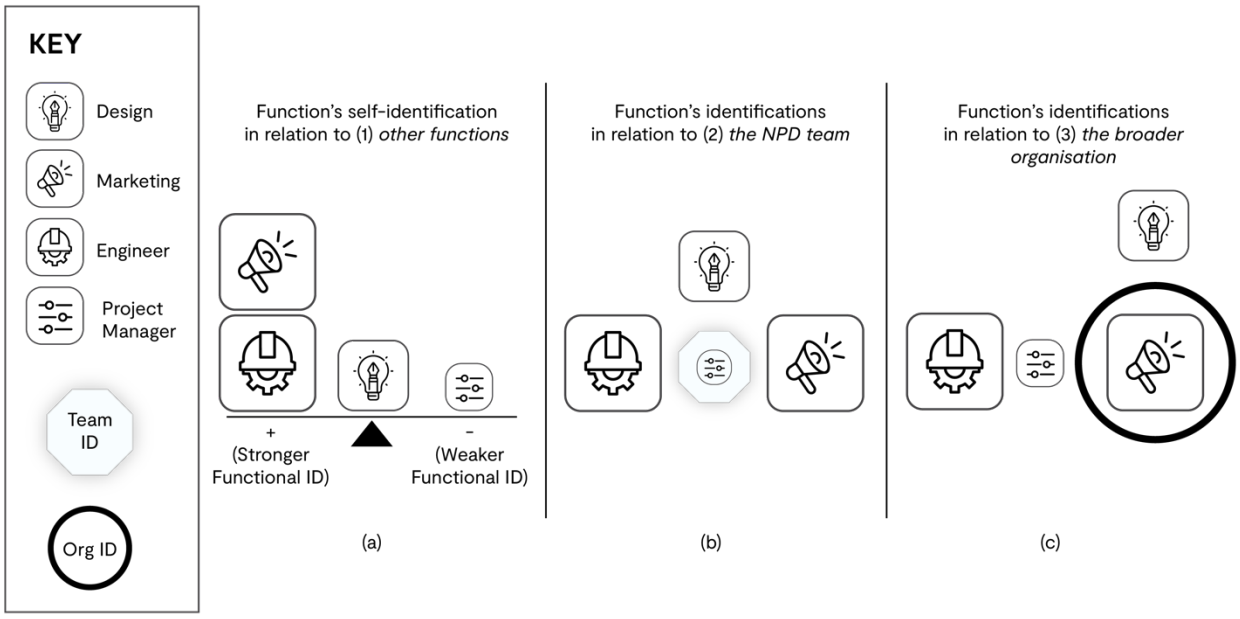
Table 5.2 Functional Perspectives

	Function	Goal Orientation	Performance Evaluation Standards	Performance Influencers
		Functional Perspective (Wittenbaum et al, 2004) reflects a group's goals / point of view		
Functional Identity is derived by perceived / interpreted membership to a group	Design	User Oriented	Altruistic	Engineers deviate from designs / user benefits
	Engineer	Problem Solvers	Functionality	Marketing / Design disregard functionality
	Operations	Responsible	Production Capability	Marketing / Design lack production consideration
	Marketing	Authoritative	Business Objectives	Engineers stop designs
	Project Manager	Overseer	Fulfilment	Balancing inconsistent team member approaches

5.5.2. Different Patterns of Identification as a Source of Tension

Apart from the evident strong functional identities detailed in earlier sections, the data exposed functions with distinct identification patterns concerning the NPD team and the organisation. While certain functions strongly identified with their NPD teams or the broader organisation, others exhibited limited identification beyond their immediate function (refer to Figure 5.3). These variations in identification were identified as contributing factors to heightened tension within the team. Moreover, the dimensions derived from the coded interviews (outlined below) each reflected the predominant perspective within the respective function.

Figure 5.3 Functional Identification



Participants within the design function demonstrated the most balanced alignment among their functional identity, team identity, and organisational identity. They perceived themselves as integral to the NPD team, emphasising the importance of collaborative engagement across disciplines within the organisation, as articulated by Design / INV-023: “it's very important to have that understanding of engineering…and really important to be able to break the ice...” (See Figure 5.3a). The group expressed a desire to connect and comprehend the motivations and commonalities of each team member, aiming to operate beyond their specific function for the greater benefit of the team (see Figure 5.3b). They also easily related to the broader vision of the organisation, as expressed by Design / INV-001: “…the designers have been a lot more big[ger] picture…” - thus displaying awareness and consideration for a grand scheme, with adequate knowledge regarding the overall organisation of processes beyond their particular function and the NPD team (see Figure 5.3c).

In contrast, engineers consistently exhibited a stronger attachment to the engineering functional identity and lower levels of identification with the NPD team or the broader organisation. They emphasised the strength of their functional identity with unprompted comments such as “…being an engineer is not just a job to me. It's like a part of who I am…” (Engineer / INV-027) (Figure 5.3a). Similarly, the group also noted a sense of exclusivity that characterised the function: “…not everybody can do it. I don't think everybody has that mentality” (Engineer / INV-030). The strength of the functional identity conflicted with a weak alignment to the team identity and goals (see Figure 5.3b). Negative sentiments against other functions were prevalent in most discussions with engineering participants. For instance, concerning the marketing functional group, often categorised as “impractical”: “God dang marketing, is just full of smoke…” (Engineer / INV-019). The group also frequently dismissed design members for being ‘unrealistic’. According to Engineer / INV-030: “There's jokes in engineering like, ‘Oh yeah, we'll make that out of unobtanium.’ And people will be like, ‘Oh, what's that?’ ‘Yeah, it's unobtanium, you can't get it.’” On the other hand, engineers routinely regarded other categories of engineers or those considered technical professions (e.g., operations groups and project managers) with “higher regard” due to their roles in bringing the product to its desired completion. Participants from the engineering function either did not mention or dismissed their connection to the broader organisational identity or goals, as noted by Engineer /

INV-031, “People like to understand or have an understanding of kind of where they sit within an organisation” (see Figure 5.3c).

Similar to the engineering functional group, participants from Operations displayed a relatively strong functional identity and lower attachment to the team or the broader organisation. As noted by Operations / INV-004: “I view the product as an extension of me, of who I am…” Very often, the group dismissed other functions of the team and the NPD team itself as a whole: “…the industrial design[ers] come up with the makeup of what the product is going to look like” (Operations / INV-011) and “…from the marketing sales side, it's not so much I know a lot, it's I'm kind of powerful from a social standpoint” (Operations / INV-004). The group often acknowledged an “arrogance” within the engineering profession, potentially due to the possibility of the group’s fear that others will perceive them as not being knowledgeable. “As an engineer, you want to be right. That's inherently the nature…” (Operations / INV-006).

Participants from the marketing function were notably more connected with the organisational identity and goals compared to the design, operations, and engineering functions, as asserted by Marketing / INV-010, “I’m always looking at the bigger picture” (see Figure 5.3c). This group perceived their function as central to the organisation but felt less connected to the NPD teams in which they worked. When asked about their interactions with other functions, they seldom provided comments regarding their NPD team members, indicating lower levels of identification with the team (see Figure 5.3b). The main comments about other functions in the NPD team pertained to engineers, who were perceived as ‘rigid’ team members by the marketing functional group: “…my experience with engineers and, again, this is a marketing perspective possibly…. there's this kind of black and white. It's like, okay, there's an answer, there's not an answer” (Marketing / INV-010). Overall, in the case of marketers, functional identity and organisational identity were often well aligned (see Figure 5.3a/c). However, a disconnect with the team identity was observed.

Finally, Project Managers were found to be the most team-centric function with the closest identification to the NPD teams (see Figure 5.3b). They indeed identified more closely with the NPD teams rather than their function. They consistently mentioned the need to remain flexible in communication styles while dealing with various functions, as noted by Project Manager / INV-007: “You have to be able to relate to people. You have to be able to understand what motivates them and sometimes motivate them, and all of that depends on that

communication." Furthermore, unlike most other functions, project managers seemed to be aware of the distinctly varied tendencies of other functions within the team. They further depicted their role as Project Manager / INV-005 did: "…we are the technical conduit to the business." In the case of the Project Managers, their functional identity was related to the notion of the team being greater than the function (see Figure 5.3a). As the team was formed in part to carry out the organisational goal(s), the Project Manager represented the link between the two areas in their role (see Figure 5.3c).

Overall, each function aligned differently with the team, the organisation, and their own functions. These different identification patterns gave rise to a team environment wherein individuals from varying functions held different views and positions on important team objectives and goals that are implicitly assumed to be well understood and agreed upon. Each functional group felt that they dealt with added strife from team members and perceived some interactions as stressors, which, in turn, distracted the group from its goals and success criteria.

5.5.3. Cutting Through Tension: Functional Alignment Brokers in NPD Teams

When questioned about the strategies for mitigating and preventing team conflicts, participants consistently highlighted the importance of individuals embodying the characteristics now termed as "functional alignment brokers" within the team. Across various functions, participants emphasised the necessity for team members capable of facilitating strategic alignment (Design / INV-017, Engineer / INV-019, Marketing / INV-010, Operations / INV-006, Project Manager / INV-007), demonstrating functional empathy (Design / INV-001, Engineer / INV-019, Marketing / INV-009, Project Manager / INV-012), and displaying an appreciation or interest in learning beyond their specific roles (Operations / INV-004, Marketing / INV-009, Design / INV-022).

Much like project managers, functional alignment brokers were acknowledged as *connectors* (Autrey et al., 2019) within the team, acting as bridges between different worlds, as expressed by Functional Alignment Broker / INV-024. They orchestrated collaborative efforts by bringing together individuals from diverse functions: "What I try to do is make sure that I understand their challenges and limitations and try to work around or through those to achieve our end goal" (Functional Alignment Broker / INV-029). However, unlike project managers, functional alignment brokers possessed significantly higher intra-person functional diversity,

having previously experienced at least three different functional roles. This prior experience afforded them greater flexibility in communication when working across functions. According to Functional Alignment Broker / INV-032, "...I've been a nice bridge between idea [design] and product management because … that tension that is there and just helping them understand where each other's coming from. Sometimes they're just not speaking the same language."

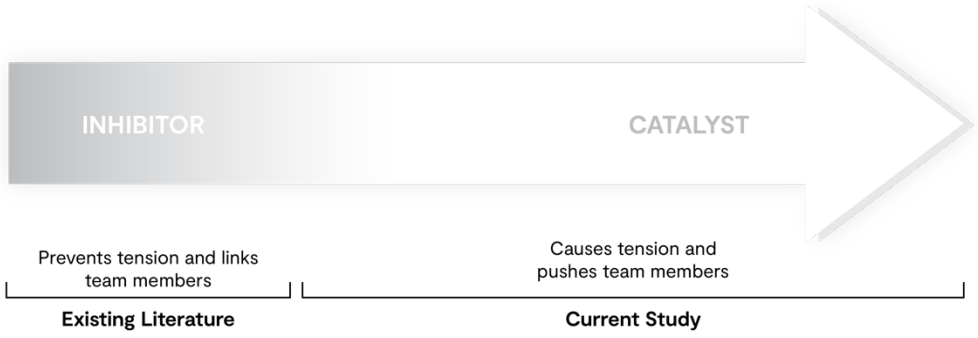
In contrast to project managers, whose primary focus is on connecting, functional alignment brokers saw themselves as essential conduits of innovation, acting as change agents or *challengers* with the ability to push functional units beyond the status quo: "You're trying to get onto a train that's already going and make it change direction without anyone noticing" (Functional Alignment Broker / INV-024). These roles intentionally complemented or enhanced the functional roles of core team members, remaining mindful of the multiple needs of the team: "...when I'm surrounded by designers, I try and hone into the technical side of things as well. So, it's making sure things are made right with thought…" (Functional Alignment Broker / INV-008). While functional alignment brokers might initially align with a function-oriented group (e.g., engineering, design, marketing, etc.), they described themselves as *continuous learners* across various areas, where their ingrained functional identities might lessen with each exploration into different functional domains. In many instances, these individuals assumed the role of expanding team knowledge beyond functional silos: "I also like playing devil's advocate and coming up with things that could potentially go wrong with certain ideas" (Functional Alignment Broker / INV-028). They perceived their role as expediting development time and enhancing team innovativeness by supporting team members in overcoming encountered roadblocks. For example, Functional Alignment Broker / INV-025 noted his role in certain instances: "working with designers who have got a brief and they are having trouble getting beyond a certain mindset or a structure."

Participants embodying the role of functional alignment brokers underscored the strategic dimension within their responsibilities, demonstrating the capacity to grasp both overarching and intricate concepts: "I moved from engineering into this whole realm of future forecasting and creating visions" (Functional Alignment Broker / INV-008). These individuals strategically leverage their educational backgrounds and multifaceted experiences to elevate innovation within NPD teams: "I can utilise my engineering background to at least understand the technical concepts but be more focused on some of the creative work" (Functional Alignment Broker /

INV-028). Typically constituting a minority in the team, they maintain a balanced proximity with various functions instead of strongly aligning with any one in particular. They possess a nuanced understanding of each function's strengths and weaknesses in approaching NPD: "…industrial design team is more about [having] an open mind" (Functional Alignment Broker / INV-028); "engineers are like '…this is my field. I've defined my field. This is my field. Don't tell me what to do in my field'…" (Functional Alignment Broker / INV-024); "…marketing are the people that understand the users, understand the marketplace, and therefore can give insight as to why we need to do" (Functional Alignment Broker / INV-025); and the project managers - "they're like the assistant to the business…" (Functional Alignment Broker / INV-029).

It remains uncertain whether the role of the functional alignment broker is gaining prominence within organisations and whether all NPD team members are expected to transition towards a functional alignment broker identity over their career trajectories. Nevertheless, this identity may be perceived as the positive end of the functional spectrum, ranging from an inhibitor (preventing tension and connecting team members) to a catalyst (causing tension and propelling team members). The catalyst end of the spectrum aligns with a role that strategically employs person-oriented traits to prompt team members toward achieving effective outcomes within teams and organisations. This role serves as a vital link between team members with diverse functional identities, potentially alleviating process and relationship tension within the team. Thus, the study reveals a broader spectrum of individuals with these characteristics than previously acknowledged in the literature. Moreover, it contributes to a deeper understanding of the essential traits for these roles, providing insights into tendencies that can positively impact innovation outcomes (see Figure 5.4).

Figure 5.4 Spectrum of Functional Alignment Broker Roles



5.6. Discussion

The study adopted an identity perspective to scrutinise the important role played by functional alignment brokers in facilitating collaboration and innovation outcomes within NPD teams. In accordance with the findings of Randel and Jaussi (2003), who observed that individual performance can be enhanced through the strength of social identities, this investigation delved into maintaining the strengths of functional identities within a team while ensuring robust collaboration. This presents an alternative approach to the NPD collaboration literature, which has traditionally focused on moderating the strength of functional identities through mechanisms such as shared languages (Carlile, 2002), shared cognitive frames (Mathieu et al., 2000), shared understanding (Bechky, 2003), and common knowledge networks (Akgun et al., 2006) to minimise social categorisation processes (Srikanth et al., 2016).

Instead, this study advocates for the deployment of ***functional alignment brokers*** possessing high levels of intra-person functional diversity to yield positive outcomes from functional tension, thereby achieving an overall ***functional balance alignment*** within the team. Such balance alignment is crucial to prevent the dominance of ingrained functional identities and allegiances that may impede collaboration and alignment with broader goals. The study findings underscore that functional identities are distinct and strong, and in many cases, toning them down to reduce tension may not be feasible. However, the employment of individuals with weakened functional identities, such as *functional alignment brokers*, holds promise for mitigating negative tension. Furthermore, allowing positive tension to emerge and managing it to generate creative outcomes in NPD teams can be a more potent innovation strategy.

The study underscores the significance of aligning micro and meso levels (overall individual connection to the team identity, referred to as ***team commitment alignment***) with the macro level (overall team connection to the organisational identity, termed ***organisational purpose alignment***) in the context of NPD teams. While prior research has explored the impact of organisational and team identity on project outcomes (Mesmer-Magnus et al., 2018), delving into cross-level interactions among these three identities provides a deeper understanding of their impact on innovation potential.

The findings reveal that functional alignment brokers play a positive role in NPD team environments by navigating diverse sub-group identification patterns to foster alignment with team goals and organisational direction. In areas with heightened relationship or process conflict,

the involvement of functional alignment brokers aids in understanding different perspectives linked to broader team or organisational identities. Their ability to comprehend functional approaches while maintaining a grasp of the bigger picture facilitates effective communication of needs within the broader team or organisational context without undermining existing identification patterns. Across all functions, there is a clear need for bridging roles with a strategic, empathetic, and continuous learning nature to mitigate unproductive team tension. This aligns with the catalyst end of the functional alignment broker spectrum (Figure 5.4), reflecting the tendencies observed in the functional alignment brokers interviewed during the study.

The study's insights on the pivotal role of individuals with diverse knowledge bases in NPD teams for facilitating collaboration align with the findings of other researchers (Park et al., 2009; Weiss et al., 2018). However, it expands on these studies by illustrating how functional alignment brokers actively link sub-groups, teams, and organisations. The strategic change agent role of active functional alignment brokers, who can relate to and understand different functions through neutral alignment, is crucial for tension resolution and collaboration. This active role contrasts with the more passive role attributed to connecting types in existing literature, where they primarily facilitate teamwork processes, coordinate positions, or manage relationships (Weiss et al., 2018; Lakshman, 2013; Mathieu et al., 2015). The research underscores the potential of engaging team members with higher-level intra-person functional diversity in more active roles to realign different functional identification patterns.

5.7. Theoretical Implications

The significance of these findings lies in illustrating that the strength of functional identities within NPD teams serves as a precursor to tension. Additionally, the varying alignments of functional identities with team and organisational identities may be linked to the level of tension. Therefore, a thorough investigation of tension and conflict within NPD teams necessitates a deep understanding of each functional identity, maintaining a multi-layered and comprehensive perspective that considers team and organisational identities and their interactions with functional identities. Beyond using identity theory for comprehending NPD team collaborations (Baunsgaard and Clegg, 2013), the study underscores the pivotal role of *functional alignment brokers* as the cornerstone for productive collaborations in NPD teams. While previous research highlighted roles with a dual understanding of marketing and engineering knowledge (Park et al., 2009; Weiss et al., 2018), the current study suggests that

functional alignment brokers' backgrounds can extend beyond the bifunctional interface, considering multi-functional interfaces in the context of strategic innovation management and leadership (Chen et al., 2018).

The study's emphasis on functional identities underscores the importance of closely observing tendencies inherent in each function before composing NPD teams. In contrast to the existing literature on product innovation, which mainly views tension emerging during team existence and interface as a complex system of distinct types (Fagerlin and Wang, 2021) or a single type, this study argues that relatively more ingrained tendencies for tension may exist at the functional level. These tendencies are often cultivated through early educational training and professional cultures. Techniques like job rotation, involving the shifting of team members to different departments (Bobbitt et al., 1978), known to increase knowledge generation in new product development (Song et al., 2006), may be integral to developing functional alignment brokers to enhance collaboration within the team.

Furthermore, the findings underscore the need to consider various functional alignment brokering roles to bridge gaps in functional perspectives between the team or organisational view and strong functional sub-group views. The composition of existing teams, including the number of designers, engineers, operations representatives, project managers, and marketing professionals, may vary and influence the balance of strengths among identities within each NPD team. Consequently, based on different team compositions, additional variants of the functional alignment broker role may be identified in subsequent studies. These influential roles offer a short-term remedy for tension within teams, focusing on managing team composition and early identification of individual attributes and broad experiential backgrounds. A relatively long-term solution involves exploring gaps in educational agendas, incorporating more "soft skills" in engineering or technical fields (Cañavate et al., 2015; Kaushal, 2018), and providing exposure to diverse disciplines. Re-evaluating traditional training can help build broader competencies related to transdisciplinary, enabling future team members to "move beyond individual disciplines" (O'Rourke et al., 2019: 38) while maintaining expertise.

5.8. Managerial Implications

From a management perspective, this research carries several implications. Firstly, in the assessment of team composition and the capacity of NPD teams to achieve innovation outcomes,

organisational leaders can benefit by considering cross-functional tensions. The study highlights the importance of incorporating additional bridging/facilitating roles (Park et al., 2009; Weiss et al., 2018) and establishes preliminary criteria for individuals in these roles. According to the research, such individuals should have experience handling at least three functional roles, possess communication flexibility to relate across functions, exhibit a desire and ability to push the team, and display a deep curiosity about other roles on the team to aid learning objectives. Secondly, this research advises managers to evaluate the existence of a distinct NPD team identity (Sethi et al., 2001) and its alignment with the benefits of organisational identity (Dutton et al., 1994). This approach suggests designing teams and NPD assignments more intentionally, considering the functional identity relationship alignment from a holistic perspective with an awareness of and promotion of the bigger picture. By focusing on identifying and addressing functional bottlenecks and directional gaps, managers can reduce the time spent on alleviating tension and enhance the potential for realising full consideration of each function, which is ultimately the true benefit of NPD teams (Edmondson and Nembhard, 2009).

5.9. Limitations and Future Research

The robustness of the data presented in this study is underscored by its thorough coverage across diverse dimensions, encompassing NPD teams, organisations, regions, and functions, thereby facilitating broader conclusions. Nevertheless, it is imperative to acknowledge potential limitations arising from the relatively small number of participants within each functional role, which may raise concerns regarding the significance of the insights garnered. However, the high degree of similarity in functional perspectives concerning goal orientation, performance orientation, and performance influencers mitigates the relevance of the smaller functional sample. Moreover, the quantity of interviews conducted adheres to established practices that are contingent upon the study's design and nature, meeting the prerequisites for comprehending and eliciting additional insights (Baker & Edwards, 2010).

Another constraint of the study pertains to participant access, particularly in eliciting contributions from individuals within a single organisation who were willing to engage in open discussions regarding information-sensitive topics related to innovation or NPD. The diminished response rate for participant recruitment impacted the sampling strategy, necessitating the adoption of a non-probability or purposive sampling method due to the impracticality of

employing probability sampling. This approach entailed the selection of participants based on specific characteristics identified by the researcher, derived from the synthesis of the literature review and research question. The lower response rate also posed challenges in recruiting a substantial number of participants from the same organisation, prompting the inclusion of regional innovation clusters and leveraging similarities observed in well-established technology hubs. While this may have introduced variability into the study methodology, the extensive cross-over experience stemming from the high labour mobility and analogous processes within the consumer electronics sector facilitated the identification of consistencies in functional perspectives across diverse technology clusters.

While the study indicates potential avenues for future research, such as longitudinally exploring NPD teams within a singular organisation, it recognises the necessity for a conceptual framework to evaluate the integration of functional alignment brokers at different developmental stages or interactions. This prospective study could delineate varied functional alignment broker roles within assorted team compositions, documenting their longitudinal benefits.

Furthermore, a potential research focus could delve into the ramifications of physical proximity among team members in NPD teams, probing whether sustained virtual and remote work introduces significant variables to the current construct. Such findings may prove instrumental in identifying functional alignment brokers possessing requisite skills conducive to hybrid or virtual team environments.

5.10. Chapter Conclusion

This study aided in addressing RSQ4, which pertains to the factors influencing alignment among team members in NPD teams by operationalising the Research Sub-Question (RSQ) 4. Following the literature review (Chapter 2), which established the foundation with insights into functional identities, explored incompatibilities in NPD teams, and examined alternative strategies to mitigate tension, Study 2 identified factors from a team-level perspective that could impact outcomes. These factors encompassed functional balance alignment, team commitment alignment, and organisational purpose alignment. Consequently, they highlighted the opportunity to move beyond tension within bifunctional interfaces and assess tension from a multi-functional interface perspective, thereby enhancing the understanding of ingrained identity allegiances influencing interactions and relationships across the organisation. Subsequently, by discerning

the nuances between each function traditionally present in NPD teams, the study identified the role of the functional alignment broker as a pivotal factor in overall alignment, to be further explored in Chapter 6.

The study specifically positioned itself within the identity perspective, tension, and NPD theory literature. The main theoretical contribution utilised an identity perspective to argue that within an NPD team, allegiances to functional identities and the diverse relationships between the team and organisation are critical precursors to tensions and hostilities. Additionally, it introduced an alternative approach for NPD theory, focusing on maintaining the strength of functional boundaries without diluting the team members' expertise through strategic positioning of specific roles, such as functional alignment brokers.

To conclude, NPD team communication and collaboration remain essential areas of study as the significance, value, and potential impact of these teams continue to evolve across diverse contexts and regions, driven by the growing demands and expectations of consumers. However, a deeper understanding and evaluation are necessary to comprehend the entire organisational system. Therefore, Chapter 6 shifts focus to the individual level to capture the baseline perspective on overall effectiveness and further examine factors linked to trans-level (or whole system) alignment, as identified in Chapters 4 and 5. In other words, the upcoming prescriptive study considers insights from the preceding chapters, as presented in the next chapter.

Chapter 6: Examining the Factors of Trans-level Alignment in NPD Teams for Person-Environment Fit

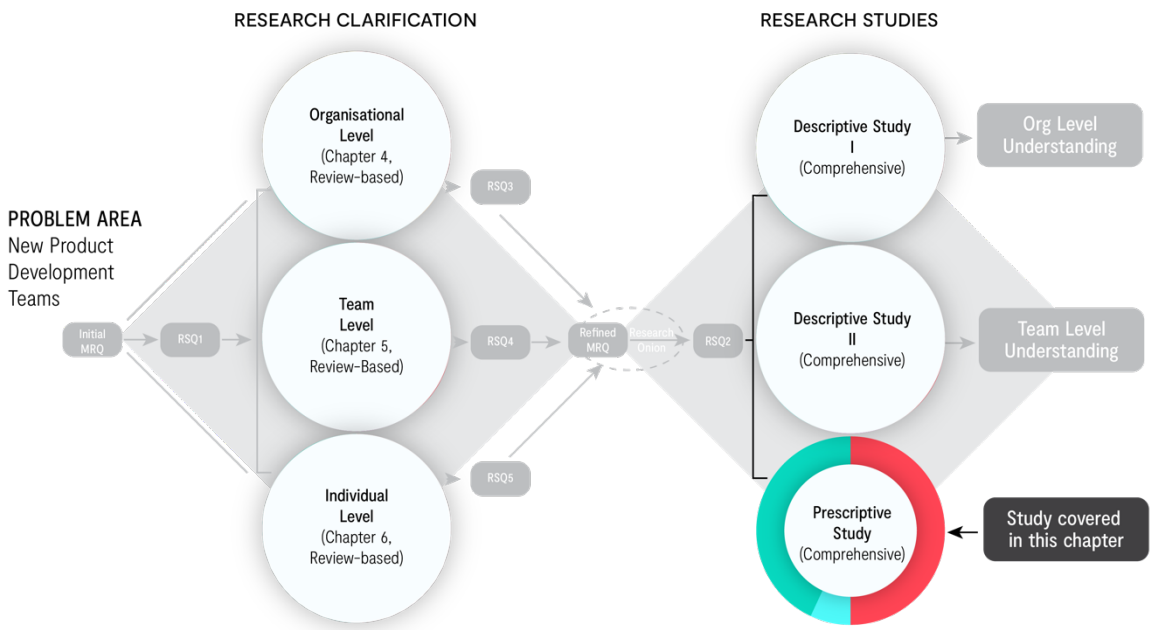
RSQ5: Under what scenario is trans-level alignment achieved to influence NPD team outcomes?

6.1. Chapter Introduction

The final study, the prescriptive study, represents the concluding segment of the three-part research (Figure 6.1). It leverages the factors unearthed in the preceding studies to explore their impact on overall alignment, with the goal of achieving an enhanced person-environment fit and compatibility. The prescriptive study serves to collect data and insights for empirical contributions. While it builds upon existing literature addressing person-environment fit and knowledge integration, there is a pressing need for further investigation into compatibility and perceptions of misalignment across the organisation at individual, team, and organisational levels. This need became apparent after the literature review mapping exercise (Chapter 2), prompting questions about examining the identified factors that influence outcomes in hybrid NPD teams from an individual perspective and comprehending perceived misalignments.

The study is strategically positioned to foster understanding and examination at the individual level, intending to integrate insights from this level into a comprehensive approach for assessing the current effectiveness of NPD teams. Data collection, analysis, and review will centre on NPD team members involved in producing physical products for consumers within notable regional innovation clusters.

Figure 6.1 Research Structure Highlighting Study 3



In this chapter, the intricacies of the study are explained, covering its design, development, and contextual background. Then, the study's findings are presented in a clear manner, followed by a critical discussion that contextualises them within the existing literature, interprets the data, and acknowledges any limitations inherent in the study. As the chapter is wrapped up, key findings will be distilled and provide insights into what the next chapter will entail.

6.2. Study Design

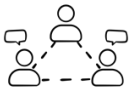
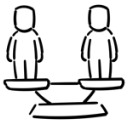
To investigate the factors identified in previous chapters (4 and 5), the study involved members of NPD teams in high-technology regions worldwide, specifically regional innovation clusters. The commonalities within each technological region allowed for a broader exploration with the potential for increased comprehensiveness. Employing a mixed methods approach, combining both quantitative and qualitative methods along with data visualisation (Onwuegbuzie and Dickinson, 2008), facilitated a more in-depth analysis of the data and enhanced the understanding of the results obtained in the preceding studies. Initial observations indicate significant misalignment at various organisational levels within the surveyed organisations, making this sample a suitable population for exploring the identified factors.

In this domain, previous works primarily engaged in extensive ethnographic studies and longitudinal interviews for data collection. However, due to time constraints associated with the PhD programme and restricted participant access during a global pandemic, surveys were deemed a suitable tool, offering swift access to participants meeting the same criteria as those in the previous two studies, and allowing for a larger sample size. Although alternative forms of interviewing were briefly considered (e.g., participant interactions with objects to elicit a different type of spontaneous feedback), these methods were ruled out due to time limitations and their alignment with the study objectives.

The study comprises two main components: (1) insights and knowledge gleaned from the literature review in Chapter 2, addressing RSQ5 objectives 1-3, and (2) the analysis of factors related to the individual perspective and exploring perceived misalignments to address RSQ5 objectives 4-5. To elaborate further, the first component of the study uses the identified factors to examine overall alignment across organisational levels, forming components of a "trans-level alignment" framework that will be tested during the study. These identified factors are summarily listed in Table 6.1. The second component of the study, evaluating responses from NPD team members concerning project outcomes, is reported in the results section.

Table 6.1: Identified Factors from across the Organisation ("trans-level alignment" framework)

Level	Concept Element	Definition	Impact
Organisation Level	**Organisational Purpose Alignment** (Chapter 5) 	Overall team connection with the organisational identity. Organisational identity refers to the psychological state in which one defines oneself using the same characteristics as an organisation (Dutton et al., 1994).	Previous research has shown that organisational identity and team identity should ideally affect project outcomes (Mesmer-Magnus et al., 2018)
	Hybrid Technology Alignment (Chapter 4) 	Agreement related to the organisational infrastructure needed/implemented to overcome technical constraints in hybrid environments in order to ensure comfort levels	Deliberate connections need to be created through organisational infrastructure in order to ensure clarity in environments that have a variety of teamwork arrangements (Chapter 4)

Team Level	**Team Commitment Alignment** (Chapter 5) 	Overall individual connection with the team identity. Team identity denotes the psychological state wherein one defines themselves by their membership in the team (Shapiro et al., 2002).	"A strong shared identity among team members has been linked to reduced conflict, particularly interpersonal conflict." (Hinds and Mortensen, 2005, p292)
	Hybrid Sociability Alignment (Chapter 4) 	Adjustment for informal social interactions in virtual environments as they can be beneficial for team members to look beyond functional labels and stereotypes	A stimulus that encourages social interactions may be required to operate effectively and encourage team members to continue their desire to work together, in order to gain more team cohesiveness within a hybrid team environment with fewer natural interactions (Chapter 4)
	Functional Balance Alignment (Chapter 5) 	A balanced distribution of functions within a team to prevent the dominance of ingrained functional identities and allegiances that may hinder collaboration and alignment with broader goals. Functional identities refer to individuals' inclination to define themselves based on the values, strategies, and norms associated with their specific functional area. By avoiding the overpowering influence of such identities, teams can foster a more inclusive and cohesive environment that encourages collaboration towards overarching objectives (Ashforth and Mael, 1989; Sethi et al., 2001)	Alignment of the functional identity with the team and organisational identity can bring together individual goals and orientations (Ashforth et al., 2011; Glynn et al. 2010; Mesmer-Magnus et al. 2018)

Individual Level	***Functional Alignment Brokers*** (Chapter 5) 	Individuals with diverse functional and educational experiences who serve as "connectors" or "liaisons" to strategically advance R&D projects by softening functional boundaries within NPD teams without diluting the expertise of team members.	Through their diverse functional backgrounds and experiences, individuals have the ability to transcend functional boundaries and foster a collaborative team environment that promotes innovation (Chapter 5)
	Workplace Autonomy Alignment (Chapter 4) 	An organisation's trust in their employees, specifically to set boundaries for their best working conditions with regard to hybrid team arrangements	Within hybrid teams, establishing a climate of trust within hybrid teams poses a challenge when the organisation fails to acknowledge and accommodate the diverse individual needs of team members (Chapter 4)

6.2.1. Study Aim, Objectives, and Research Question

The aim of study 3 was to comprehend the attainment of effectiveness in contemporary NPD teams, taking into account contextual factors across various organisational levels, known as trans-level alignment. This objective aligns with Research Sub-Question 5, which investigates the circumstances under which trans-level alignment is realised to impact outcomes in NPD teams. Therefore, the study set out to explore the following research objectives that originated from the literature mapping exercise in Chapter 2:

- ***OBJECTIVE 4***: Examine alignment factors from an individual perspective that impact outcomes in NPD teams
- ***OBJECTIVE 5***: Explore perceived misalignments in NPD teams

With a view to addressing the question and fulfilling the objectives, this study will focus on NPD team members in order to understand the circumstances wherein alignment with the organisation is accomplished.

6.2.2. Methods: Context and Development

Employee turnover poses a widespread and costly challenge for contemporary companies (O'Connell and Kung, 2007). The associated costs, including recruitment, training, and compensation, along with the detrimental impact on team morale, underscore the urgency for managers to grasp the factors influencing person-environment fit for retaining employees (Chiat and Panatik, 2019; O'Connell and Kung, 2007). Despite the escalating turnover rates across diverse sectors (Chiat and Panatik, 2019), exploring person-environment fit, particularly within New Product Development (NPD) teams, is crucial for organisational success (Badrinarayanan and Arnett, 2008; Edmondson and Nembhard, 2009; Fain and Kline, 2013; Sivasubramaniam et al., 2012).

NPD teams, comprising members from varied disciplines, collaboratively shoulder the responsibility of bringing a product to market (Tang et al., 2015). While this diversity fosters innovation and access to diverse expertise, it also presents challenges related to knowledge boundaries and differences in functional practices and perceptions (Carlile, 2002; Cooper, 2019; Kotlarsky et al., 2015; Nakata and Im, 2010). Tenure diversity, differences in thought worlds, and varying motivations further complicate integration within these teams (Hammermann et al., 2019; van de Brake et al., 2020; Dougherty, 1992; Karau and Hart, 1998). Existing research on knowledge differentiation and integration mainly concentrates on team-level strategies, neglecting the organisational context and the inclusion of additional team members. Consequently, a comprehensive understanding of integration in organisations from a whole-systems perspective remains limited.

Team studies underscore the significance of team composition and person-environment fit in fostering team effectiveness and performance (Edwards and Shipp, 2007; Nielsen et al., 2017; Van Vianen, 2018). In contrast, integration research predominantly centres on team-level solutions. This study diverges by considering alignment across the organisation as a strategy to enhance person-environment fit and attain superior outcomes. The concept of "trans-level alignment" is introduced as a framework that holistically assesses the current effectiveness of NPD teams by considering all levels of the organisation collectively.

The study proposes a model incorporating trans-level alignment to achieve person-environment fit within NPD teams and investigates misalignment through a mixed methods approach. The findings underscore the importance of crafting strategic team compositions that

account for existing boundaries and integration challenges within the organisation to elevate team outcomes. Unaddressed integration challenges can create contentious environments leading to employee turnover (Lee et al., 2017; Lin and Huang, 2020). This turnover results in substantial losses for organisations, encompassing training time, resource investment, and increased workload for remaining employees (Chiat and Panatik, 2019). Consequently, organisations grapple with identifying suitable individuals for their teams and navigating calculated risks in the hiring process.

Sample Selection

Data was gathered from NPD team members situated in four locations (Silicon Valley, the Greater Boston Area, New York, and the Greater London Area), corresponding to the regions where the initial research interviews occurred in Chapter 4 and Chapter 5. Employing a cross-sectional design, data was collected at a single point in time using questionnaires (Christensen et al., 2011). This design facilitated convenience and purposive sampling methods through a web-based survey distribution tool (Survey Monkey) to precisely target the population suitable for evaluating the model. Convenience sampling was chosen as the research question did not necessitate statistical representations of the population (Christensen et al., 2011), making it easier to recruit participants. Purposive sampling was based on defined characteristics for data analysis, providing a diverse range of data to capture different viewpoints.

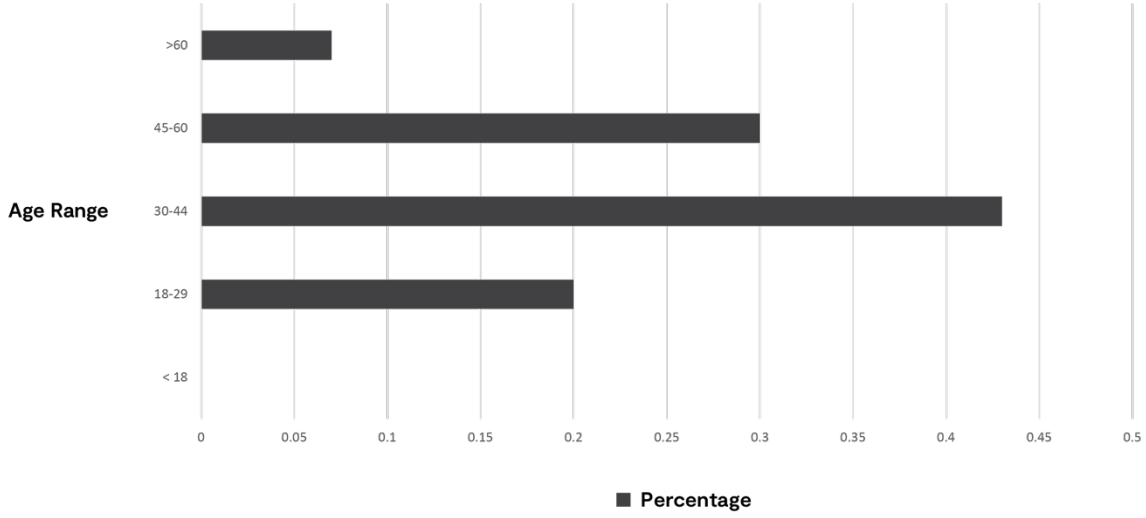
The questionnaire, aimed at collecting self-reported data, featured questions related to the seven elements of trans-level alignment (Table 6.1), connected to organisational, team, and individual contexts. It included one qualifying question and two demographic questions to ensure the participation of suitable respondents. Additionally, seven closed questions gauging the direction and strength of expressed attitudes and seven follow-up open questions for more detailed qualitative findings were included to eliminate mismatched respondents. Refer to Appendix A9 for survey questions.

A total of 208 questionnaires, along with two pilot surveys to assess survey timing and question clarity, were distributed. The higher quantity of questionnaires was distributed under the assumption of a high disqualification rate. All questionnaires were returned via email.

Participant Recruitment and Data Collection

The surveyed population consisted of individuals engaged in teams dedicated to new product development, as indicated by the qualifying question. Respondents were distributed evenly across regions: Silicon Valley (~ 37%), NY & Boston (~30%), and London (~34%). Gender representation leaned towards 62% female and 38% male, reflecting the available respondents. The targeted age range spanned from 24 years (assuming at least 1-2 years of work experience) to 64 years (the average retirement age) (Munnell, 2015). Figure 6.2 below illustrates the age range, showcasing an increasing diversity of ages in the workforce (Hammermann et al., 2019).

Figure 6.2: Population Age Range Targeted



Among the eligible respondents within the specified age range, the experience varied from 1 to 25 years, with an average of 8.5 years. The data collection period extended from 12/21/22 to 12/28/22. The average completion rate stood at 45%, resulting in 94 qualified survey participants. Following data cleansing, 30 respondents were excluded due to inconsistencies or incomplete responses, with 12 respondents falling into this category and 18 respondents belonging to teams with a single discipline. The latter group was deemed unfit for the study, which focuses on functionally diverse NPD teams. Consequently, 64 valid questionnaires remained for subsequent analysis.

Measures, Data Coding and Analysis

The instructions directed participants to identify the most suitable individual to hire for a New Product Development team, responsible for transforming ideas into products for sale. Respondents were equipped with a six-point Likert scale, ranging from strongly agreeing (6) to strongly disagreeing (1), deemed appropriate for guiding respondents and gauging team member attitudes (Taherdoost, 2019). The Likert scale pertained to the seven elements of trans-level alignment, with a Cronbach's alpha of 0.605, indicating reliability in the overall data set.

To assess alignment, the seven elements were distributed across three contextual levels—organisational, team, and individual. A weighted mean and standard deviation were utilised to gauge general trends in responses (Pimentel, 2010). However, visual methods were employed to chart data patterns, providing deeper insights into respondents' awareness of misalignment within the team.

For a more comprehensive analysis, the open-ended questions, collecting qualitative data from the surveys, underwent coding (Adu, 2019). Subsequently, a free-form first-order analysis was conducted to derive categories or themes from participant statements. Refer to Appendix A10 for the breakdown of the coding structure by theme and A11 for a coded survey example.

Control variables included team member demographics (age, gender, organisational tenure) and team size (averaging 7-12 members), likely representative of those present in NPD teams.

6.3. Results

The study sought to assess the extent of misalignment within teams for the purpose of enhancing outcomes. Participants were queried about each level of the organisation, drawing on the identified elements of trans-level alignment from earlier chapters. The ensuing findings initially validated the presence of some type of misalignment related to the individual, team, and/or organisation (82.8% concurred). Subsequently, an investigation delved into the locations where misalignment was perceived to exist and the degree of misalignment communicated.

6.3.1. Tendencies of Misalignment in NPD Teams

To investigate areas where tendencies toward misalignment were more pronounced, the data was initially analysed using the weighted mean and standard deviation (refer to Table 6.2). This analysis indicates the extent of agreement among respondents. According to the data, team

commitment alignment (team level) exhibited the highest misalignment, followed by workplace autonomy alignment (individual level) and hybrid sociability alignment (team level) as the next areas of greatest disagreement within organisations. The highest levels of alignment were observed at the organisational level, particularly in hybrid technology alignment and organisational purpose alignment. This suggests that respondents belonged to teams with robust organisational identities that may not necessarily align with the diverse functional goals of the teams. It also implies potential constraints on employees' freedom to choose where they can work most effectively and challenges in team member interactions. Such factors may impact overall deliverables or project outcomes, drawing on insights from the literature and previous studies.

Table 6.2: Summary of Alignment Weighted Average and Standard Deviations

Trans-level Alignment Element	Weighted Average	Standard Deviation	Misalignment Agreement Ranking
Team Commitment Alignment	3.64	1.40	1 (most)
Workplace Autonomy Alignment	4.47	1.25	2
Hybrid Sociability Alignment	4.78	0.83	3
Functional Alignment Brokers	4.91	0.89	4
Functional Balance Alignment	5.00	0.84	5
Organisational Purpose Alignment	5.03	0.84	6
Hybrid Technology Alignment	4.98	0.76	7 (least)

As the closed-ended questions from the Likert scale provided only partial insights, further exploration into the details of team commitment misalignment, as communicated in the open-ended questions, was conducted. To complement the data on misalignment between the team and organisation, 54% of participants highlighted mismatches in expectations related to function/design and the approach/strategy for executing these functions/designs. Additionally, 26% expressed concerns about timelines and urgency as sources of disagreement. At the team level, 56% reported a mismatch in goals and priorities, indicating internal discrepancies between functions within the team. Other areas of disagreement related to process/strategy (21%) and

budget/timeline (18%), or both. These figures indicate significant disagreement at two distinct levels within the organisation.

6.3.2. Types of Misalignments in NPD Teams

Subsequently, data visualisation methods were employed to delve deeper into relationships at various contextual levels. The information provided by the respondents was visually presented in a bar format, revealing seven combinations of misalignments in teams and their respective prevalence. The team level remained the most misaligned area within the organisation (28%), yet a significant mismatch was also observed between the team and individual levels (20%), and some degree of misalignment was identified at all levels (20%). Refer to Table 6.3 for details.

Table 6.3: Types of Contextual Misalignments

Type of Misalignment (Levels)	Percentage of Respondents
Team Only	28.1%
All Levels	20.3%
Individual & Team	20.3%
No Levels (Ideal)	17.2%
Team & Organisation	7.8%
Individual Only	3.1%
Individual & Organisation	1.6%
Organisation Only	1.6%

The substantial misalignment observed at the individual and team levels could be construed as a challenge in interactions. This was evident in the responses to open-ended follow-up questions. When discussing hybrid sociability alignment with colleagues, 65% indicated that more formal in-work interactions occurred, such as meetings, Zoom sessions, in-office chats, and project-specific conversations. Only 35% reported more informal "get to know you" gatherings, such as socials, company-sponsored events, food/drink gatherings, or team-building events. If knowledge of colleagues is predominantly confined to functional boundaries, it indicates a limited level of personalisation within the teams and poses a challenge for social interactions.

6.3.3. Exploring the Strengths of Misalignment at Each Level

Information from the seven combinations of identified misalignments was categorised into high or low levels of misalignment to gain deeper insights into the relationships between trans-level alignment and the potential for integrating knowledge from new team members. The objective was to enhance understanding of how the environment functions, rather than to validate or invalidate the model. Figures 6.3 and 6.4 provide a summary of various visual representations of data illustrating the existing misalignments across all three levels. This facilitates the identification of characteristics absent in the portrayed misaligned teams and helps pinpoint desirable traits for new team members to integrate effectively, leading to a better fit and improved project outcomes.

Figure 6.3 Annotated Graph for Evaluating Participant Responses (Data Visualisation)

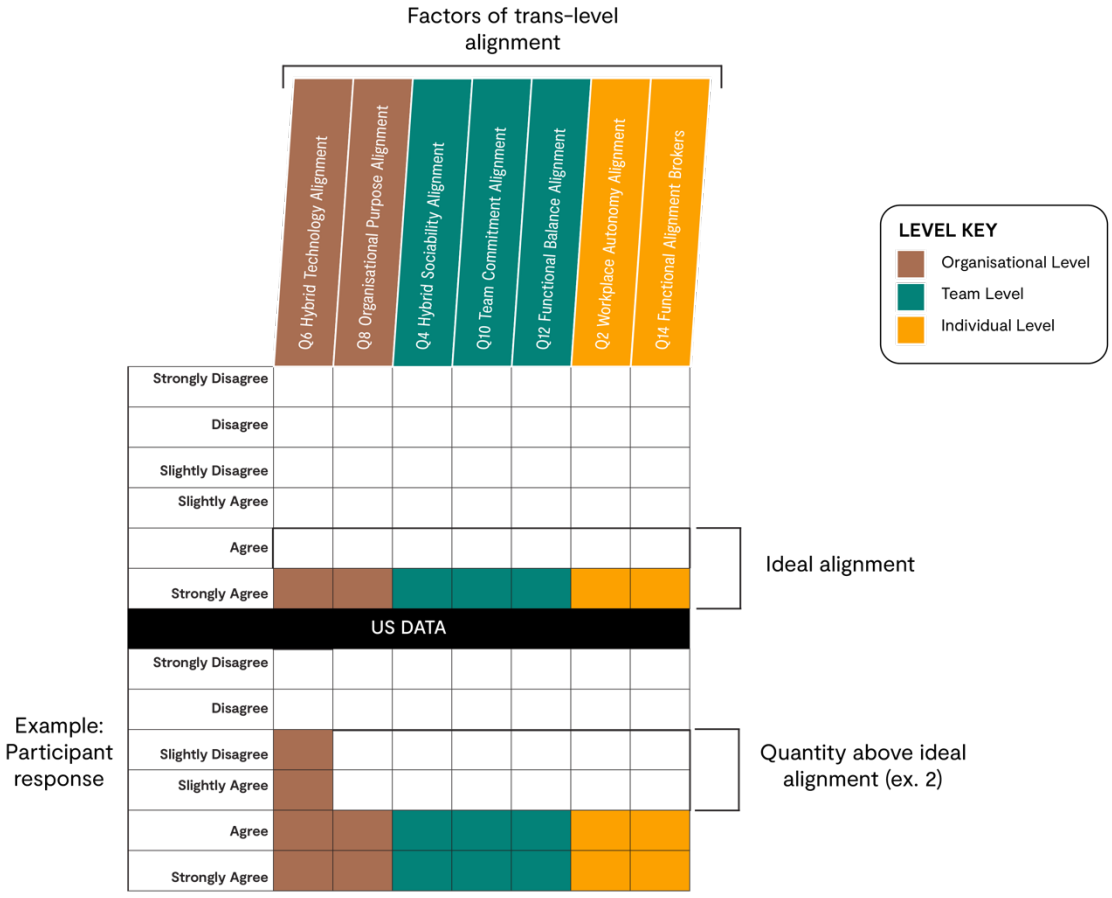
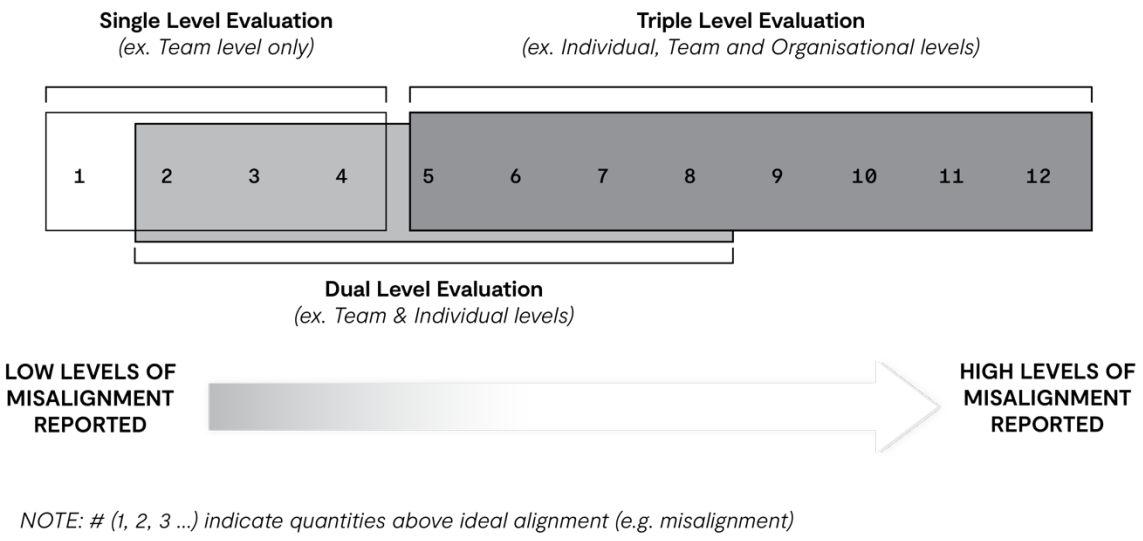


Figure 6.4 Evaluating Patterns of Misalignment



NOTE: # (1, 2, 3 ...) indicate quantities above ideal alignment (e.g. misalignment)

The data suggests that lesser misalignment is apparent when focusing on a single level of the organisational context. However, with the evaluation of more levels, the presence and intensity of misalignment or complexity increase, necessitating greater clarity.

6.4. Discussion

In general, the study underscores the potential and utility of the concept of trans-level alignment in understanding person-environment fit during the integration of new knowledge or team members. The need for trans-level alignment in strategic team compositions finds support in both quantitative and qualitative data, revealing misalignment at every level of the organisation. Seven types of misalignments emerged from the quantitative data. The findings also suggest that trans-level alignment extends beyond formal objectives, such as goal alignment, considering individual preferences and how team members interact and build relationships beyond the workplace. In essence, creating environments that accommodate flexibility in where and how team members' work may be a crucial element of trans-level alignment, contributing to improved performance outcomes. The qualitative data provides deeper insights by elaborating on why tendencies towards higher levels of misalignment exist at the individual and team levels, based on participants' responses to open-ended questions. Mismatched expectations and limitations to formal interactions were prevalent, creating disconnects between the relationship needs of team members and the business needs related to the approach.

6.5. Theoretical Implications

In broad terms, this research aligns with the advantages associated with utilising established integration approaches, including systemised, personalised, cognitive, and shared methods (Cooper, 1994; Gao and Bernard, 2018; Grant, 2012; Tang et al., 2015; Carlile, 2004; Jarvenpaa and Keating, 2011; Peltokorpi and Hood, 2019; Wegner, 1987). However, these individual literature approaches are predominantly one-dimensional and do not comprehensively address the diverse aspects of integration necessary to attain person-environment fit (Lewin, 1951; Van Vianen, 2018). Consequently, through an analysis of different facets of trans-level alignment encompassing existing integration approaches, the study presents a unified assessment of alignment that spans various levels and dimensions. This evaluation sheds light on alignment challenges within contemporary NPD teams, portraying it as a more intricate problem. The exploration beyond a singular organisational level reveals varying strengths of misalignment. Moreover, the trans-level perspective surpasses much of the existing research that primarily concentrates on the team level or, in some instances, two levels. This discovery encourages researchers to consider the macro, meso, and micro levels (Cunningham and O'Reilly, 2018) for context, as different types of misalignments were identified, emphasizing the significance of broader considerations in influencing outcomes.

6.7. Managerial Implications

For industry managers seeking optimal candidates for their teams or organisations, this study offers valuable insights. Rather than concentrating solely on individual abilities (e.g., complementary fit) or values and preferences (e.g., supplementary fit), the trans-level alignment concept considers both types of fit across diverse contexts. Based on team members' perceptions of existing misalignments, additional characteristics for new hires can be identified and applied to the team. For instance, a team with high team commitment alignment and hybrid sociability misalignment might seek candidates with a varied experience background to foster better connections across disciplines, alongside someone socially adept to enhance interactions. Given the survey's coverage across multiple teams and locations, these findings should be viewed as preliminary, and further research is necessary to delve into the elements of trans-level alignment.

6.8. Limitations and Future Research

The survey conducted in this study encompassed individuals engaged in small NPD teams, typically consisting of 7 to 12 members. Further research is warranted to delve into trans-level alignment dynamics over time and ascertain the optimal frequency of member surveys for an accurate portrayal of the environment. While participants were evenly distributed across regional innovation clusters, gender representation was not evenly dispersed, potentially leading to criticisms regarding overrepresented opinions. Although gender was beyond the scope of this thesis, future studies could consider including gender representation reflecting the current NPD landscape to mitigate such criticisms.

Moreover, given the identification of misalignment in the current study, additional research is imperative to delineate approaches for implementing alignment solutions. While the survey method facilitated the collection of a larger volume of participant responses, its limitations, including the inability to elicit the same depth of answers or conduct spontaneous follow-up questions as in interviews, should be acknowledged. Nonetheless, this survey design enabled a rapid examination of factors gleaned from interview data in preceding studies, bolstering the robustness of the insights garnered. Subsequent studies could incorporate longitudinal components to enable further follow-up and clarification of identified themes.

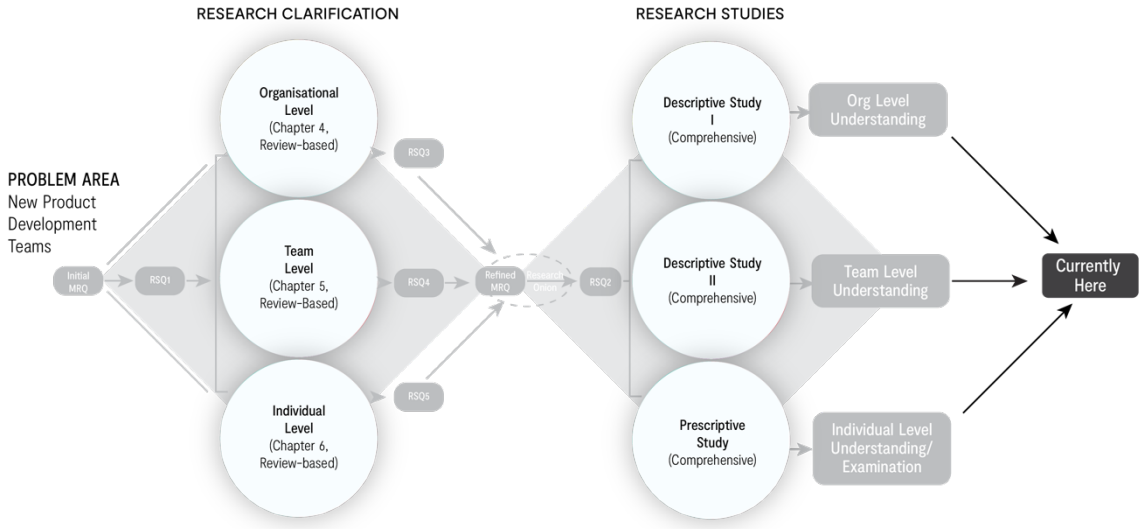
On a final note, the theoretical model employed in this study lacks expectations regarding the repercussions of alignment shifts occurring during or post team member integration. Future research should conduct empirical investigations within a single company, affording complete access to organisational, team, and individual contexts. Such a comprehensive study could augment the validity of the findings gleaned from this study.

6.9. Chapter Conclusion

This study contributed to answering RSQ5 concerning how the key features of trans-level alignment contribute to effective teams by operationalising Research Sub-Question (RSQ) 5. Following the literature review (Chapter 2) that laid the groundwork for person-environment fit and knowledge integration, Study 3 aided in better understanding how effectiveness is achieved. Existing theories neglect the upfront consideration of alignment across multiple levels of the organisation during the hiring phase or the accommodation of variability in needs for each team. Specifically, the study positioned itself within the person-environment fit literature, leaning

strongly towards management and organisational behaviour areas. The overall findings underscore the importance of adopting a holistic approach when designing strategic team compositions to address specific misalignments. In further detail, the primary empirical contribution generated insights into integrating new knowledge/team members for person-environment fit based on detected misalignments throughout the organisational framework, offering utility for future work. Figure 6.5 illustrates the thesis progression and the fundamental outcomes from the individual level analysis.

Figure 6.5 Research Positioning Exiting Research Studies Stage



Chapter 7 serves as the concluding section of the thesis, encapsulating the research findings, limitations, and outlining future research directions. The ultimate goal is to present a practical framework that enhances comprehension of alignment in NPD teams to improve outcomes.

Chapter 7: Conclusions and Recommendations

7.1. Chapter Introduction

This dissertation examines the efficiency of New Product Development (NPD) teams in hybrid teamwork setups, employing a unified method termed trans-level alignment that considers all organisational levels. *Trans-level alignment* is a framework that comprehensively evaluates the current effectiveness of NPD teams by considering all levels of the organisation in a unified manner. Chapters 4, 5, and 6 address this by assessing the impact of multiple levels within an organisation. The first study focuses on effective hybrid environments and team working arrangements at the organisational level. The second study delves into trans-level alignment factors by understanding different functions at the team level. The third study examines individual influences and views established in the first two studies at the individual level. Despite each study having an independent approach, they collectively contribute to a holistic understanding of influences on NPD team effectiveness.

Adhering to a pragmatic paradigm, this thesis employs an abductive approach and utilises qualitative and mixed methods data analysis. The research gathers data from NPD team members in regional innovation clusters known for their abundance of new technology, expertise, and resources, using in-depth semi-structured interviews and questionnaires. The collected data is situated within theoretical frameworks through a mapping literature review approach, enabling a comprehensive analysis.

To ensure study validity, reliability, and rigour, careful consideration is given to sampling strategy, data collection methods, and data analysis techniques. Ethical principles are maintained throughout the research process to protect the well-being of participants.

This chapter provides a summary of research questions and corresponding answers, highlighting key findings that address research objectives. Theoretical contributions and implications for researchers are outlined, with a focus on the opportunity gap explored in the thesis. Industry implications for NPD field managers, team members, and business leaders are also discussed.

The chapter concludes with suggestions for future research, identifying remaining unanswered questions and presenting opportunities for further investigation post-PhD

completion. Table 7.1 offers an overview of thesis contributions, discussed in more detail throughout the chapter.

Table 7.1 Thesis Contributions Overview

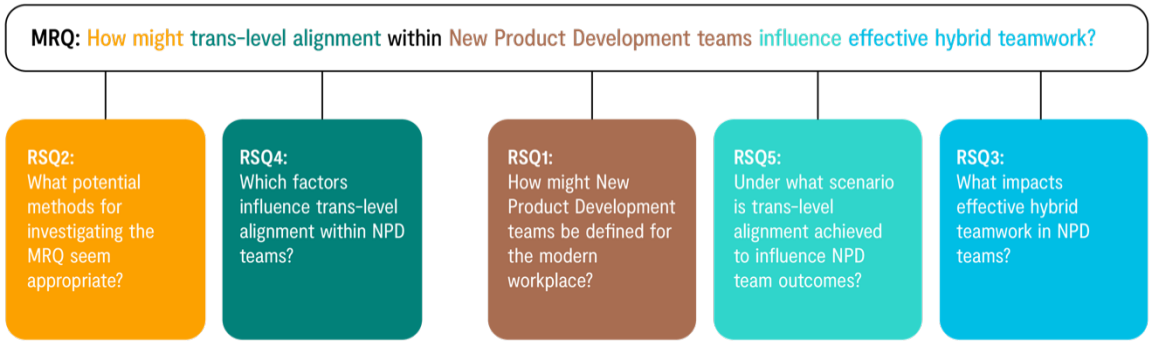
Chapter	Contributions	Descriptions	Theoretical / Empirical Outcomes	Industry Implications
4	Trans-level considerations	Identified considerations across organisational levels for effective hybrid team-working arrangements	Connected three underexplored factors to existing team effectiveness/NPD theory using a multilevel perspective of an organisation	Consider trans-level factors when designing hybrid teams for long-term employee retention and NPD effectiveness
5	Functional identification patterns	Revealed sources of tension/ineffectiveness resulting from functional-cultural/time-based tendencies	Used an identity perspective to contend that within an NPD team, allegiances to functional identities and the varying relationships between the team and organisation are the most important precursors to tensions and hostilities	Consider more ingrained functional tendencies when designing teams
5	Functional alignment broker roles	Shared a spectrum of broker roles as a method for mitigating tension/ineffectiveness	Revealed an alternate approach for NPD theory that focused on maintaining the strength of functional boundaries without diluting the team members' expertise through strategic positioning of specific roles (e.g., functional alignment brokers)	Establishes four initial criteria for identifying or developing functional alignment brokers
6	Misalignment combinations	Uncovered combinations of misalignments from trans-level considerations and identity impacts on the effectiveness	Generated insights regarding integrating new knowledge/team members for person-environment fit on the basis of detected misalignments (7 types) throughout the organisational framework, which will	Consider additional characteristics for new hires based on team members' perceptions of the misalignment present

			be useful for future work.	
6	Trans-level alignment model	Developed a model for utilising alignment for person-environment fit in NPD teams	7 key elements of the trans-level alignment model for considering new knowledge integration into teams	Build environments that cater to flexibility in where and how team members work for better performance outcomes

7.2. Revisiting MRQ and RSQs

As mentioned before, the main research question (MRQ), which was 'How might trans-level alignment within New Product Development teams influence effective hybrid teamwork?', was derived from the broader area of interest, namely New Product Development teams. This single question encapsulated the core inquiry of the thesis. To address the MRQ, it was dissected into essential components represented by the research sub-questions (RSQs). Each RSQ, corresponding to chapters 2-6, was tackled through literature reviews/background information, justification of methodology, and/or empirical research. Figure 7.1 illustrates the relationship between the MRQ and the key elements of the RSQs. The comprehensive answer to the thesis question is presented in the subsequent sub-sections by addressing these RSQs.

Figure 7.1 MRQ and RSQs Linkage



7.2.1. RSQ1 and Answer (Chapter 2)

RSQ1, which queried 'How might New Product Development teams be defined for the modern workplace?', was essential to contextualise NPD teams and enhance comprehension of the investigation's background. Chapter 2's literature mapping review addressed this question by

defining contemporary NPD teams as those operating in hybrid work arrangements characterised by high functional diversity, necessitating various types of knowledge. This definition served as a foundational understanding for exploring challenges associated with complex team structures. Consideration was extended across organisational levels, encompassing variability in communication types/styles and accommodating diverse perspectives.

7.2.2. RSQ2 and Answer (Chapter 3)

RSQ2, questioning 'What potential methods for investigating the MRQ seem appropriate?', aimed to justify the optimal methods for thesis investigation. In Chapter 3, these methods are outlined and justified in accordance with the pragmatic paradigm philosophy principles. This approach emphasises a focus on meaning and a real-world practice orientation, advocating for the use of diverse methods (e.g., qualitative and mixed) to best address the MRQ (Scott, 2016; Tran, 2016). This methodological approach aligns with similar perspectives within design research (Feast and Melles, 2010; Goldkuhl, 2012), emphasising a deeper understanding of practice and/or education (Blessing and Chakrabarti, 2009).

7.2.3. RSQ3 and Answer (Chapter 4)

RSQ3, querying 'What impacts effective hybrid teamwork within NPD teams?', sought to define 'effective' and understand insights from NPD teamwork arrangements. Chapter 4 answers this question by employing the IMOI team effectiveness model (Ilgen et al., 2005; Mathieu et al., 2008) and incorporating an accepted definition of effectiveness to ground the research. Results indicate that trans-level factors within the organisation impact hybrid teamwork. These factors include misalignments over individual sentiments about the organisation pertaining to agreement on flexibility of work environment (workplace autonomy alignment), communication constraints given limits with hybrid setups (hybrid sociability alignment) and disconnected expectations and overall comfort levels due to technical constraints in hybrid team arrangements (hybrid technology alignment). These factors, linked through the IMOI model, contribute to achieving team effectiveness.

7.2.4. RSQ4 and Answer (Chapter 5)

RSQ4, posing the question 'Which factors influence trans-level alignment within NPD teams?', aimed to comprehend the key factors, their composition, and the mechanisms through

which trans-level alignment occurs, including contextual considerations across the organisation. Chapter 5 addresses this query by examining multi-functional interfaces, deviating from the bi-functional interfaces noted in the literature. The analysis focuses on the tension within these expanded interfaces that triggers misalignment. One key factor identified is the imbalance of ingrained identities and functional allegiances, referred to as functional balance alignment. An illustrative example is the coexistence of strong engineering and marketing functional identities, leading to tension arising from their conflicting approaches or mental models (Henke et al., 1993; Felekoglu et al., 2013; Sethi et al., 2001; Sivasubramaniam et al., 2012; Tang et al., 2015).

Another significant factor is the varied relationships, if any, between functions and team identity (team commitment alignment) and/or the overall connection to organisational identity (organisational purpose alignment). These identified factors exert influence on team member interactions, impacting project time and completion, while also contributing to increased relationship conflict and the potential for employee turnover.

The study's findings highlight the crucial role of functional alignment brokers, individuals capable of navigating between different sub-group identification patterns, positively impacting the NPD team environment. Strategically deploying functional alignment brokers based on organisational needs or the specific location of alignment issues is proposed as a means to influence trans-level alignment.

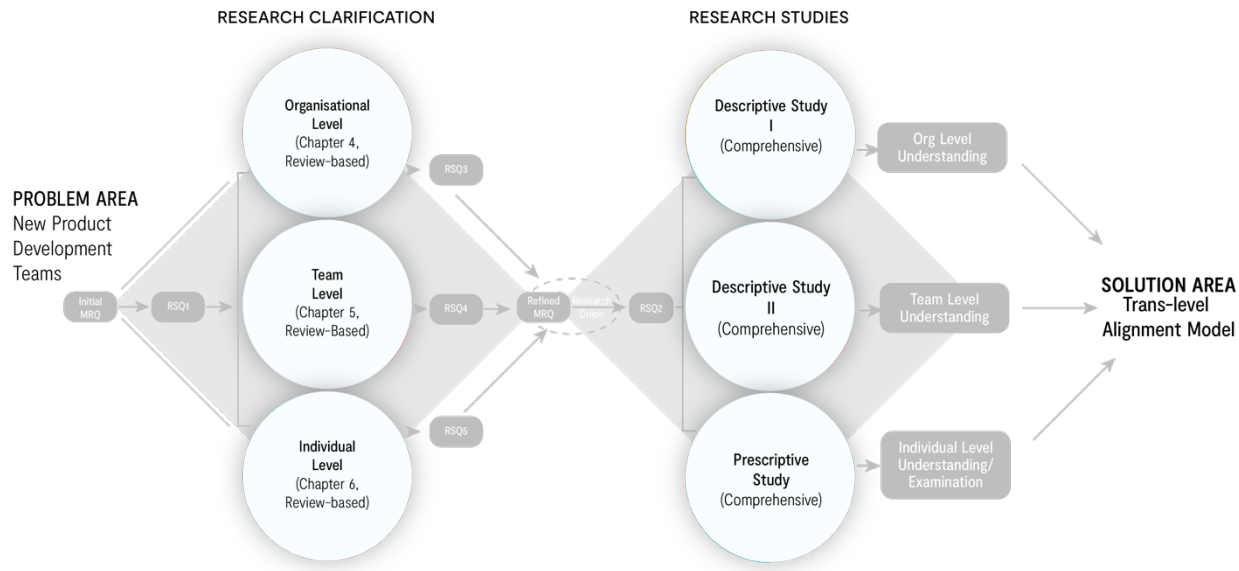
7.2.5. RSQ5 and Answer (Chapter 6)

RSQ5, the ultimate research sub-question, 'Under what scenario is trans-level alignment achieved to influence NPD team outcomes?', aimed to further explore the fundamental features of alignment that contribute to effective teams. Revisiting the features identified in the preceding chapters (4 and 5) enhances understanding of how effectiveness is attained. Chapter 6 addresses this question by unveiling where diverse types of misalignments occur and indicating considerations when incorporating new team members and knowledge for effective environments.

The data indicates that in hybrid environments, trans-level alignment should encompass various aspects. Firstly, it involves aligning formal objectives at the organisational level, ensuring that the team's goals align with those of the larger organisation. Secondly, it entails examining how team members interact and cultivate relationships in diverse contexts at the team level, recognising the significance of effective collaboration and communication. Lastly, trans-

level alignment involves considering the working preferences and flexibility permitted at the individual level, acknowledging the distinct needs and strengths of team members. Although these considerations may originate or be more prominent at specific levels, they possess the potential to impact various areas across the organisation. Consequently, they should be considered in a unified and integrated manner. Figure 7.2 visually illustrates the complete transition from identifying the problem to presenting the solution.

Figure 7.2 Thesis Progression from Problem to Solution



7.3. Theoretical Outcomes

The contributions of the thesis distinguish themselves from other research on team effectiveness or NPD theory by embracing an interdisciplinary perspective and formulating a trans-level alignment model. This methodology involves adopting a comprehensive systems perspective to assess compositions and their overarching effectiveness. As delineated in Table 7.1, the thesis presents five primary contributions, each of which will be elaborated upon in the subsequent sub-sections.

7.3.1. Trans-level Considerations

A primary contribution of the thesis lies in its emphasis on hybrid team arrangements, reflective of contemporary organisational environments for NPD teams. Despite the increasing

focus on this area, particularly in the post-pandemic era, existing research tends to lean more towards face-to-face settings or offers limited perspectives, such as a singular level of focus or *intra-level alignment*, when it comes to hybrid teams. Within this context, the thesis explores three underexplored factors in the realm of team effectiveness and NPD theory by examining beliefs emerging from team member interactions within hybrid team arrangements. These emergent states, also known as team member beliefs, are highlighted in the literature as factors like trust, cohesion, and psychological safety, particularly relevant to teams with a virtual component (Breuer et al., 2016; Lechner and Mortlock, 2021; Malhotra & Majchrzak, 2014; Peñarroja et al., 2015; Marks et al., 2001; Waller et al., 2016).

However, these three states face limitations in their existing definitions. Trans-level alignment, as illustrated in the thesis, offers a broader perspective to these concepts. For instance, organisational trust (Robinson, 1996), traditionally perceived unilaterally based on how an individual views their organisation, can be redefined through trans-level alignment by considering how the organisation values or believes in its employees.

The dual perspective on organisational trust, referred to as shared organisational trust in Chapter 4, gave rise to a trans-level alignment factor where the agreement on flexibility in work location was identified as crucial for team outcomes, specifically ***workplace autonomy alignment.*** Other pertinent emergent states, namely cohesion and psychological safety, were extended to address additional requirements arising from hybrid team-working arrangements. This extension involved giving more consideration to informal social interactions, aiming to help team members transcend functional labels and stereotypes, particularly in predominantly virtual interactions (e.g., ***hybrid sociability alignment*** for team cohesion).

In parallel, the importance of aligning messages or objectives emerged as a factor, especially as team complexity increased and team member comfort in their environment had the potential to decrease. The impact on team members associated with psychological safety was linked to how effectively organisations adapted to an augmented virtual context. Issues such as disruptions from various learning curves and misalignments due to reduced access to team members influenced how the team operated and how individuals expressed themselves, necessitating attention (e.g., ***hybrid technology alignment).***

Therefore, this thesis advocates for design researchers to navigate both broad and detailed spaces, accommodating various forms of hybrid teams, to gain a comprehensive understanding of the design's impact.

7.3.2. Functional Identification Patterns

Moving to the team level, comprehending functional balance alignment emerged as another significant contribution, with the research showcasing the variation in how functions relate to different levels of the organisation. Specifically, delving into ingrained functional, cultural, and time-based roles highlighted that the strength of identities and imbalances with other functions within the composition acted as precursors to tension or ineffectiveness in teams if not addressed (e.g., ***functional balance alignment***). Another aspect of identity alignment focused on how functions related to team identity to ensure that functional identities did not overshadow the team's goals (e.g., ***team commitment alignment***).

Furthermore, organisational identity became another factor in evaluating the overall connection between individuals, teams, and the organisation's strategy (e.g., ***organisational purpose alignment***). Hence, when researchers assess teams, the approach should encompass connections or relationships throughout the organisation, considering the functional baggage brought to the team before it commences. Figure 5.3 illustrates existing functional relationships, highlighting misalignment between a function's relationship to other functions, the NPD team, and the broader organisation.

7.3.3. Functional Alignment Broker Roles

The findings brought forth enhanced insights into brokering roles within teams as a strategy for mitigating negative tension or instigating positive tension to enhance areas of ineffectiveness (e.g., ***functional alignment brokers***). Existing literature commonly portrays these roles as more passive or primarily focused on preventing negative tension, acting as inhibitors. However, this thesis revealed that these roles, termed ***functional alignment brokers*** in Chapter 5, may adopt a more active stance, serving as catalysts that generate positive tension. Such roles were identified as fundamental to pushing the boundaries of NPD. Introducing a spectrum of brokering-type roles allows for a dynamic approach to strategically deploying individuals in teams, considering diverse needs for specific types of brokers to achieve desired outcomes. This discovery encourages researchers to seek more dynamic solutions as team composition varies.

7.3.4. Misalignment Combinations

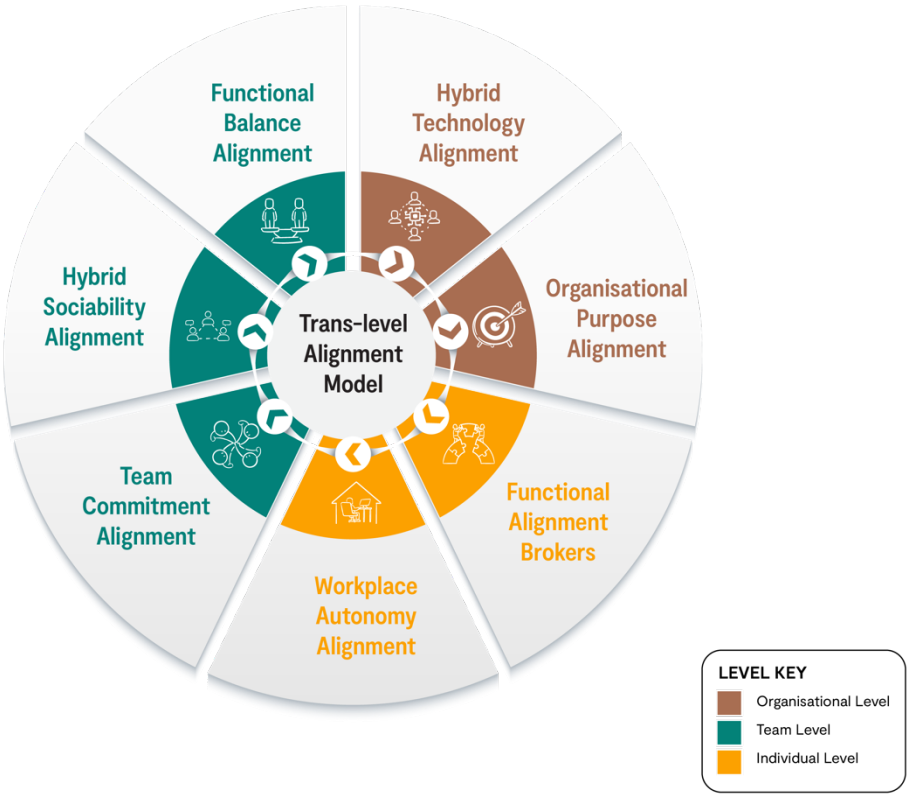
The analysis unveiled seven distinct combinations of misalignments originating from individual perceptions, each influencing effectiveness to varying degrees based on trans-level alignment factors such as individual preferences, team dynamics, and organisational constraints. This discovery emphasises the necessity for an approach that goes beyond traditional boundaries and takes into account a broader spectrum of factors.

To fully grasp and tackle the issue in a holistic or whole-framework manner, researchers should embrace a multi-level perspective, covering macro, meso, and micro levels of analysis. By incorporating diverse viewpoints and assessing effectiveness from different angles, a more comprehensive understanding of the problem can be attained. This approach enables researchers to present a comprehensive picture and formulate strategies that address the intricacies inherent in trans-level alignment.

7.3.5. Trans-level Alignment Model

Seven essential components of trans-level alignment were identified and scrutinised to formulate a design intervention (refer to Figure 7.3). These seven key elements serve to tackle the obstacles encountered by NPD teams, offering a cohesive framework for seamlessly assimilating new knowledge and team members into the organisation. The challenges encompass heightened complexity in work arrangements, increased diversity in functional specialisation, and variations in individual preferences that could impact sustained individual retention within the team. This framework takes into consideration the entire system for a more comprehensive evaluation, aiming for improved overall performance outcomes. It stands as a crucial model for both researchers and practitioners, a topic that will be further explored in the subsequent section.

Figure 7.3 Trans-level Alignment Model

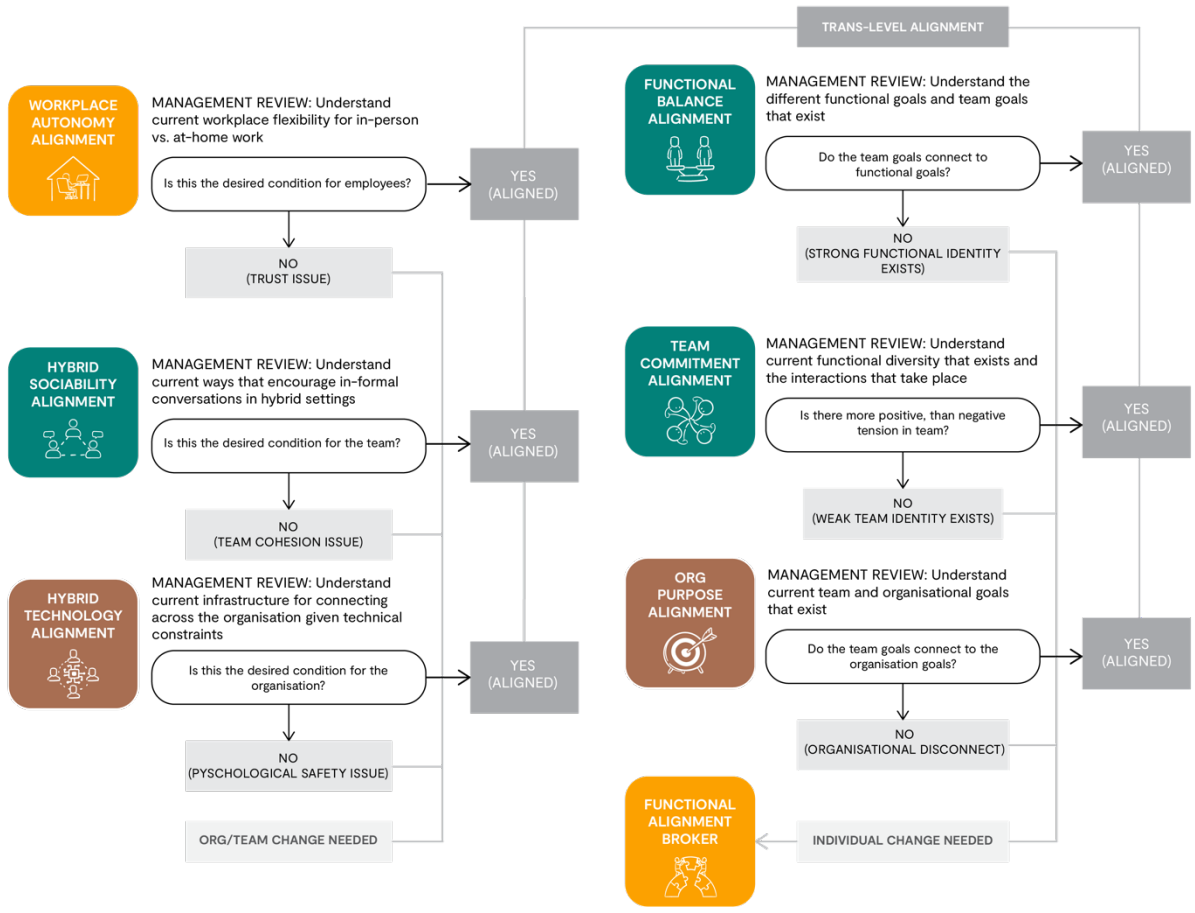


7.4. Industry Implications

This thesis offers valuable insights for managers, business leaders, and team members in NPD and is equally applicable to those operating in diverse functional environments seeking strategies to enhance team effectiveness. The model derived from this thesis, termed trans-level alignment, serves as a comprehensive framework that holistically assesses the current effectiveness of a team by considering all levels of the organisation in a unified manner. The team, particularly the NPD team, holds a central position in fostering competitive advantage and growth (Cooper, 2017; Mu et al., 2017; Sivasubramaniam et al., 2012). To fully leverage the potential of this specialised team with distinct functions, the research has identified seven key elements addressing various levels of the organisation to drive more productive outcomes. These seven key alignment elements include workplace autonomy alignment, hybrid sociability alignment, hybrid technology alignment, functional balance alignment, team commitment alignment, organisational purpose alignment, and functional alignment brokers. The flow chart in

Figure 7.4 illustrates how practitioners can utilise these elements to gain insights into potential misalignments or issues present.

Figure 7.4 Practitioner's Trans-level Alignment Flow Chart



7.4.1. Understanding the Current NPD Landscape for Managers

As depicted in Figure 7.4, grasping the organisational landscape at micro, meso, and macro levels is imperative for managers. Therefore, the effective application of these insights necessitates a manager's comprehension of their existing environment before pinpointing the necessary changes to enhance outcomes. Specifically, being cognizant of individual preferences, understanding how communication traverses boundaries, acquiring an in-depth understanding of the collaboration infrastructure and cross-functional interactions, and establishing a robust comprehension of the overarching goals throughout the organisation are crucial. Each element of understanding highlighted in Figure 7.4 correlates with an identified alignment element from the

research. Subsequently, the assessment through the baseline manager understanding and yes/no flow chart questions led to the conclusion that alignment fluctuates and may be addressed through organisational, team, and/or individual changes (as discussed below).

7.4.2. Designing for Hybrid Environments

This thesis offers insights into the effective design of hybrid environments tailored to diverse team scenarios. The enhancements for such environmental adjustments entail modifications to the organisation's and/or team's operational approaches, particularly in response to the team's requirements. The critical elements associated with team working arrangements include workplace autonomy, hybrid sociability, and hybrid technology alignments. Workplace autonomy hinges on the organisation's capacity to clearly communicate work expectations for flexibility and encourage breaks from technology use, especially for team members operating remotely. Recognising that team members exhibit varying preferences for effectiveness (e.g., working from home, office, or a combination), fostering optimal performance from each team member necessitates an accommodating approach. The absence of alignment in this realm signals issues with trust within the team, originating from the organisation, an individual, or both.

The research also affirms that to foster greater team cohesiveness in a hybrid team environment with limited natural interactions, stimuli for social interactions may be essential. Introducing humanising stimuli, such as team social gatherings and planned team-building events, becomes pivotal, a concept termed hybrid sociability alignment. This alignment is crucial for encouraging team members to transcend functional boundaries and collaborate effectively.

The thesis delves into exploring individual comfort levels within environments constrained by technology, owing to diverse ways of working (e.g., connecting with team members in various locations, time zone differences, and varying familiarity with technology tools). In essence, hybrid technology alignment is indispensable to ensure intentional connections consistently traverse the organisation, adapting to the team's needs, fostering psychological safety for team members to openly express ideas. Without deliberate connections within the infrastructure, teams lack the capability to address the diverse needs or learning curves inherent in hybrid team working arrangements, potentially impacting outcomes.

It is deduced that criteria spanning multiple levels (e.g., workplace autonomy, hybrid sociability, hybrid technology alignments) should be taken into account when evaluating the implementation or improvement of a hybrid team. There is also an implicit emphasis within these criteria on the adaptability to diverse needs and scenarios within a team/organisation.

7.4.3. Incorporating Functional Alignment Brokers

The thesis delineated circumstances wherein alignment through individuals or functional alignment brokers becomes imperative. Key factors for alignment, as discerned from the research, encompassed functional balance, team commitment, and organisational purpose alignments. Managers or business leaders should be prompted to comprehend areas of wavering team commitment and how organisational purpose permeates the entire organisation. A meticulous understanding of these aspects and identification of existing gaps are crucial for the intentional design of teams and NPD assignments.

Moreover, the presence of misalignment or gaps indicates robust functional identities, feeble team identities, and/or an overarching organisational disconnect. Consequently, the findings suggest that addressing these issues necessitates fostering more functional balance and/or realignment with individuals, teams, and/or the organisation to propel the team towards improved outcomes. This is attributed to the existence of either an excess of likeminded functions causing stagnation in achieving positive outcomes/goals or an inadequacy of likeminded functions.

Proposing functional alignment brokers with high-level intra-person functional diversity emerges as a strategy for instigating positive changes in team outcomes, given their weakened functional identities. This diminished functional allegiance results from these individuals possessing extensive experiential backgrounds, facilitating a more profound understanding of various roles within the team. The research establishes an initial criterion for these individuals, encompassing experience in handling at least three functional roles, demonstrating communication flexibility (understanding how to relate across functions), having a desire and ability to push the team, and possessing a deep curiosity about other roles on the team to aid learning objectives. The employment procedures or strategies, such as job rotation, involving the reassignment of team members to various departments (Bobbitt et al., 1978), have been

acknowledged for their capacity to enhance knowledge generation within the realm of new product development (Song et al., 2006).

Nevertheless, these individuals can be strategically deployed by organisational leaders or self-positioned by NPD team members as change agents in areas marked by increased relationship or process conflict. They prove beneficial in aiding each function's comprehension of perspectives different from their own, connected to the broader team or organisational identities. Consequently, permitting positive tension to emerge while managing negative tension for creative outcomes in NPD teams can serve as a potent innovation strategy (Bobbitt et al., 1978; Song et al., 2006).

7.4.4. Trans-level Alignment Focused Environments

Finally, establishing adaptable work environments that cater to the diverse needs and preferences of team members and refining the supporting structures are vital aspects of trans-level alignment. The primary objective of this concept is to improve performance outcomes and unlock teams' full potential. To attain these desired results, managers should give precedence to incorporating new individuals and their knowledge into the team. This involves not only considering individual abilities or values and preferences in isolation but also evaluating both types of fit within the multi-level contexts advocated by the trans-level alignment concept.

The all-encompassing approach underscores the dynamic nature of team composition, taking into account perceptions of misalignments at the organisational, team, and individual levels as perceived by existing team members. Only by comprehensively understanding the broader picture and the interconnected components can we fully realize the true potential of teams operating in these environments.

By acknowledging the significance of trans-level alignment and embracing its principles, organisations can cultivate an environment that optimises team performance and enables teams to thrive. It is through this comprehensive understanding and proactive approach that the true potential of teams can be unleashed and harnessed in these dynamic and complex work settings.

7.5. Research Limitations

In this segment, we delve into the limitations and drawbacks of the thesis, primarily emanating from factors beyond the researcher's control, such as time constraints, participant access, and certain aspects of the research design.

Firstly, a limitation arises from the time available for completing the thesis, leading to the adoption of cross-sectional designs in the studies. While longitudinal studies would have offered valuable insights into changes over time, practical constraints within the timeframe of the thesis prevented their implementation. It is noteworthy that cross-sectional studies, despite this limitation, provided advantages in swiftly acquiring data across various domains, minimising recall bias, and ensuring accurate participant experiences (Coughlin, 1990).

Another constraint relates to participant access, specifically in obtaining participants from a single organisation who were willing to openly discuss information-sensitive topics related to innovation or NPD. The 21% response rate for participant recruitment impacted the sampling strategy, necessitating the use of a non-probability sampling method due to the impracticality of probability sampling. This approach involved selecting participants based on specific characteristics identified by the researcher, derived from the literature review and research question. The lower response rate also posed challenges in recruiting a substantial number of participants from the same organisation, leading to the inclusion of regional innovation clusters and leveraging similarities found in well-known technology locations.

It is crucial to recognise these limitations, acknowledging their potential implications for the generalizability and representation of the findings. However, despite these constraints, the thesis managed to make valuable contributions within the given time and resource limitations. Future research endeavours can leverage these insights to address these limitations and deepen the understanding of the research topic.

Lastly, the third study employed a survey in its research design. While this approach facilitated the capture of a larger quantity of participant responses, the limitations of a survey included the inability to attain the same depth of answers or pose spontaneous follow-up questions as would be possible in interviews. Nevertheless, this survey design allowed a swift examination of factors obtained from the interview data in the first two studies, contributing to strengthening the position of the insights gathered.

7.6. Future Research Opportunities

Future research endeavours should address the limitations outlined in the preceding section (7.5), while also exploring additional opportunities to advance the research direction. Leveraging the contributions outlined in Table 7.1 as a foundation, Table 7.2 presents additional questions crafted for prospective investigations. The focus of future research should revolve

around scrutinising specific interaction points within the life cycle of new product development to pinpoint optimal opportunities for impact and timing. Conducting longitudinal studies within a single organisation would be apt for examining the evolution of teams and interaction points over time, particularly when investigating emergent states and their operationalisation, including motivational team emergent states.

Table 7.2 Future Research Investigations

Contributions	Future Research Questions for Investigations
Trans-level considerations	• How might key interactions within the hybrid team working arrangements accelerate or hinder team performance? • Which motivational team emergent states foster better innovation outcomes in hybrid teams? • When and how do operationalised emergent states impact degrees of virtuality?
Functional identification patterns	• Under what conditions do functional allegiances need to be re-visited in teams?
Functional alignment broker roles	• How and in what compositions do various functional alignment broker roles facilitate better innovation outcomes? • How do functional alignment broker roles affect teams over time?
Misalignment combinations	• How do different degrees or combinations of misalignment influence NPD performance? • Under what conditions does alignment need to be reassessed in teams?
Trans-level alignment model	• How might organisations cultivate broader competencies related to a trans-level alignment approach? • How might a trans-level alignment approach promote and cultivate AI to reap team outcome benefits?

Another avenue for research entails evaluating the timeframe required for alignment to manifest within teams and determining when functional alignment patterns necessitate reassessment. Additionally, delving into the role of functional alignment brokers warrants further investigation. Analysing additional variants along the spectrum of roles and identifying the most effective team compositions for each variant could yield valuable insights. Semi-structured, in-depth interviews with functional alignment brokers could offer valuable data to address these research questions.

Furthermore, there is potential for further research to explore different combinations of misalignment beyond the survey data collected in Chapter 6. The seven types of misalignments

identified could undergo further examination to assess their short-term or long-term impact on an organisation.

Lastly, an area for further development involves not only formulating strategies for long-term organisational commitment to a trans-level alignment approach but also determining how to embed this mindset into the organisation's business ethos. This contribution would enhance the development of a more comprehensive theory within the domain delineated by this thesis.

In conclusion, the proposed directions for future research present opportunities to delve deeper into specific aspects of team alignment, emergent states, misalignment, and organisational commitment. By addressing these areas, researchers can contribute to the ongoing development and refinement of the trans-level alignment approach in the field.

7.7. Chapter Conclusion

This chapter presents a concise summary of the responses to the central research question and sub-questions of the thesis, explores the implications and contributions of the findings, and highlights potential avenues for future research. The thesis, comprising three studies that employed qualitative and mixed methods, delved into the impacts of hybrid team arrangements within New Product Development (NPD) teams across multiple organisational levels. A distinctive feature of this research was its adoption of an interdisciplinary perspective, contributing significantly to the existing literature on NPD teams.

The initial study aimed to define the efficacy of hybrid teamwork throughout various organisational levels, identifying structural factors influencing hybrid environments. The second study pinpointed key factors for aligning team members in NPD settings, investigating strategies for achieving such alignment. The third study focused on enhancing person-environment fit through team member alignment to improve overall team outcomes. These findings hold practical significance for design researchers, educators, and practitioners engaged in diverse functional teams.

In essence, this research offers substantial contributions to academic literature. Theoretical advancements include the evaluation of teams through a holistic framework, generating fresh insights across individual, team, and organisational levels. It illuminated the sources of tension within teams utilised for competitive advantage, like NPD teams, attributing such tension to ingrained functional allegiances and diverse patterns of functional identification.

The study recommended assessing team compositions by considering the functional tendencies of team members as a precursor to potential tension or misalignment. Additionally, the research progressed the understanding of brokering roles in functionally diverse teams by shifting the focus from a passive to an active role.

In summary, this research elevates NPD theory and literature by introducing a unified approach to evaluate teams and integrate new individuals, ultimately leading to improved team outcomes and the optimal utilisation of expertise. The chapter concludes with recommendations for future research and ongoing development in this field.

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Appendix

A1: H-Index (Seminal Authors)

(NOTE: H-index and citation count obtained May 20th, 2023, from Goggle Scholar)

Key Authors	H-index	Citations	Research Areas	Chapter
Terri Griffith	31	7616	innovation, sociotechnical systems, work and technology, technology and organizations, work design	4
John E. Sawyer	19	10,492	organizational behaviour, creativity & innovation, teams, virtual teams	4
Margaret Neale	69	31,110	teams, negotiation, human resource management, diversity	4
Catherine Durnell Cramton	17	5,357	Global teams, Coordination, Virtual teams	4
Michael D. Johnson	21	8,776	Groups and teams, social identity, emotions and moods	4
Daniel R. Ilgen	not found			4
John R. Hollenbeck	not found			4
John E. Mathieu	91	61,708	Organizational Behaviour, teams, Groups, Multiteam Systems	4
M. Travis Maynard	30	9,854	Organizational Behaviour, Team Effectiveness, Management	4
Stephen Zaccaro	67	34,125		4
Michelle A. Marks	not found			4
Jeff LePine	49	49,122	teams, stress, engagement, leadership, trust	4
Ronald F. Piccolo	29	21,947	Leadership, personality, motivation	4
Christine Jackson	13	6,230	Organizational Justice, Leadership, Psychological Collectivism, Team Effectiveness	4
Amy Edmondson	74	68,218	Organizational behaviour, psychological safety, teams, teaming, organizational learning	4
Sandra L. Robinson	42	41,440	management, organizational behaviour, trust, deviance, psychological contracts	4
Leon Festinger	not found			4
Pamela Hinds	45	14,734	Global Teams, Working Across Cultures	4
Marianne W. Lewis	34	23,315	paradox, leadership, innovation	5
Mary Beth Pinto	28	5,260		5
JK Pinto	67	22,784	Project Management, Innovation, Program Management	5
John E. Prescott	42	14,448	Strategic Management	5
Kay Lovelace	not found			5
Debra L. Shapiro	62	23,833	Managing conflict, perceived injustice, team dynamics, and cross-cultural challenges	5
Gerald Goodwin	23	10,033	Psychology, Teams, Leadership	5
Andrew Hargadon	27	16,179		5
Robert I. Sutton	61	45,079	Organizational Behaviour, Organizational Theory, Leadership, Innovation	5
Blake E. Ashforth	85	102,449		5
Fred Mael	not found			5
Rajesh Sethi	not found			5
Daniel C. Smith	24	8,503	Marketing Strategy, Consumer Decision Making	5
C. Whan Park	54	36,187	Branding, Consumer Behaviour	5

Alok Chakrabarti	44	18,164	Technology Management, Strategy, Management	5
Daan van Knippenberg	105	51,448	Organizational Behavior, Leadership	5
Carsten De Dreu	109	59,857	Intergroup Conflict, Cooperation, Creativity and Innovation, Decision Neuroscience, Group Performance	5
Laurie R. Weingart	44	18,635	negotiation, conflict, conflict management, group processes, teams	5
Karen Jehn	59	42,181	conflict management and negotiations, group processes and team effectiveness, research methodology, workplace diversity, politic	5
Peter j. Burke	60	40,000	social psychology, identity, math models	5
Kathleen L. Gregory	not found			5
Jan Stets	63	27,261	identity, self, emotions, morality	5
Rohit Deshpande	49	40,437	Marketing, Branding, Business of the Arts, Cultural Entrepreneurship	5
Frederick E. Webster Jr.	45	32,202	Marketing	5
Mary Jo Hatch	57	35,894	organization theory	5
Majken Schultz	45	30,659		5
Ute Hulsheger	33	9,129		5
Neil Anderson	76	34,521	Organizational Psychology, HRM, Innovation, Creativity, Employee Selection	5
Blake E. Ashforth	85	102,449		5
Kristie Rogers	12	2,075	Organizational Behaviour	5
Kevin Corley	42	34,276	Organizational Behaviour, Organizational Change, Strategic Leadership	5
Deborah Ancona	37	16,761	leadership capabilities, team process and performance	5
David F. Caldwell	not found			5
Tony Simons	29	11,854	Organizational Behaviour	5
Randall S. Peterson	29	10,358	Teams, Conflict, Trust, Top Management Teams	5
Kevin Lane Keller	114	275,387	Marketing, Branding, Brands, Brand Management	5
Mark Mortensen	20	4,618	Teams & Groups, Global Virtual Teams, Distributed Work	5
Joseph Berger	50	16,182	Status Characteristics theory, Expectation States theory, social psychology, group processes	5
Susan J. Rosenholtz	not found			5
Morris Zelditch, Jr.	not found			5
Christine Moorman	47	44,142	Marketing, Marketing Strategy, Learning, Health	5
Gerald Zaltman	59	45,255		5
John R. Hauser	63	33,186	Marketing, Management, Product Development	5
Anthony Di Benedetto	55	15,614	Innovation, new product development	5
Ravi Madhavan	22	7,885	Strategic Management	5
Rajiv Grover	not found			5
Boas Shamir	63	34,986	Leadership, motivation, identity, charisma, followership	5
Michael B Arthur	53	34,890	careers, knowledge work	5
Robert J. House	not found			5
Paul R. Carlile	21	12,207	Innovation, open innovation, boundary objects, knowledge work, practice theory	6
Deborah Dougherty	not found			6

Linda Argote	55	43,439	Organizational Learning, Knowledge Transfer, Group Processes and Performance	6
Paul Ingram	44	20,915	Leadership, Organizational Theory, Strategy	6
Beth Bechky	22	10,943	occupations, organizations, work, technology, qualitative methods	6
Natalia Levina	30	7,383	Information Systems, Crowdsourcing Innovation, Outsourcing, Boundary Spanning, Bourdieu	6
Emmanuelle Vaast	33	6,592	Information Systems, Organizations, social media, online communities	6
John Seely Brown	not found			6
Paul Duguid	not found			6
D Wegner	95	68,293	psychology	6
Michael A West	not found			6

NOTE: Per Hirsch (2005):

- h index of 20 after 20 years of scientific activity, characterizes a successful scientist
- h index of 40 after 20 years of scientific activity, characterizes outstanding scientists, likely to be found only at the top universities or major research laboratories.
- h index of 60 after 20 years, or 90 after 30 years, characterizes truly unique individuals.

A2: Chapter 4 & 5 – Interview Guide Questions and Rationale

QUESTION GUIDE AND QUESTION REASONING:

[NOTE: Follow-up questions were only asked if the aim of the initial question was not met yet]

1. Background / Experience	Team Effectiveness Factors
a. Tell me about yourself. Which roles have you fulfilled in your career? Is this a different path than what you studied at university? *>>> **Question Aim**: Learn about work and educational background, and any role of credentials* *>>>**Applicable Studies**: 1 & 2* *>>>**Follow-up Question:** Given your career path, is there an achievement or credential that is something you hold in high regard in your field/others?*	Functional background and formal training [NOTE: potential to establish baseline with alignment to functional identities (Ashforth et al., 2011; Glynn et al. 2010; Mesmer-Magnus et al. 2018)
b. How does your role fit at your current organisation in terms of carrying out your organisation's goals? How do you achieve that on a day-to-day basis? *>>> **Question Aim**: Understand status and relative position within the organization* *>>>**Applicable Studies**: 1 & 2*	Positioning within the company / Status (Mathieu et al., 2008)
c. What types of products have you developed in teams over the years? How long have you been in product development? *>>> **Question Aim**: Identify sector experience and type of product development experience* *>>>**Applicable Studies**: 1 & 2*	Years of experience / sector (control)
d. From a work standpoint, what do you think are your most effective skills (top 3) or attributes? (individually and as a team) *>>> **Question Aim**: Learn about team member competencies, potency, and views of effective teams* *>>>**Applicable Studies**: 1 & 2* *>>>**Follow-up Question:** Given these skills, how do you think it helps or fits in from a team / task standpoint? Can you describe a team situation where you felt out of your depth and how did you handle it?*	Potency – self-rating (Guzzo et al., 1993), Competencies (skills, attributes, talent, KSA), (Morgeson et al., 2005) [NOTE: Explore functional awareness about their own knowledge]

e. Given the following, which three best describe you in terms of your interests and aspirations:

- Realistic – 'the do-er'
- Investigative – 'the thinker'
- Artistic – 'the creator'
- Social – 'the helper'
- Enterprising – the persuader'
- Conventional – 'the organisor'

*>>> **Question Aim**: Identify team member interests and lead in for participants to talk about views of other team members*

*>>>**Applicable Study**: 2*

*>>>**Follow-up Question:** Given the terms, is there one that you may find challenging to work with and why?*

Identify interest domains/RIASEC code (Holland, 1997), explore potential links to different tendencies (LePine, 2008) and sense of underlying character

[NOTE: Possible probe to a discussion about existing depictions of team members]

2. <u>Multidisciplinary Team Experience</u>

Team Effectiveness Factors

a. Typically, how many team members are in a core project team for a new project? In your experience, does the size of the team matter for it to be effective?

*>>> **Question Aim**: Identify team size*

*>>>**Applicable Studies**: 1 & 2*

Group size (control / positioning question)

b. Which team members do you interact with most frequently? Least frequent (e.g., disciplines)? Which of those interactions do you feel most comfortable in navigating and why?

*>>> **Question Aim**: Identify level of cross-functionality, trust, tensions and opens to exploration for follow-up questions for interactions between specific functions*

*>>>**Applicable Study**: 2*

*>>>**Follow-up Question:** Do you have experience working with [function]?*

Composition, level of cross-functionality (Lee and Chen, 2007) and open exploration into connections, interactions and experiences to other team members/functions

c. What do you find is the biggest barrier to effective communication / coordination between team members and why?

*>>> **Question Aim**: Lead to discussion about potential conflict and impacts on communication / team functioning*

*>>>**Applicable Studies**: 1 & 2*

*>>>**Follow-up Question:** How do these barriers impact the outcome?*

Exploration into potential conflict factors and other barriers

[NOTE: Use only if question has not been covered during discussion]

d. What do you consider product success?

*>>> **Question Aim**: Understand what the participant identifies as important*

*>>>**Applicable Study**: 2*

Exploration into potential outcome metrics

e. With the current CoVid-19 situation, how has this changed your work as a team? What has worked well? What has not worked well?

*>>> **Question Aim**: Learn about hybrid working environment*

*>>>**Applicable Study**: 1*

*>>>**Follow-up Questions:** Prior to the pandemic were your team members working in a remote format in any way? Do you see opportunities in working this way post pandemic?*

Virtuality (Schweitzer and Duxbury, 2010) – the degree of use of virtual tools

3. <u>Perspectives / Values</u>

Team Effectiveness Factors

a. When you start working on a project, what are your motivations for completing that project?

*>>> **Question Aim**: Understand drive/values and sensitivity to other team members*

*>>>**Applicable Study**: 2*

*>>>**Follow-up Questions:** With the different levels of involvement on the team, would you say that all the team member's motivations are the same? If no, what do you think is impacting the difference?*

Motivation (Marks et al., 2001) and exploration on perceived commitment

[NOTE: Only include question if there is trouble getting information on differences between functions]

b. What is it about your company or team culture do you think works? Or doesn't work?

*>>> **Question Aim**: Understand connection to current culture*

*>>>**Applicable Study**: 1*

Exploration into thoughts on company culture, org identity (Dutton et al., 1994)

c. If there was a product development draft in your organisation and you had to fill 5 spots with disciplines for the project to be the most effective, which would you choose and why?

*>>> **Question Aim**: Understand perceptions of team member value*

*>>>**Applicable Study**: 2*

Exploration into thoughts on other function's value

d. Rate your preference from 1 (avoid) to 10 (relish / enjoy), for …. And why?

(1) Data – reviewing specs, statistics
(2) People – pitching the product
(3) Ideas – brainstorming new ideas
(4) Things – building a prototype

*>>> **Question Aim**: Identify personal interest dimensions and if it differs from team members*

*>>>**Applicable Study**: 2*

Interest Dimensions (Prediger and Vansickle, 1992) and exploring misalignment

A3: Chapter 4 – Coding Structure

Individual Factors *(Workplace Autonomy Alignment)*

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
• Slowed progress with lack of in person check-ins with engineers *–INV-001* • Lack of communication, less productive and less informed members *–INV-006* • Less productive overtime *–INV-009* • Meetings run longer than scheduled *–INV-007* • Lonely experience / less efficient overall *–INV-026* • Ingrained mentality for consecutive meetings daily w/ no break *–INV-12*	Less productive	Boundaryless Environment
• Communication barrier which leads to additional work / explanations *–INV-018* • More work/nothing to break up the transition between work & home *–INV-015* • More work required to complete the same tasks *–INV-007* • Rollercoaster in communication timing *–INV-020*	More work	
• Learning curve based on comfortability with technology *–INV-010* • Learning curve for those first exposed to the fully digital world *–INV-012* • Learning curve for those used to working in the same office *–INV-014* • Abrupt change to remote work *–INV-003*	Learning curve	
• Potential for mental health issues remaining in state of focus *–INV-008* • Mentally exhausting in-home environment *–INV-024* • Mental strain for professions that are more interactive *–INV-010*	Mental health challenges	Overworked Resources
• Lack of eye contact makes focusing challenging *–INV-028* • Zoom fatigue and lack of engaging, motivating and concise meetings *–INV-023* • Zoom fatigue / Unclear boundaries when communicating work *–INV-021* • Psychologically always on the clock / possible burnout potential *–INV-011* • Overworked, because nothing else to do *–INV-018* • Company experienced burnout *–INV-026*	Zoom fatigue / Burnout	
• Unenjoyable lonely working environment with too many distractions *–INV-001* • Demotivating experience with solo work and absence of sharing ideas *–INV-022* • Hates working at home, due to lack of people *–INV-019* • Lonely experience / less efficient overall *–INV-026*	Lonely and de-motivating	

Team Factors *(Hybrid Sociability Alignment)*

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
• Lack of real-time feedback and in the moment excitement *–INV-008* • Lack of in-person contact takes away from human experience *–INV-028* • Lack of human interactions (hallway conversations) *–INV-029* • Struggling to find avenues for team members to communicate *–INV-020*	Lack of real-time feedback	Feedback Constraints
• Lack of spontaneity in work and artificial forced work format *–INV-024* • More scheduled, no hallway/kitchen/water cooler talks *–INV-015* • Lack of comradery / humour / banter among colleagues *–INV-008* • Lack of social interactions *–INV-023* • Awkward Zoom socials rather than natural in-person interactions *–INV-017* • Increased number of social check-ins (happy hours, virtual lunches) *–INV-018* • Lack of informal check-ins (e.g., walking past the desk) *–INV-025*	Lack of spontaneity / social relationships	
• Understanding technical language with a different background *–INV-008* • Engineering language is deadline oriented *–INV-016* • Technical conversations w/ eng. and business conversations w/ PMs *–INV-011* • Knowledge gap between team members disciplines *–INV-012* • Lack of technical knowledge when communicating *–INV-014*	Challenges understanding /communicating with technical	Communication Loss

• Engineers and Marketing different types of communication –*INV-026*	functional languages	

Organisational Factors *(Hybrid Technology Alignment)*

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
• Clarity and timeliness of communication –*INV-025* • No clear goals or overarching goals –*INV-032* • Every department believes they have the final decision –*INV-021* • Delinquent communicators that require additional work –*INV-007*	Communication / goal clarity	Goal Clarity
• Team conversations involve unknowns, scope, delivery, and compromise –INV-022 • Late scope changes disrupting existing work –*INV-019* • Different priority perspectives and understandings between disciplines –*INV-031* • Tension due to uncertain/unclear priorities between team members –*INV-009* • Requirements do not always reflect true product expectations –*INV-026*	Scope / priority changes	
• Engineers stopping conversations questioning feasibility –*INV-008* • Engineers' resistant to hearing change in their field –*INV-024* • Defensive engineering stance on process and product –*INV-028* • Condescending engineering approach during discussions –*INV-004* • Engineering not accepting feedback on own solution –*INV-013* • Judgmental teammates discourage productivity & other questions –*INV-018* • Engineers dismissing Manufacturers based on their own arrogance –*INV-019* • Sarcastic laughs to impossible requests –*INV-030* • Engineers are definitive in their thinking (e.g., black or white) –*INV-010* • Engineers not listening to what is needed for the team –*INV-014*	Engineers stopping conversations	Disconnected
• Unwillingness to integrate perspectives –*INV-024* • Inability to see team goals instead of individual goals –*INV-028* • Naysayer roles on teams (engineering and marketing) –*INV-013* • Argumentative engineers eliminating teamwork possibilities –*INV-019* • Software engineers disconnected and uncommunicative in the team –*INV-027* • Insecurity of technical team members afraid to ask for help –INV-005 • Design and Engineering focus conflicting –*INV-033*	Unwilling to integrate perspectives	

Emergent States

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
• Engineer and Designer communication alignment –*INV-008* • Communication alignment with engineering outcomes/goals –*INV-029* • Clear goals align questioning from multiple disciplines toward outcome –*INV-017* • Design and engineering front-end alignment benefits outcomes –*INV-023* • Focused on common team goal / collective approach –*INV-004* • Alignment with engineers toward the goal –*INV-019* • Work synergy toward a common goal with constant communication –*INV-027* • Designing with manufacturing in early stages of development –*INV-030* • Need to be very transparent when speaking with engineering –*INV-021* • Aligning team member interests to make and execute products –*INV-007* • Everyone working towards the same goal / commitment –*INV-020*	Goal / *communication* alignment across functions	Team Cohesion
• Openly exchanging / challenging ideas –*INV-028* • Team discussions for decision making –*INV-029* • Environments with open disagreements is healthy in teams –*INV-022* • Humble team members in environment that allows questions –*INV-011* • Increased feedback and performance reviews in communication –*INV-018* • Reaching consensus / continuing discussions in times of disagreement –*INV-031* • Willingness to help team members regardless of background –*INV-019* • Humility to achieve success –*INV-003*	Open *communication* environment allows exchange of ideas	Psychological Safety

• The ability to communicate between team members produces results *–INV-002*		
• Getting people comfortable / building trust *–INV-032* • More challenging to build rapport *–INV-013* • Uncertainly about starting a completely virtual project *–INV-007* • Challenging to make new relationships during the pandemic *–INV-020* • Unclear boundaries when connecting / communicating work *–INV-021* • More misunderstanding / mis-intent *–INV-009* • Responsiveness and emotional intelligence when communicating *–INV-002* • Team member ability to relate to people for communication *–INV-007* • Understanding people's strengths / weaknesses *–INV-012*	Un/Comfortable *communication* among team members	Team Trust or *Shared Organisational Trust*

A4: Chapter 5 – Coding Structure

GOAL ORIENTATION >> Functional Perspectives

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
Design • Bringing value to the customers / Creating impact in people's lives *–INV-017* • Successful product people use or are inspired by products/people *–INV-023* • Solving problems for the consumers *–INV-016* • Products should be persuasive for consumers *–INV-033*	Customer-oriented for value / product creation	User Oriented
Engineer • Engineers like solving problems *–INV-003* • Task-oriented *–INV-027* • Mechanical engineers care more about function than aesthetics *–INV-019* • Hands on work ethic expected in the area *–INV-030*	Engineers are technically / task oriented	Problem Solvers
Operations • Team focused on the end success not individual task driven *–INV-004* • Pride in the product produced / contributions *–INV-011* • Strong connection with the outcome of a product *–INV-004* • Engineers focused on function *–INV-013*	Engineers take pride in the delivered product	Responsible
Marketing • Marketing is the ultimate creative role *–INV-009* • Ideas must consider marketing to be successful *–INV-010* • Marketing and Design overlap *–INV-009* • Belief perspective is best path forward *–INV-021*	Marketing overlaps or supersedes other roles	Authoritative
Project Manager • PM role provides a systematic way of looking at the organization *–INV-012* • Project manager is the constant throughout the lifecycle of the project *–INV-007* • PM is the "babysitter" / overseer of the process *–INV-014* • Facilitates open communication environment with criticism and feedback*–INV-005*	Project Management oversees development	Overseer

PERFORMANCE EVALUATION STANDARDS >> Functional Perspectives

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
Design • Success is products that help people *–INV-001* • Success is bringing value to the customers / Creating impact in lives *–INV-017* • Success is what value is delivered *–INV-023* • Success is solving problems for the consumers *–INV-016* • Solving the right problems (success) *–INV-022*	Success means solving problems / bringing value	Altruistic
Engineer • Success definition is technological advancement *–INV-018* • Success is completing assigned task *–INV-019* • Success is meeting goals *–INV-030* • Success is designing something that functions as intended *–INV-027* • Success is product performance *–INV-031*	Success means completing functional task / advancement	Functionality
Operations • Success is on time, good quality and meets budget *–INV-011* • Success is product performs to specifications, good quality and sells *–INV-013* • Success is meeting schedule while maintaining quality *–INV-004* • Success is quality parts/assemblies shipped to customers *–INV-006*	Success is meeting the product requirements / production goals	Production Capability

Marketing • Marketing view success as business value *–INV-009* • Success is market / brand / company success *–INV-010* • Product success is revenue / profit *–INV-021* • Success is learning something about the customer *–INV-015* • Success is ROI *–INV-002*	Success is business oriented (customer, revenue, brand)	Business Objectives
Project Manager • Success is meeting all requirements / internal expectations*–INV-005* • Success is achieving the timeline, budget, quality *–INV-007* • Meeting deliverables and timelines *–INV-012* • Success is a product that matches the product specifications*–INV-014* • Success is meeting budget and schedule targets *–INV-020*	Success is meeting requirements	Fulfilment

PERFORMANCE INFLUENCERS >> Functional Perspectives

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
Design • Tech expert is not thinking about value to customer, but best for science *–INV-023* • Unwillingness to stray from previous experience / modes of operating *–INV-022* • Engineers want to deviate from design vision *–INV-001* • Engineers time focused *–INV-016* • Engineers focuses on realistic things *–INV-033*	Engineering righteousness tendency	Engineers deviate from design / user benefits
Engineer • Inexperience in Design is frustrating *–INV-019* • Design concerned about art vision rather than feasibility*–INV-030* • Business can make unreasonable requests *–INV-003* • Marketing based on personal knowledge of customer requirements *–INV-018*	Questions accuracy of marketing/design knowledge	Marketing / Design disregard functionality
Operations • Questioning of marketing knowledge in an area *–INV-006* • Engineering is more about function than aesthetics *–INV-004* • Industrial design is concerned about aesthetics*–INV-013* • Feedback from business is always negative / what was missed *–INV-013*	Marketing/Design work lacks precision / reason	Marketing / Design lack production consideration
Marketing • Engineers focused on micro level *–INV-009* • Engineers view things as black or white *–INV-010* • Engineers question legitimacy/feasibility of ideas with righteousness*–INV-002* • Older engineers are less flexible in work processes *–INV-009*	Rigid / In-flexible engineering team members	Engineers stop designs
Project Manager • Understanding people / empathizing in teams *–INV-020* • Ability to manage expectations from team members and stakeholders *–INV-014* • Recognize different receivers of information *–INV-007* • Adapts communication style based on who is in the room *–INV-012* • Communication flexibility when speaking with different audiences *–INV-026*	Flexible communication style for different disciplines	Balancing inconsistent team member approaches

FUNCTIONAL IDENTIFICATION >> in relation to other functions

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
Design • Need early involvement of multiple disciplines *–INV-023* • Communication translations needed across disciplines *–INV-016* • Balance of members w/ diverse perspectives that can communicate *–INV-022*	Flexibility / Inclusion across disciplines	identity related to the team

• Understand timelines across functions *–INV-001*		
Engineer • Engineer believes they have all the answers *–INV-019* • Being an engineer is my identity *–INV-027* • Not everyone can be an engineer *–INV-030* • Engineers focused on building something technically impressive *–INV-003*	Engineering ego / attitude	strong functional identity
Operations • Engineers want to be right *–INV-006* • Engineers need to be right *–INV-013* • Engineering tends to be arrogant *–INV-004* • Pride in the product contributions *–INV-011*	Engineering fixation / pride	strong functional identity
Marketing • Ideas must consider marketing to be successful *–INV-010* • High value on entering / launching new markets *–INV-010* • Perspective is the best path forward *–INV-021* • Success/Importance/Value is connected to business field *–INV-009; 010; 021; 002*	Value associated with marketing / business field	strong functional identity
Project Manager • Importance of aligning all interests in the company *–INV-007* • Conduit to understand discipline challenges / needs *–INV-012* • Willingness to learn and critically think *–INV-005* • Importance of knowing your responsibility / expectation on the team *–INV-014* • Knows needs for the individuals involved in each meeting *–INV-012*	Expectation for creating alignment among others	weaker functional identity

FUNCTIONAL IDENTIFICATION >> in relation to the NPD team

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
Design • Emphasizes ability to collaborate with engineers *–INV-001* • Understanding discipline needs *–INV-016* • Understanding different fields to facilitate mutual respect *–INV-023* • Understanding roles within teams at a high level *–INV-017*	Collaboration sensitivity across disciplines	connected to understanding team members
Engineer • Marketing makes things up / irresponsible *–INV-019* • Questions occur over whether marketing data is accurate *–INV-027* • Engineers get ridiculous requests *–INV-030* • Project Manager stops the iteration process *–INV-027*	Lack of respect / understanding of functional experiences	negative slant against other functions
Operations • Marketing described as guesswork *–INV-004* • Questioning of marketing knowledge in an area *–INV-006* • Marketing requests can be irrational / against logic *–INV-013* • Dismissive of other discipline knowledge / project contribution *–INV-013* • Engineers have superior / condescending attitude *–INV-004*	Engineers have arrogant / dismissive tendency	dismissed other functions and team
Marketing • Marketing and Design overlap *–INV-009* • Lack of interest in other disciplines *–INV-009* • Each perspective believes they have the best path forward *–INV-021* • Close-minded individuals in product development *–INV-002*	Marketing has less connection / interest in other disciplines	lower levels of connection to team
Project Manager • Awareness of team member needs when communicating*–INV-020* • Understanding people's strengths and weaknesses and aligning tasks *–INV-012*	Open communication / willingness to	team-centric

• Communication ability to relate to people / understand motivations *–INV-007* • Encourages open discuss to influence better team working *–INV-026* • Team member need empathy / understanding different abilities *–INV-007*	understand different disciplines	

FUNCTIONAL IDENTIFICATION >> in relation to the broader organisation

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
Design • Communication by focusing team on same goal *–INV-017* • Designers maintain product vision *–INV-001* • Interactions with design bigger picture / broad *–INV-001* • Design role is to empathize with users and business goals *–INV-016*	Broader team goal alignment	related to the broader vision of the organization
Engineer • No interest in learning about marketing *–INV-019* • More Important making a product that is life sustaining *–INV-003*	Lack of efforts to understand broader objectives	lower attachment to the broader organization
Operations • Marketing has the power *–INV-013* • Marketing tends to be more power-driven *–INV-004*	Marketing has more power in team / disconnection	lower attachment to the broader organization
Marketing • Perspective is big picture oriented *–INV-010* • Jack of all trades – involved in many areas of the business *–INV-002*	Marketing has broad view of business	connected with the organizational identity
Project Manager • Project management is the channel between business and technical teams *–INV-005* • Role connection between marketing/sales teams and tech *–INV-012* • Understands how to utilize different methods of communication *–INV-007* • Makes information accessible *–INV-007* • Ability to manage expectations from team members and stakeholders *–INV-014*	Project Management is connection between technical and business	link between organization and team

FUNCTIONAL ALIGNMENT BROKERS

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
• Helps designers beyond functional roadblocks *–INV-025* • Communication switch based on who's in the room *–INV-008*	communication flexibility between functions	influencers
• Understands functional challenges and limitations *–INV-029* • Understands wants, needs, desires, aspirations, challenges, and problems *–INV-025* • Broad professional experience allows possibility to relate more to others*–INV-008* • Habit of listening before participating in teams*–INV-024*	functional empathy	relatable
• Bridge between worlds *–INV-024* • Bridge between idea [design] and product management *–INV-032* • Prefer teamwork over individual work *–INV-028* • Helping people developing themselves, develop their ideas *–INV-025*	relationship-builders across functions	being personable
• Capabilities for comprehending both engineering and future visions *–INV-008* • Ability to see future differentiations for the company *–INV-024*	future-oriented / business perspective	strategic
• Make directional changes without anyone noticing *–INV-024* • Enhanced the functional roles by understanding other opinions *–INV-008* • Works to expands the team knowledge beyond the functional siloes *–INV-028*	push functional units	challengers

• Need to continuously learn *–INV-029* • Willingness to learn new disciplines / technology *–INV-008*	curiosity about functional roles	continuous learners

A5: Chapters 4 & 5 – Coded Interview Transcript Example

Coding_INV-019

INTERVIEW DATE: August 16, 2020
INTERVIEW LENGTH: 00:55:29
CODE: INV-019
OCCUPATION: Mechanical Engineer
LOCATION EXPERIENCE: Silicon Valley

Line	INV-019 Interview Transcript	CODE
1	**Interviewer:**	
2	Okay, so we are recording. Essentially, there are three sections of questions,	**<< Question 1a/b/c >>**
3	a little bit about your background and experience, and we'll talk about your	
4	experience in multidisciplinary or cross functional teams, and then finish it	
5	up with your thoughts on different values in teams or perspectives in teams.	
6	So, standard first interview question, tell me about yourself. What types of	
7	roles have you had over the years?	
8		
9	**INV-019:**	
10	Okay. So, I'm a mechanical engineer. I've been working for 12 years and I	
11	started in aerospace. My first job was in aerospace in Albuquerque, New	Aerospace experience
12	Mexico, which was very 9:00 to 5:00, not a lot of creativity, but it was a	
13	great place to start because I learned how to do drawings, I worked with	
14	machinists that had been working for 25, 30 years. Because I came in the	
15	person with the least amount of experience was 10 years, that was like,	
16	"You're a baby. You've only been working for 10 years," which is now that	
17	I've been to startups, it's just hilarious. But it was a great place to start	Startup experience
18	because those people were just seasoned and they just wanted to teach you	
19	what they knew.	
20		
21	**INV-019:**	
22	So, it was actually... I was so unsure of myself and I just got lucky that I'm	
23	still working in this profession because the path and the people that I	
24	encountered were good people. So, aerospace was good. It was a good little	
25	nest for me to develop and good people to learn from doing things the right	
26	way, smoothing slowly, although that killed me because it was pretty	
27	boring. It could be really boring. It's 9:00 to 5:00, 9:00 to 5:00. I think that	
28	was one or two weeks that I worked over 40 hours because my counterpart	
29	was on vacation one time, so I was like, "Okay." But for me, looking back	
30	it was perfect.	
31		
32	**INV-019:**	
33	Then, I went to a helicopter company because I didn't know what I wanted	
34	to do, and it was aerospace. And the Bay Area was extremely intimidating	
35	because you have Berkeley and Stanford and people that have already been	
36	doing it for so long. I did actually interview for [Company A] back when I	
37	was at [Company B], and they're like, "You don't have enough experience.	
38	You don't have enough experience," and I get that looking back, although I	
39	think I would have been fine. It just would have been a big transition.	
40		
41	**INV-019:**	
42	So then, I just stayed in aerospace because I knew it. And so, I went to a	
43	helicopter company up in Oregon, and it wasn't for me. They didn't really	

44	know how to do design. It was like, they were operators of the helicopters	
45	and then they got the type certificates for the helicopters and then they were	
46	able to start doing design. So, I jumped in right when that was happening,	
47	and I did a design for them, CADded it up, got it prototyped, and they're	3D experience, prototyping
48	like, "Oh, so now it's ready for production," and you're like, "This is not the	
49	thinking. There's so much testing to do." They thought when some people	
50	see CAD, they think you're done, and you're like, "This is just the	
51	beginning. This is just a very small part in getting a product out." Even	
52	though it's intensive, it's just a piece. I've learned that, I used to think that	
53	"Oh, I'm such the shit, I CADded something. I'm amazing," no, you're	
54	fucking not. Go to China. No, you're fucking not. So, I did that.	
55		
56	**INV-019:**	
57	And then, I visited my friend here and went to a startup Christmas party	Networking event led to
58	and they're like, "Oh, you got to make it to the Bay Area. We'll send you	additional jobs
59	jobs. So, I met these guys and they sent me all these jobs. I linked up with	
60	my first startup and they flew me down. I got picked up in a Mercedes car	
61	and the guy had my name on a... I was like, "What the hell is this? This is	
62	amazing." Especially because aerospace, you're like packing your lunch	
63	bag, you walk in. It's just very old and just slow. So, I go to the startup and	
64	I got that job and it changed my life. It was incredible.	
65		
66	**INV-019:**	
67	I went to China 9 times in 10 months and I worked with the best mechanical	In person Asia
68	engineer I've ever met in my fucking life. He went to Berkeley for his	manufacturing experience
69	undergrad and masters, and he worked for [Manufacturing Provider A] on	
70	[Company C] products. So, he has met [Designer A] and walked around	
71	factories with him. And he's very quiet about all of that stuff. You don't	
72	know that he's just a machine. I've never worked with... He's a workaholic,	
73	too. There's a lot of crazy types of people here. I can be that way, but I know	
74	that's not the most important thing in life. And so, I don't want to do that.	
75		
76	**INV-019:**	
77	And it was really stressful. It was like drinking out of the firehose, but it	Respectful positive conflict
78	was also the best time. I've never shared CAD files with somebody. But	between manufacturing
79	him and I, we butt heads and we'd fight but I had the best time working with	engineers
80	him. But it was very stressful. It was very hard. We got the product out	
81	within one year. CADded everything, went to China, got the product out. It	
82	was a Kickstarter as well. The CEO is a piece of shit. He's a 23-year-old	Toxic environment
83	asshole that would yell his PhD to people in their face, nice people, and it	influenced by Founder
84	just felt like you're in an abusive household. You're just like, "This is not..."	abusive behavior
85		
86	**INV-019:**	
87	So, when I quit, that was the first time... When I quit, it's usually like, "Bye,	
88	[INV-019]," and I get signed stuff from all the people, and it's great. I had	
89	to walk out of that job without telling anybody because if you said any	
90	grievances, you would be fired. So, I deleted everything off my computer,	
91	personal stuff. I collected up my personal items, walked out, and then sent	
92	an email saying, "I'm giving my resignation immediately," because it was	
93	such a toxic environment. And this guy has a reputation. He's such a piece	
94	of shit, and he was just a baby. He just wanted to be Steve Jobs, and you're	
95	like, "Oh, dear God, if that's your aspiration, that's not good," especially	
96	when you're 23 and being an asshole just to be an asshole. So, it really	
97	changed my life, that first startup.	
98		
99	**INV-019:**	

100	Then, I went to [Company D], a drone company where I met [INV-016]	Drone company experience
101	and a really amazing group of people who got that product to launch. I	
102	joined after the product had already launched. So, I basically had a year of	
103	a lot of fun with them because the company couldn't decide what they were	
104	doing. We would work on stuff and then not work on stuff. And then we	After work socializing
105	would go go-karting. We just did so much fun stuff. We built a Mars Rover	contributed to fun
106	with this really smart PhD kid that I worked with. He's like, "Can you build	environment
107	me a Mars Rover?" I'm like, "Yeah, sure." So, we got 3D printed files and	
108	put all these sensors and stuff that we had from the office. So, that was just	
109	a shit show, and fun and just weird development work that didn't really go	
110	anywhere.	
111		
112	**INV-019:**	
113	And then, I went to [Company E]. [Company E] was a huge move for me	
114	because I was at my third startup and I got to own China. So, before when	
115	I worked at my first startup, I wasn't the owner of it. [Employee] was the	
116	president. I was the vice president support. On that job, the buck stops with	
117	me and it was the first time I was the only mechanical engineer that called	
118	all the shots. It was really fun. I loved having the power, but at the same	Lonely, pressure filled
119	time, it's lonely because you got to talk, you got to have another mechanical	experience when you are the
120	engineer to say, "Hey, what do you think of this? Did it..." Because we're	decision maker
121	100% better together because I could tell you any design thing and you	
122	could say, "What do you think about this?" And all of a sudden, the designs	
123	better. I definitely have that mindset. I don't have the fucking answers. So,	
124	I missed that.	
125		
126	**INV-019:**	
127	And then, I hired a guy that I was friends with at [Company D] who was	
128	younger than me, and I had a hard time. I'm not a manager. I just need you	
129	to be up and running. So, I had a hard time being that. We're still good	
130	friends to this day, but it was hard to work together because it's like, "I don't	
131	want to have to be telling you. And if you didn't do it, oh God." So, that got	
132	hard. And it was work from home, that's not my personality.	
133		
134	**INV-019:**	
135	And then, I had a friend from [Company D] go to [Company C], and he's	
136	like, "You should interview with [Company C]." It was up and down with	
137	the interview process, but then got hired in with [Company C]. I'm at my	
138	two years now with [Company C], and it's really nice to be back with a big	
139	company with an open checkbook where engineering can order the shit that	
140	they need and I don't have to fight with getting resources. So, this is the first	
141	time I've been at a job that I want to stay as long as I can because it's just	Financially beneficial
142	financially advantageous.	environment
143		
144	**Interviewer:**	
145	It's a really good job?	
146		
147	**INV-019:**	
148	The most I've ever been paid. But I mean, it's not perfect. There's stuff that	Lack of autonomy or respect
149	I get frustrated with. People should just let me do whatever I'm going to do	from management
150	because I'm like, "I'm going to get stuff done. Don't tell me what to do,"	
151	and I'm going to accomplish a bunch of shit and work well with people. So,	Conflict occurs when
152	I butt heads with them sometimes when I don't think people are making the	personally question
153	best decisions up top. That can be hard. Or being managed poorly, I have a	leadership decisions
154	hard time with. But anyway, so aerospace, startups, now I'm at [Company	
155	C] hardware.	

156		
157	**Interviewer:**	
158	Very, very cool. I have so many follow-up questions.	
159		
160	**INV-019:**	
161	Go for it.	
162		
163	**Interviewer:**	
164	So, one thing you said that stuck out the beginning was, and I've heard this	
165	before from other aerospace people, is that in aerospace, you learn how to	
166	do it the right way. What does that mean to you?	
167		
168	**INV-019:**	
169	Oh, here's the thing, in startups, you're with these kids, literally fucking	Startups have tendencies to
170	kids. It's their first job. And I was in the land of 26-year-old boys, and I'm	be younger less experienced
171	older than all of them. So, I'm just like, "Oh my God." They just have not	men
172	had... A startup isn't the best place for an engineer to start because you don't	
173	know how to do GD&T, you don't know how to do drawings, and	Less requirements in startup
174	everything is 100 miles an hour. So, I think it's on the Elon Musk quote like,	environment
175	"Break things and work faster." So, you have to have that method because	
176	you're just constantly making something, it doesn't work, and then you	
177	iterate. I'm a huge believer in iteration and giving the time for that.	
178		
179	**INV-019:**	
180	For aerospace, the reason it was good is because our schedules were like,	Aerospace industry focused
181	there was never a rush. Literally, I don't remember being pushed on	on functional correctness vs
182	schedule. We just moved really slow. So, it was like, "Okay, I'm going to	time dependencies (“right
183	get it machined." You get it machined, of course, you have to iterate on it,	way”)
184	you find, "Okay," and then you just have the time to work through your	
185	design until it's perfect. And another thing that's amazing is we used to have	
186	very... Because this is going to go on F=16. You cannot fuck around. It's	
187	not junk consumer products. It's not going to kill somebody. This is the real	
188	deal where you have your testing defined. We have saltwater, fog, dust	
189	ingress, thermal cycling. We have these huge chambers to do tests, and you	
190	have somebody who does tests, you have somebody who does analysis.	
191		
192	**INV-019:**	
193	So, that's the fucking bullshit fallacy of stupid startups is they go, "We hire	Misunderstanding of
194	smart people. You're a mechanical engineer. You can do thermal, you can	different professions with
195	do structural, you can do design, and you can do manufacturing," and I'm	high expectations to wear
196	like, "Fuck you. I've never met an engineer who can do all of that. Never."	many hats
197	It pisses me off because all of us struggle with being not good enough that	General disgust for over
198	like, "Why can't you just run that thermal with your eyes closed?" It's like,	expectations for engineers
199	"Because I don't do this. I'm a design engineer."	
200		
201	**INV-019:**	
202	And that's what's cool about aerospace is you have those pillars. I have	
203	analysis, I have structural people. I CAD it, sure, I get it all built up. I have	
204	enough people who do the CAD, I have people who do my drawings. You're	Higher respect in
205	so boujee of an engineer. You're so fucking boujee. Everybody does	engineering centric
206	everything for you. So, you're just like... But I CAD it because I wanted to,	environments
207	but some of the old engineers did not. But when you did a drawing, it went	
208	out to six or eight people that had a big stamp block that the electrical	
209	engineer looked at it, the CAD person. All of these people look at your	Lack of respect for startup
210	design and thoroughly vetted it and they had years of experience, "Dude,	engineers not following
211	startups. Oh my God, they just make fucking garbage drawings. They just	

212	get it out. They 3D print it, they put it together, and they go, 'Oh yeah, we're	quality protocols in
213	good.'"	engineering tasks
214		
215	**INV-019:**	
216	And because it's consumer, it's not as detrimental, like we made a stupid ass	Recognition that consumer
217	bleep sensor. It wasn't... Who cares? You're just selling this thing on	products do not need the
218	Kickstarter. So, it's funny. Yeah, aerospace you learn it the right way	level of specification that
219	because you have people that have years of experience that hold up the	other areas require
220	pillars of engineering and they fully vet it and you have the time and your	
221	parameters are completely defined because it's a contract for the	
222	government that says, "You're going to build me this box that can do all of	
223	these things.	
224		
225	**INV-019:**	
226	There's no... Oh my God, the definition changes every day here. It's like,	Scope changes and timeline
227	"Oh, I think I want this. Can you add a bell? Can you add a whistle?" And	underestimation for different
228	you're like, "Fuck you, asshole. I've been working on this so you should	tasks
229	have told me that you wanted that months ago." And so, you fight with ID	
230	because of [Company C]. Everyone wants to be [Company C] and they go,	
231	the ID people, [Company I], "ID over-road mechanical engineering." So,	Lack of respect or
232	we're like, "This sensor doesn't work as well because you're leaving the	understanding for aesthetic
233	opening that's this big. No light is getting it." Well, the symmetry is going	importance
234	to mess up the symmetry. So, you knew you were putting out an inferior	
235	product because ID had to make it look pretty, and to me, that was a really	
236	hard one to struggle with.	
237		
238	**INV-019:**	
239	Now, I'm more mushy on it. I'm like, "Fine, it's got to look good." And if	Mechanical engineers care
240	mechanical engineers did design everything, everything would be an ugly	more about function than
241	box, but it would function.	aesthetics
242		
243	**Interviewer:**	
244	So, are the startups there, they mainly consisted of ID backgrounds and	
245	maybe business backgrounds, it sounds like?	
246		
247	**INV-019:**	
248	There was a good mix of everybody. I mean, you have the software	
249	development guys. I think what was lacking was test and people with really	
250	good experience. Good manufacturing and testing. There's a few that would	
251	be in there, but not enough of a voice to get to understand what	
252	manufacturing is.	
253		
254	**INV-019:**	
255	But tons of marketing, God dang marketing, is just full of smoke. That's	Marketing makes things up /
256	like [Company D] went under. Actually, I'm wearing my [Company D] shirt	irresponsible
257	today. They went under because of marketing. Marketing saw it, thought it	
258	like, "Oh, it's done," and just blew so much smoke. And I heard marketing	
259	spends, I don't know, eight times as much as engineering does, which is so	
260	dumb. Okay. Sorry, I can talk-	
261		
262	**Interviewer:**	
263	No, no.	
264		
265	**INV-019:**	
266	... so watch out.	
267		

268	**Interviewer:**	
269	I got all the time in the world. So, just out of curiosity, what drew you to	
270	aerospace? Did you study and-	
271		
272	**INV-019:**	
273	No. I didn't even know what aerospace was when I got that job. It's so funny.	
274	I think I had to Google what it was because I didn't know. No, I just wanted	
275	like... I didn't know what I wanted to be. And then I took up... Every day I	
276	was like, "I could be a firefighter." I would just think of something new	
277	every day. I had no guidance growing up. Nobody fucking cared about my	
278	education.	
279		
280	**INV-019:**	
281	And then, I was going to City College here in San Francisco and I took a	Original career inspiration
282	part of a broken VCR my dad had just randomly, and my older sister goes,	came from taking a part a
283	"Why don't you take an introduction to Engineering class?" I was like, 19	VCR
284	then, and I was like, "Sure. All right, whatever." And so, I took it and I was	
285	completely enthralled. I was like, "Oh my God, I don't even know what this	
286	is but I want it." It was a cool class because they had electrical engineers,	
287	all the different disciplines come in, and mechanical was materials. I also	
288	really like materials, but I'm not that good at chemistry. But mechanical just	Appreciation for materials
289	stood out because they seem like the coolest and it was really broad.	
290		
291	**INV-019:**	
292	So, I just thought, "Whatever I need to do to get that, I'm going to get it	
293	even if I have to take trigonometry 10 times or calculus 10 times," because	
294	I was never good at school ever. And then, I made my way through and got	
295	the degree. It was very hard. My eye was twitching, and I had smoked	
296	cigarettes and I was just like, "This is hard."	
297		
298	**INV-019:**	
299	But then, one of the sponsors for our senior projects was [Company B] and	
300	I wasn't even on his team but he's like, "Give me some candidates for the	
301	job." The head of the mechanical engineering department put my resume	
302	in. I interviewed for it, and I got it, and it changed my life. I don't know	
303	what the hell I would have done if I wouldn't got that job. Everything was	
304	just by the seat of my pants. I'm like, "All right." And then, it just worked	
305	out.	
306		
307	**Interviewer:**	
308	So, as a design engineer, is there something in your field where if you	**<< Question 1a >>**
309	achieve this or if you have that certification, then you're held in high regard	
310	or people look at you like, "Oh, wow. This person's done this."?	
311		
312	**INV-019:**	
313	It's funny because in the Bay Area, it's the Wild West and if you're good,	Appearance of competence
314	you're good and you're in. It's just all how you speak. So, if you go into a	in Silicon Valley can open
315	meeting and you're intelligent, you know the answers, you could very	doors
316	quickly just skyrocket without anybody knowing anything about your	
317	background.	
318		
319	**INV-019:**	
310	Where my good friend who I worked with the aerospace, she's now at	
311	[Company F]. Did you know if you have a bachelor's, you're not titled as	
312	an engineer? They require you to have your master's to be considered an	Masters degree is now
313		important in Engineering

314	engineer, which is a bullshit because some engineers get out with their	Engineer tends to have
315	master's and they think they're fucking the smartest thing ever.	greater ego with advanced
316		degree
317	**INV-019:**	
318	I worked with a guy like that who didn't know what he was talking about.	
319	I'm like, "You have no experience. All you have is what you learned in..."	
320	And I would butt heads with him all the time because he never talked to the	
321	machine shop. He never went. He just knew everything from books. So,	
322	there's this weird balance of-	
323		
324	**Interviewer:**	
325	Industry versus academia?	
326		
327	**INV-019:**	
328	Yeah, yeah. But so in New Mexico, in some of not the Bay Area Wild West,	
329	it's very, "Oh, you have your master's? Okay. Oh, you're so smart." Right?	Conflict between academic
330	And I mean, PhDs are valued here. If you have your PhD, I don't think	experience vs industry
331	master's doesn't really come into the conversation. People don't go, "Well,	experience in industry
332	I have my master's." Nobody cares. Like, "Are you good? I don't care. Are	
333	you good? That's all that I care about. Oh, you have your master's. Oh, cool.	
334	Yeah, you're really smart. Cool." But PhDs are highly regarded, but they're	PhD valued
335	in their own space. They're more highly regarded, that level of education	
336	here.	
337		
338	**INV-019:**	
339	For me, personally, credentials, if I was GD&T certified, which is the	GD&T certification valued
340	Geometric Dimensioning and Tolerancing certified, and I think about that	
341	if I ever wanted to, the only reason... Well, I would love to know it	Certification means I know
342	completely that I was certified enough by the board because then nobody	what I am doing =
343	could talk shit on your drawings. It's the ultimate level of being like, I can	superiority over other
344	make my engineering drawings and somebody... Because some people	engineers
345	over-dimension the shit out of it where they put too tight of tolerances on	
346	stuff and it makes it really hard for manufacturing. It makes it really	
347	expensive. You don't even need it.	
348		
349	**INV-019:**	
350	So, when people, unless you're doing optics or fiber optics, something that	
351	really requires very tight tolerances, most of the time, you're fine with...	
352	Machine shops are phenomenal, what they can hit right now. So, when you	
353	see an engineer put a zero plus or minus, you don't know what you're talking	
354	about. So, for me, really, I should get that training, but it's hard. It's a whole	
355	language. And if I had that, I could put the smack down on drawing.	
356		
357	**INV-019:**	
358	So, for me, that would be the only credential that I would personally be	
359	wanting. I don't want to go back to school. There's no fucking way. A	
360	master's wouldn't even be worth it for me. I know in other industries, people	
361	are like, "Oh, I could earn so much. I can earn $10,000 more a year," that's	
362	bullshit in the Bay Area. People make butt tons of money. It doesn't fucking	High opportunity to make
363	matter. They don't even have to, there's some people that work in startups,	money in San Francisco
364	they don't even have their degree, and it doesn't matter. They dropped out.	
365		
366	**INV-019:**	
367	Like my friend's husband, he was a programmer in Europe, in Spain, and	
368	he made some app. Got hired in by a company here, never finished college,	
369	and he's now at [Company G], and he's some super high up. They have a	

370	million dollars house in San Francisco. I didn't finish college. And that's	In some cases, finishing
371	part of Bill Gates thing of, "If you're good, you're fucking good." So, that's	school is not important if
372	nice because I don't like how stringent it was for... My friend, she's been	you can prove production /
373	working for 20 years and she's an amazing engineer. And I'm like, "God	worth
374	damn them to take that title away from you. Fuck that." That's such an old	
375	thinking. It's such old thinking. If you're good, you're good, granted PhDs	
376	another level. So, you can't argue with that. That's a ton of work, and only	
377	certain people... Master's too shit for me.	
378		
379	**Interviewer:**	
380	So, working in teams, I guess, what are you bringing to the table? Forget	
381	about the technical stuff, but what are your effective skills in making these	**<< Question 1d >>**
382	teams slow?	
383		
384	**INV-019:**	
385	Oh, man. Yeah, so I started going to therapy recently and I'm learning a lot.	
386	I'm learning so much, and I love it, good and bad and whatever, but seeing	
387	how it plays out for me in life. But honestly, what I bring to a team, I'm not	
388	bragging, but I can give so many good references, personal references, work	
389	references. Because for me, what I bring is a genuinely wanting to help.	
390	What can I help you do? So, if somebody comes and they ask me, "Hey,	Committed to helping other
391	[INV-019], do you know about this? Hey, [INV-019], blah, blah, blah," I'm	excel with personal
392	going to genuinely give you my time and I'm going to wrack my brain and	references (skill)
393	I'll bring you parts. I'll think of something to keep the conversation going	
394	forward, to keep us going forward.	
395		
396	**INV-019:**	
397	And the other thing that I bring is logic. Oh my God. I go to so many	
398	meetings that's just nonsense and then nothing comes out at the end. So, for	Ability to clarify goals for
399	me, even if I don't fully understand, maybe everything that operations does	different groups
400	and needs is, I think, a respect for all of the pillars because some people just	
401	dismiss the technicians. They just dismiss. They don't even talk because	
402	they're too good. They're engineer, they have all the answers. To me,	Engineer believes they have
403	everybody's important, from the person that's on the line, that person is	all the answers
404	going to tell me if my design isn't going together. That person is my first	
405	fucking line of defense. So, for me, each person matters. Each person could	
406	help contribute to make my design better. How can I help and how can I	
407	bring logic to this story?	
408		
409	**INV-019:**	
410	So, when you hear conversations going, and you're like, "Wait, wait, wait,	
411	wait, wait," and I usually start in because it's how to crack into people is	
412	saying, "What is the thing that you want? What is the thing that you're trying	
413	to accomplish?" And then, people kind of, "Well, I really want... Well, this	
414	was easier," and it's like, "Okay, what you're telling me is, if you had a tool	
415	to do this, your team would run better. Is that what I'm hearing?" "Yeah."	
416	"Okay, okay. That's what you want. That's what he wants." Okay, and then	
417	you hear from this person, "Well, the schedule is blah, blah, blah, blah,	
418	blah." Okay, so what can we do? So, I think it's just like, you got to pull out	
419	of people what do you want, and then if they realize that that's what you're	
420	trying to accomplish...	
421		
422	**INV-019:**	
423	Like for me, I described my job as like, I'm the artist and you're giving me	
424	the direction. I'm going to paint the picture until it's right for you. Even if	
425	you're fucking technician that has no education, you are my front fucking	

426	line. And then I'll take you the tool, I'll make it for you and I say, "Is this	
427	what you want?" And they go, "I've had..." They get all shy, some of them,	
428	but once you develop the relationship, they're like, "Oh, it didn't really	A relationship is needed to
429	work. They're like a glued bolt onto a tool that I made because the height	communicate issues openly
430	wasn't right." And I thought and I was laughing, I'm like, "No, this is	
431	wonderful. That's fine. Just tell me. Let me fix it." So then, I get it, and I	
432	get in their hands and they go, "Oh, [INV-019], thank you so much. That	
433	just made... Now, we can hold this teeny-tiny connector that we need to	
434	solder in teeny tiny wires into," and that makes my heart so happy.	
435		
436	**INV-019:**	
437	So, I think it's like, I'm working for you. This thought of I'm working for	
438	you, what's the story we're trying to go for and we're better together? So, I	
439	think that's what I bring to a team. It's a collective want for all of us to come	
440	together in mutual respect for everybody.	
441		
442	**Interviewer:**	
443	First of all, that's fantastic. But is it ever a burden to always reach out and	
444	understand all these operations but maybe not get the same response from	
445	different groups?	
446		
447	**INV-019:**	
448	I mean, yeah, all the time. But I feel like I bet a pretty high average because	
449	you start making inroads with high up managers and the technicians love	
450	you. From this, it does take a lot of energy, but because people see that	The effort to understand
451	you're trying to be good, your response back is usually your fuel because	other groups eventually pays
452	they are good, they do want it. So, I do get fueled, but oh man, I do get	off if it is consistent
453	dragged down. You know where it usually comes from is the other	
454	engineers.	
455		
456	**INV-019:**	
457	Right now, I'm battling two of the engineers on my group where they just	Described engineers as
458	are not helpful. They suck. They're argumentative. They fight everything	argumentative and
459	that you say. It's not like a collective of saying like, "What are we saying?	untrusting
460	How are we moving forward?" It's a "No. No. No. Well, we can't do that.	
461	We're not going to spend time on that, and blah, blah, blah." I'm like, "Dude,	
462	you're just not a team player. You suck. I don't want to work with you." I	Toxic environment leads to
463	usually go try and find ways around those people.	going around people for task
464		completion
465	**INV-019:**	
466	So, when I don't meet that same respect or that spirit, but you can usually	
467	change people. I feel like you can change people. Once they realize you're	
468	working for them and you smile at them and you ask them how they are,	
469	you get really, really far. But there's some people that are just always going	
470	to be assholes. So, I talk about it in therapy. I'm like, "What do you do with	
471	those people? They suck. They make me-	
472		
473	**Interviewer:**	
474	In and outside of work.	
475		
476	**INV-019:**	
477	Oh my God.	
478		
479	**Interviewer:**	
480	It sounds like you connect more with the manufacturing side, or at least	**<< Question 2b >>**
481	empathy from what they have to deal with.	

482		
483	**INV-019:**	
484	Yup. The manufacturing in the field, the people who are actually using that	
485	product. And to me, that was hard about aerospace is we never got feedback	
486	from the customer. One time, the OH-58, because we worked on OH-58, F-	
487	16, the OH-58 helicopter came and landed in our parking lot. We got to	
488	meet the pilots and see our box in the helicopter. And, to me, that was a	
489	huge disconnect in aerospace is you want to have that connection with the	
490	customer because it's like, "How am I going to make it better? How am I	
491	going to know what to do? Why would I just put out something and then	
492	that's it, okay, there it is?" You constantly need feedback for anything that	
493	you're putting out into the world.	
494		
495	**INV-019:**	
496	So, to me, our operators and our manufacturing line are the people that it's	Greater respect for
497	in their hands, major respect, major respect, because if the engineers are	manufacturing
498	just CADding, you don't know shit. I'm sorry. You need to be involved with	
499	manufacturing, going to China, seeing the line, seeing the injection-molded	
500	plastic parts come off the tools. You have to be connected to every level.	
501		
502	**INV-019:**	
503	And then, it starts to dorf you. You think, "Oh, I can CADded it. I'm done."	
504	And then you see the guy who designed the tool to injection mold your part,	
505	and all of these gates and the sliders and you're like, "Oh, I'm this. I'm this."	
506	The rest of the getting it to the end gate is so much more. So, you just find	
507	the respect for the rest of the picture.	
508		
509	**Interviewer:**	
510	So, how does it compare with working with, and you touch on this a little	**<< Question 2b >>**
511	bit, but working with the industrial designers where they're further from	
512	manufacturing?	
513		
514	**INV-019:**	
515	It depends on your design person because I think there are some that want	
516	to know, ID guys wants to... The more they went to China, I think the more	The more Design
517	in sync they got with it. I haven't worked with [Company C] ID, I'm sure	experiences backend of
518	those guys are well-versed in what is possible. They need to know. They	product, the better the
519	can't just put out a thing and say... I mean, they can, say, make it this nice,	working relationship
510	but they also have to understand the manufacturing part, and they have	
511	amazing teams to support all of that.	
512		
513	**INV-019:**	
514	When I started working with the ID guys, [Company I], and they rolled	
515	everything and they were fresh out of school, it was really frustrating. It	Inexperience in Design is
516	was very hard. It was so hard to work with them because it was like, "Just	frustrating
517	make it this good," and your like, "Okay, to make it that good, it's going to	
518	take a lot of iteration. It's going to be very costly." And are they all being	
519	open to alternatives? When you just get very stuck in like, "It's this, it's	
510	this," it's like you might find it even better finish or even better material to	
511	answer the need. And I'm sorry, I feel like you have no creativity if all you	
512	say is, "What did [Company C] do? How does [Company C] do it?" To me,	
513	that's already you're losing. I'm like, "Why? Why would you do that?"	
514		
515	**INV-019:**	Views Design as concerned
516	So, yeah, ID, sometimes it feels... I love art though and I do a lot of creative	more with art then
517	outside of engineering projects. So, I struggle with it because I believe in	functionality

518	pushing for beautiful things, but then if you're starting to encroach on	
519	functionality, where does that line...	
520		
521	**INV-019:**	
522	There was a talk I missed in San Francisco that was ID versus mechanical	
523	engineering, and I still regret that I missed that talk because we're very like,	
524	"God dang it." It's like an arm wrestle. But you know what, at the end of	
525	the day, those ID guys made me a better mechanical engineer because they	
526	made my job that much harder and I had to start thinking out of the box of	
527	like, "It's just another design parameter," where I'm like, "Now, I have to	Design forces you to think a
528	meet this, right?" So, I think that they made me better. They made me a	different way
529	better engineer. It's a struggle. I used to struggle though.	
530		
531	**Interviewer:**	
532	I hear you. I hear you. Okay, so I'm going to give you six terms and I want	**<< Question 1e >>**
533	you to tell me the three that best describe you in terms of your interests or	
534	aspirations.	
535		
536	**INV-019:**	
537	Okay.	
538		
539	**Interviewer:**	
540	So, the first is realistic, the second is investigative, third, artistic, fourth,	
541	social, fifth is enterprising, and then the last one is conventional.	
542		
543	**INV-019:**	
544	Oh, I think it is realistic, artistic, and... What was the fourth one?	Self-Identified RIASEC:
545		Realistic + Artistic + Social
546	**Interviewer:**	
547	Social?	
548		
549	**INV-019:**	
550	Social. That's it.	
551		
552	**Interviewer:**	
553	For the ones that you didn't pick, do you associate those with different	
554	professions, or is that-	
555		
556	**INV-019:**	
557	No, it's still very much part. There are engineers that would, for my	
558	profession, there would be the people that would be all of the different	
559	combinations. No, they still fit. They're just not me. Like enterprising, I	
560	wouldn't consider myself enterprising, but some people definitely are.	
561	They're not scheming, but they're taking it apart. They're thinking in a	
562	different way. But I don't think about that stuff.	
563		
564	**Interviewer:**	
565	So, your main interactions are with other mechanical engineers or-	**<< Question 2b >>**
566		
567	**INV-019:**	
568	No. Actually, I try to get away from the other, especially because they're	
569	bugging me. I just find who I can... You know who I work with the most,	
570	is manufacturing and operations. That's what I work with the most.	
571		
572	**Interviewer:**	
573		

574	Okay. And so, what size teams, to give me some context, have you worked	<< **Question 2a** >>
575	in with from the aerospace to the startup to-	
576		
577	**INV-019:**	
578	Yeah, you know what's super crazy is, the aerospace, when I look back on	
579	it, it was a team of nine. We were small, nine mechanical engineers, and	Team Size: 9 (Company A)
580	we're like, "Oh, we're a small team." There's 14 electrical engineers.	
581	Looking back and I'm like, "Holy shit." There are two female engineers,	
582	one was aerospace and one was mechanical, but it's been ages since I	
583	worked with another female mechanical engineer. One at [Company E], the	
584	second startup I work for. Literally, I've worked with one was aerospace,	
585	two mechanical engineers in my entire fucking career. It's crazy, right? So,	
586	nine-	
587		
588	**Interviewer:**	
589	That sounds about right though.	
590		
591	**INV-019:**	
592	I know when people go, "Oh, there needs to be more women engineers."	
593	I'm like, "I graduated with two other mechanical engineers. They're not	
594	there. I don't know what to tell you. And when I've had to wear really stinky,	
595	sweaty ESD smocks in China, I'm like, "This is really hard to sell to	
596	anybody. This is not a glamorous job at all. It's disgusting." And also, the	
597	guys it's like...	
598		
599	**INV-019:**	
600	So anyway, nine for aerospace. So, the teams just kept getting smaller,	
601	right? So, it was nine, and then I was a team of five at the helicopter	Team Size: 5 (Company C)
602	company and then it was two, and then it was, I don't know how many	
603	people really worked as mechanical, three, and then one. And now, I'm on	Team Size: 3 (Company B)
604	a team that started out as five and now we're down to three. So, the teams	
605	actually... I don't think if you... You could get out of hardware product with	
606	two mechanical engineers, like one, but if you're a bigger company, you	
607	need money to support different projects. But if you have two in-sync,	
608	really working well mechanical engineers, you could accomplish anything.	
609	I would say that's good. That's all you need.	
610		
611	**Interviewer:**	
612	What about different generations, are you working with different	
613	generations now?	
614		
615	**INV-019:**	
616	Oh my God. So, I'm 38, right? So, I'm in the middle. I'm this middle old.	
617	I'm middle old. I work with these little son of a bitch, young, fucking	Experience with young
618	mechanical engineers that know-it-all asshole guys. They suck. Like, "You	engineers that are braggarts
619	don't know it all. Stop acting like you know it all or that you're so smart.	Lack of respect for
620	You don't know anything. Stop it." It's not that you don't know anything but	experience / Lack of
621	there's just no humility. They're just know-it-alls, and that's the worst	humility
622	personality to me.	
623		
624	**INV-019:**	
625	There's people who are smart and there's people that are assholes. And it's	
626	like, there's not good engineers. If you're an asshole and you're not smart, I	
627	fucking hate you. Hopefully, you're smart and nice. But you get those smart	
628	assholes and they're just the worst to work with. So, age is hard.	
629		

630	**INV-019:**	
631	I've worked for the older generation, and luckily, I've had the experience of	Experience some older
632	working with older engineers, I would say their batting at. Maybe 75% of	generation engineers
633	them are amazing, 75%, but then you'll have that 25% that, especially being	dismissing behavior based
634	a woman of color, they don't even acknowledge you. They dismiss	on a response to
635	everything you say. They're like, "Why are you here?" You're just vapor.	demographics (female,
636	They're just total assholes, very dismissive, just jerks. So, there's a handful,	POC)
637	like white old males, of course, statistically. So, I would say the older ones'	
638	hidden mistake can be phenomenal, like phenomenal guide. They help you	
639	and they're wonderful.	
640		
641	**INV-019:**	
642	Sorry, my dogs a little... He scratches at his dog bed like a little weirdo even	
643	though he can get in. And then, I have to move it so he can go in. So anyway,	
644	it's hard, mostly old white males. But I've had a lot that have helped me in	
645	my career because they're like, "You should be here," and they're amazing.	
646	But I would say 75%, 80% of them are good and amazing, but there's some	
647	bad apples.	
648		
649	**INV-019:**	
650	The young guys, there's some... It depends. It depends on how I feel like	
651	their upbringing where some see you and they're delighted that you're there	
652	and they want to bring you along and like, "Come on. Oh, what do you	
653	think of this?" and there's respect immediately and we're just having a good	
654	time and we're doing our thing. But then, this younger, he's 33, mechanical	
655	engineer that I work with now, oh my God, he's the worst. There's a	
656	dismissive attitude and not being respected. But I would say the younger	Experienced dismissive
657	one... It's hard. I can't think of what the percentage would be for the young	attitudes from engineers
658	that are good, helpful and not helpful or respectful and not respectful. But I	
659	feel like they have a lower number of being good. I don't know, maybe like	
660	60% are awesome and then 30% suck.	
661		
662	**Interviewer:**	
663	So, the know-it-all tendency, is that would you say is more of an	
664	engineering thing?	
665		
666	**INV-019:**	
667	Oh, man. Engineers can be such assholes, like I'll do it here if I have to, if	
668	somebody's really pushing me and then... Because the cool thing about	
669	engineering and why you get paid so much is because it ends up you have	
670	to answer like, "This is mine." If it sucks, I have to answer for that. And	More responsibility (for
671	you really felt that heavy in aerospace. It's an attitude, and it's unfortunate.	answers) in engineering can
672	I wish that it wasn't that way. But yeah, it's definitely something that	lead to nuisance behavior
673	engineers can pull. You pull the engineer card and you can be a total	
674	asshole, and I can't say I'm not guilty of it too.	
675		
676	**Interviewer:**	
677	So, in your current role, do you have touchpoints with the business	**<< Question 2b >>**
678	development people, the marketing, or is that mainly in your previous	
679	roles?	
680		
681	**INV-019:**	
682	Mainly in my previous roles. And even then, it wasn't very much, probably	
683	because I don't really want it. I don't care and I don't want to know. I'm just	Limited access to marketing
684	like, "What is the work that needs to get done?" But I hear about it and I do	No interest in learning about
685	find it semi-interesting because it helps inform what's going to happen for	marketing

686	me but mostly then no, though, because they won't affect what I need to do	
687	soon at the moment.	
688		
689	**Interviewer:**	
690	Where do your requirements come from, project management or-	<< **Question 2b** >>
691		
692	**INV-019:**	
693	It's by the seat of your pants, I swear. I wish there was more structure. I	
694	wish I've had good technical managers. And then, especially in aerospace,	
695	you get assigned a specific task with a specific deliverable, and that was	
696	really nice because you can say, "Okay, I'm making this thing." Here, like	
697	I said about the bells and whistles, there's no clear thing for me. It's	The role of a project
698	something that I'm trying to push that we get a project manager, a good	manager can evaluate tasks
699	technical lead, who can look at all the tasks that we have and help guide the	and guide the team with
700	team and focuses on a really clear and define deliverable, but people are	clear deliverables
701	just...	
702		
703	**INV-019:**	
704	Getting a design requirement document is so hard. It's so hard even to make	Lack of design requirements
705	up for... [Company D] couldn't put it together. They tried, they tried, they	here
706	tried. But this is something that's hugely lacking across industry, in the	
707	groups that I've been in. I know that there's groups within [Company C],	
708	[Company H], because they're able to get out. Kindle, they're able to	
709	actually realize the thing that they want to build. But for most from what	Project manager understands
710	I've seen, I'm like, "That person is missing. And they have to be technical,	engineering and the product
711	they have to understand engineering, and they have to understand the bigger	space
712	product space.	
713		
714	**INV-019:**	
715	And then, if you direct engineers, it's like focusing sunlight. If you can get	Focused engineers can
716	people in line to the goal, you can accomplish so much. But usually I feel	accomplish more
717	like, "Oh, what's this task? Okay, I go and do this. Okay, I go and do that."	
718	It's like, you're constantly improving here and there and that. I have to listen	
719	because I don't have good directive. I listen, I listen to the field, I listen to	
720	the floor, and that's how I'm able to be successful is because they go, "Man,	
721	we're really struggling with this thing," and then I'm like, "I'll work on it.	
722	I'll get it." And then I get it to them and they're like, "Oh, wow, [INV-019]	
723	helps us," and I'm like, "Yeah, because I'm just looking for work." I'm	
724	looking for a real ask, and then I have somebody who's going to give me	
725	feedback on it and then I'm going to get it to you and you're going to be	
726	happy.	
727		
728	**INV-019:**	
729	So, that's that. But in a big overall arching company thing, I feel like it's	
730	missing a lot. [Company D] was missing it, [Company E] was missing it.	Competent leadership is
731	[Company I] was missing it, where you have a good technical lead who	missing from many
732	really understand. It's not just VC blowing smoke, people blow smoke all	companies
733	the time, "Oh, we should make this blah, blah, blah. You should design a	
734	phone." It's like, "No, you shouldn't." There's already people doing that.	
735	One person told us to do that at [Company I], and all of us were like, "Why	
736	would we do that? I mean, it's such a waste of everybody's time." Crazy.	
737	That's crazy stuff here anyway.	
738		
739	**Interviewer:**	
740		
741		

So, what would you say then the biggest barrier, or that alignment of tasks and groups and maybe positioning within the company that that's one of the biggest barriers?		**<< Question 2c >>**
INV-019:		
Yeah, definitely, and the attitude. Having a good attitude, having a positive work environment, and getting like, "Is your team okay? Are they working together well? Have you checked in with your people or do they have stuff going on in their personal lives?" My favorite manager, who's my first manager at aerospace, he knew that one of the guys was going through a divorce and he gave him more time off than the company allotted time because he knew, "If I lose this person, if I'm hard on him like, 'You need to be here every day, 40 hours, or I need you to perform it top level, even higher than that...'" Our jobs are bigger than... We're more important. Knowing about the human aspect and the human dynamic between your teammates is huge. It's huge, and we don't talk about it. You're just supposed to be super hard and super smart and you're just supposed to be non-emotional and super logical, and it's bullshit.		Alignment of tasks and good attitudes contribute to positive work environments Leadership that cares personally about team members (seen as human) Human dynamic between teammates is important
INV-019:		
The old white guy engineer on my team, he'll always make comments like, "Oh, well don't get too emotional or don't blah, blah, blah." And I've seen him have tantrums, like being a baby about not getting what he wants, and I'm like, "That's being emotional too, asshole. You think because you're a guy and you can huff and puff and blah, blah, blah." I'm like, "What do you think that is? You're not cool, calm, and collected and being logical. You're being a fucking asshole baby."		Expectation to not show emotion from engineers
INV-019:		
So, I think there's so many fallacies about the behavior of how we work and not paying attention and blowing it off. And to me, if I had a dream team, it would be very checking in on people and it would be very close-knit, and they ignore it. I've had a situation. I was having a hard time working with the operations lady and I told, he was the CEO at the time. He never addressed it. He just wanted everything to be happy. And I'm like, "You don't even have an HR person and you think you're cool because we're so cool and we're a startup." I'm like, "There's a reason, and HR is not empowered enough to do that stuff."		Ideal team is socially close
INV-019:		
So, my friend worked at a startup here and they were part of the vibe team to make sure engineers were happy. It was more just like pampering the engineers, but kind of therapy aspect of... If you want a team of... People are not... Our jobs aren't the most important thing, but you should also love your job and want to stay there and build the relationships because then you can get so much accomplished. So, that's also lacking. I wish I was more of a want to be helpful and to make a good team and to connect with people and make sure communication was good. That stuff's completely ignored because we're logical.		Building relationships between team members important in team success, often ignored in more technical disciplines
Interviewer:		
We're logical. Do you think that that's something that's ingrained in the culture, or could you do that bottom up? Like if the technical manager had that reaching out aspect, do you think that those connections could still be formed or-		**<< Question 3b >>**

798	**INV-019:**	
799	They could. They could. I think if the leadership, especially from	
800	leadership, because engineers will go, "Oh, the manager said..." The higher	Hierarchical relationships /
801	ups, they do abide to that mostly. And I think if you had a person at the top	communication more
802	with that intrinsically in them, it would foster the change because they	respected by engineers
803	would be, "I'm the lead. I'm leading this team. And I'm telling you, this is	
804	so." And also, standing up for people in meetings and stopping bad behavior	
805	in the meeting and saying, "Stop that. That's inappropriate. We're going to	
806	cut that conversation. Let's come back to it. Come back to me more	
807	prepared." So, I think there's a way I think that managers really need to go	
808	through, like therapy, they need to go through people skill things.	
809		
810	**INV-019:**	
811	I mean, from the ground up, yes. If you had a company that started from the	
812	beginning and that was a huge part of your culture, you could start it there.	
813	It takes one person in a lead role to change it within. In your small groups,	
814	I think they could be a huge force of positivity and moving things into a	
815	better direction.	
816		
817	**Interviewer:**	
818	So, how has working during COVID been where you're missing that	**<< Question 2e >>**
819	connection?	
820		
821	**INV-019:**	
822	Yeah, it was so hard for me. It's funny that some people, my colleagues and	
823	past engineers that I've worked with that are in the Bay Area at different	
824	companies, some of them are happy and fine, and some of it's complicated	
825	because they have kids. I don't have kids, but for me, it was really hard. I	Strongly dislikes working
826	fucking hated it. I hated working at home. I need people. I went back maybe	from home
827	10 weeks ago because it was deemed that our team was Stage 1 or whatever,	
828	so we got to go back for [Company C], which made me really happy. I've	Went back to the office
829	been in the office, I don't think I've worked a day at home, even though I	when it was deemed safe
830	could if I wanted to.	
831		
832	**INV-019:**	
833	One of our electrical engineers who lives pretty far, he's been home the	
834	whole time. I think he's come in one time, which is fine, because as long as	
835	you can get your work done, I don't care. I don't care. But for me, I need to	Difficult when you're
836	go somewhere outside of my house. It was so hard for me to work. And	dealing with evaluating
837	then, you have all these parts shipped to your house, and your house gets	shipped parts (at home)
838	messy, I hate it. A mechanical engineer working from home is terrible	
839	because you just have so much, for me. You have parts and boxes and	
840	deliveries with junks up your house, and I'm already messy. And so, it's a	
841	nightmare. And to focus, to get the line between personal and work, it was	No separation between work
842	so hard to focus. I couldn't think. So anyway, we got to go back and I'm	and home
843	really happy because I don't want that. I don't want to work from home.	
844		
845	**Interviewer:**	
846	So, you're not doing the Zoom calls and all that stuff?	
847		
848	**INV-019:**	
849	We were, but even my team's so weird. I had to push for us to have a daily	
850	call because I knew one of our guys was not doing anything and even	Productivity decreased
851	wouldn't admit it. I'm like, "I know it's hard for all of us. I'm not at 100%	during CoVid
852	productivity. I'm not. I'm lagging. It sucks, but I'm trying hard." I had to	
853	push for us to daily see each other, and it helped when we started seeing	

854	each other. But my team isn't like that. I have to push for it and beg for it.	
855	But we have it and I think it makes it better, but people just don't... They	
856	just would rather just stay home and be quiet and weird.	
857		
858	**Interviewer:**	
859	Sounds like your team might not be aware of the impact that you have on	
860	them.	
861		
862	**INV-019:**	
863	I feel like one guy knows. We're pretty close. But then now the guy who	
864	stepped into take management, the older white guy and then this younger	
865	guy, I don't feel valued by them. But I'm valued by the operations and	More valued by operations
866	manufacturing. They're always like, "Good job, [INV-019]. Wow, [INV-	then engineering team
867	019]." So, there's a part of me that's like, "Can I just go work for that team	members
868	because they get me? And my team doesn't get me."	
869		
870	**INV-019:**	
871	And I think it has to do with... I think it's a male thing. Because I speak my	
872	mind. I speak what's my truth out loud, and I'm usually not inhibited. If I	Confrontational approach
873	think something's messed up, I'm going to say it. So, I think they don't like	with team members
874	my full stress, I'm loud, and I'm like, "Hey, that's fucked up." I think they	
875	would just be more comfortable with me being quiet and in line and doing	
876	my job. And I'm like, "No, I'm too wild. I can't do that." And I want to have	
877	a good time. I want to have a good time, anyway.	
878		
879	**Interviewer:**	
880	How does those types of relationship impact the final product, or does it?	<< **Question 2c** >>
881		
882	**INV-019:**	
883	It hurts it. It hurts it. If we can be in-sync and we're working for a common	
884	goal and we're working for each other, we're going to do so much more.	
885	We're going to be so much better. But when I don't want to work with you,	When team member
886	and I'm going to go do every other thing and not be involved with the work	relationships are bad,
887	with you, it hurts the final product.	involvement decreases and
888		impacts final product
889	**INV-019:**	(impact)
890	Like in [Company C], there's a DRI, the directly responsible individual. So,	
891	when it's not this good, cohesive, ideal working relationship, what I always	
892	lean on in engineering is whatever I'm directly responsible for, I'm going to	
893	deliver 110%, but I want it to be separate from you because I don't want	
894	what I have to put out into the world linked with you because you suck to	
895	work with.	
896		
897	**INV-019:**	
898	So, I still find my successes by getting with the task and I'm assigned to it	Success is completely
899	and then I deliver 110%, but we would be better collectively for our group	assigned task
900	on bigger things if we could get our manpower together, work together and	
901	push it out. So, yeah, it's a sad tactic that I have to work now to have sanity	
902	and get positive results is I just stay away from the other two engineers.	
903		
904	**Interviewer:**	
905	And so, is that how you define product success if you can complete the	<< **Question 2d** >>
906	individual tasks?	
907		
908	**INV-019:**	
909		

910	I define if it's a thing assigned to me and I deliver on it and everybody's	
911	happy, then that's my success. There's just a lot of ambiguity right now of	
912	what our actual deliverables are and us moving on a larger project. It's all	
913	up in the air. But even then, when we do get assigned an overarching	
914	project, I'll take my task and I'm going to do it because I don't see	Toxic environment leads to
915	collaboration happening, and it hurts the team but it's not fostered in our	collaboration avoidance
916	group whatsoever. So, the best I can do is just deliver on my own good	(impact)
917	things. It makes me feel a little bit sad saying that. Like I should try harder	
918	to find ways to work with my teammates but...	
919		
920	**Interviewer:**	
921	Yeah, it's like you're stuck in a bad relationship.	
922		
923	**INV-019:**	
924	Yeah. And that sucks, right? It sucks.	
925		
926	**Interviewer:**	
927	You're getting paid to be there.	
928		
929	**INV-019:**	
930	Yeah.	
931		
932	**Interviewer:**	
933	Okay, I just have a couple more questions for you and then I'll stop the tape	**<< Question 3c >>**
934	here. This is my favorite question. If you're building a consumer electronics	
935	product, and there's a product development draft and you have to fill five	
936	spots, and those spots can be disciplines that are the same or different, who	
937	would you choose to put in those spots to build the most effective product?	
938		
939	**INV-019:**	
940	I would have... Let's see. I would have two mechanical engineers, an ID	Ideal NPD Team: 2 ME + 1
941	because you need somebody to do art, decide what the packaging is going	ID + EE + Operations lead
942	to look like. You need somebody with an artistic background. Mechanicals	
943	can do so much. They can cross over to operations and all of that. I would	
944	say an EE and an operations technical lead. So, yeah, I think that EE, two	
945	mechanicals, because they're going to cover. They can cover everybody	
946	else. They can help everybody else and work closely with everybody else.	
947	Operations and then Art design, yeah.	
948		
949	**Interviewer:**	
950	Mm-hmm (affirmative). Sounds like a dream team.	
951		
952	**INV-019:**	
953	It would be if we can work on any... If I had those guys to do the work that	
954	is something I wanted to do, oh, man.	
955		
956	**Interviewer:**	
957	So, my last question is just about work preferences. So, there are four areas	**<< Question 3d >>**
958	and I want you to rate them in terms of 1, avoid at all costs, I don't like	
959	working on this, or 10, I really enjoy working with this type of work. So,	
960	the first one is data, reviewing specs or statistics.	
961		
962	**INV-019:**	
963	I would say like... Not that I enjoy it, but it's important. So, I put that at 7.	Data: 7
964	Yeah, because it's important. It's not that I... It's a must. You have to do it,	
965		

966	and it really informs everything. So, I'm like, "Do I like it?" No, so I'm	
967	going to take off points, but it's important so it's still high-ish.	
968		
969	**Interviewer:**	
970	And then, people. So, pitching a product.	
971		
972	**INV-019:**	
973	Oh, no, I don't want to do that. No, that's low. That's low. I feel like people	
974	already should know what the heck they want to do. I don't want to. No.	
975	That's low for me. I don't want to pitch it. I don't want to sell it. I don't want	
976	them to sell it.	
977		
978	**Interviewer:**	
979	So, 1?	
980		
981	**INV-019:**	
982	Yeah, I'll put it at 1. It's not an interesting.	People: 1
983		
984	**Interviewer:**	
985	Ideas. So, brainstorming new ideas.	
986		
987	**INV-019:**	
988	Oh, a 10.	Ideas: 10
989		
990	**Interviewer:**	
991	And then, the last one would be things. So, building a prototype, something	
992	really hands-on.	
993		
994	**INV-019:**	
995	10. 10.	Things: 10
996		
997	**Interviewer:**	
998	Of course, right? You're a mechanical engineer. You have to.	
999		
1000	**INV-019:**	
1001	It's the best.	
1002		
1003	**Interviewer:**	
1004	So, before I stop the tape here, any final thoughts on effective	
1005	teamworking? Or did we cover most of the good stuff?	
1006		
1007	**INV-019:**	
1008	I got a good rant from you covering most stuff. But again, just the spirit of	
1009	helpfulness, I think that's key of knowing you don't have all the answers,	Communication key
1010	wanting to be helpful, and respecting everybody. We're working for each	humbleness in not knowing
1011	other. We're better together. You're not the smartest person. Don't think	everything, helpful and
1012	that. You're going to be closed down because of that.	respectful
1013		
1014	**INV-019:**	
1015	Yeah, I think that's it. I guess for me, my biggest reward is making	
1016	something and then you give it to the person, and then they're so happy. To	
1017	me, that's why I do what I do is because I see that happiness of the other	
1018	person that you made something for them.	
1019		
1020	**Interviewer:**	
1021	Very cool. We'll stop the tape here.	

Initial Codes

>> Participant, INV-019, transcript evaluation with codes generated using interpretation-focused coding <<

Aerospace experience
Startup experience
3D experience, prototyping
Networking event led to additional jobs
In person Asia manufacturing experience
Respectful positive conflict between manufacturing engineers
Toxic environment influenced by Founder abusive behavior
Drone company experience
After work socializing contributed to fun environment
Lonely, pressure filled experience when you are the decision maker
Financially beneficial environment
Lack of autonomy or respect from management
Conflict occurs when personally question leadership decisions
Startups have tendencies to be younger less experienced men
Less requirements in startup environment
Aerospace industry focused on functional correctness vs time dependencies ("right way")
Misunderstanding of different professions with high expectations to wear many hats
General disgust for over expectations for engineers
Higher respect in engineering centric environments
Lack of respect for startup engineers not following quality protocols in engineering tasks
Recognition that consumer products do not need the level of specification that other areas require
Scope changes and timeline underestimation for different tasks
Lack of respect or understanding for aesthetic importance
Mechanical engineers care more about function than aesthetics
Marketing makes things up / irresponsible
Original career inspiration came from taking a part a VCR
Appreciation for materials
Appearance of competence in Silicon Valley can open doors
Master's degree is now important in Engineering
Engineer tends to have greater ego with advanced degree
Conflict between academic experience vs industry experience in industry
PhD valued
GD&T certification valued
Certification means I know what I am doing = superiority over other engineers
High opportunity to make money in San Francisco
In some cases, finishing school is not important if you can prove production / worth
Committed to helping other excel with personal references (skill)
Ability to clarify goals for different groups
Engineer believes they have all the answers
A relationship is needed to communicate issues openly
The effort to understand other groups eventually pays off if it is consistent
Described engineers as argumentative and untrusting
Toxic environment leads to going around people for task completion
Greater respect for manufacturing
The more Design experiences backend of product, the better the working relationship
Inexperience in Design is frustrating
Views Design as concerned more with art then functionality
Design forces you to think a different way
Self-Identified RIASEC: Realistic + Artistic + Social
Team Size: 9 (A)
Team Size: 5 (B)
Team Size: 3 (C)

Experience with young engineers that are braggarts
Lack of respect for experience / Lack of humility
Experience some older generation engineers dismissing behavior based on a response to demographics (female, POC)
Experienced dismissive attitudes from engineers
More responsibility (for answers) in engineering can lead to nuisance behavior
Limited access to marketing
No interest in learning about marketing
The role of a project manager can evaluate tasks and guide the team with clear deliverables
Lack of design requirements here
Project manager understands engineering and the product space
Focused engineers can accomplish more
Competent leadership is missing from many companies
Alignment of tasks and good attitudes contribute to positive work environments
Leadership that cares personally about team members (seen as human)
Human dynamic between teammates is important
Expectation to not show emotion from engineers
Ideal team is socially close
Building relationships between team members important in team success, often ignored in more technical disciplines
Hierarchical relationships / communication more respected by engineers
Strongly dislikes working from home
Went back to the office when it was deemed safe
Difficult when you're dealing with evaluating shipped parts (at home)
No separation between work and home
Productivity decreased during CoVid
More valued by operations then engineering team members
Confrontational approach with team members
When team member relationships are bad, involvement decreases and impacts final product (impact)
Success is completely assigned task
Toxic environment leads to collaboration avoidance (impact)
Ideal NPD Team: 2 ME + 1 ID + EE + Operations lead
Data: 7
People: 1
Ideas: 10
Things: 10
Communication key humbleness in not knowing everything, helpful and respectful

A6: Chapters 4 & 5 – Participant Information Sheet

Imperial College London

Participant Information Sheet (Interviews)

Better Understanding Collaboration & Communication in Multidisciplinary NPD (New Product Development) Teams

We would like to invite you to participate in this research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way.

Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

- **What is the purpose of the study?**

This study is part of a PhD research project on multidisciplinary NPD teams, which encompass a broad range of expertise. This multidisciplinary approach to solving complex innovation problems presents challenges of communication and collaboration across different domains of knowledge. By exploring multidisciplinary collaboration throughout early-stage product commercialization, this research will examine individual interpretations, functional perspectives and values within teams. Using insights from online interviews and team workshops, this research positions itself to better understand team working to improve multidisciplinary NPD team effectiveness.

- **Why have I been invited?**

We are looking to recruit multidisciplinary NPD team members with experience in the early stages of new product development in the sectors of high tech and/or medical device products for a ~1-hour online interview. We will use the online conferencing platform, Zoom to audio record the interview. Join us to share experiences about team working, communication and collaboration with functionally diverse disciplines. (participant identities will remain anonymous)

- **Do I have to take part?**

It is up to you to decide whether to take part. If you do decide to take part, you will be emailed this Participant Information Sheet to keep and be asked to sign an Informed Consent Form to return via

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email to the lead researcher (Margot Sandy, m.sandy18@imperial.ac.uk). If you decide to take part, you are still free to withdraw during the interviews without giving a reason.

- **What do I have to do?**

You do not have to prepare anything prior to participating in the study. However, the lead researcher will email the interview questions to you for review if desired. Also, once you have signed the consent form, expect another email with the Zoom conferencing link / calendar interview invite. Simply click on the Zoom link to meet for an online interview (~1 hour) at the agreed upon time and share your experiences in multidisciplinary NPD teams. Your responses will remain confidential and coded to shield your identity.

- **What are the possible disadvantages and risks of taking part?**

There is no risk in taking part in the study. We are here to learn from your experiences. If there is concern about sharing sensitive data, confidentiality or protecting your identity, please note we are following general research ethics, data protection protocols and shielding your identity using a coding system throughout the study.

- **What if something goes wrong?**

If you are harmed by taking part in this research project, there are no special compensation arrangements. If you are harmed due to someone's negligence, then you may have grounds for a legal action. Regardless of this, if you wish to complain, or have any concerns about any aspect of the way you have been treated during the course of this study then you should immediately inform the

satisfied with the response, you may contact the Imperial College Joint Research Compliance Office.

- **Will my taking part in this study be kept confidential?**

The Investigators will preserve the confidentiality of participants taking part in the study and fulfil transparency requirements under the General Data Protection Regulation for health and care research. Data and all appropriate documentation will be stored for a minimum of 10 years after the completion of the study, including the follow-up period.

- **What will happen to the results of the research study?**

After the interview, the transcript will be available to the participant following the study if desired.

The overall study outcomes will form the basis for establishing new knowledge in the field of multidisciplinary team working in NPD contexts and to be reported in the lead researcher's PhD thesis. Any additional written reports resulting from the data gathered (including participant quotes with

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identities shielded) are only used for academic and scholarly purposes that may be published. Published work will be available to participants if desired. Please note, your name will not be revealed / identified in any report.

- **Who is organising and funding the research?**

Imperial College London is the main sponsor of this research through the lead researcher's 2018 Presidential PhD Scholarship.

- **Who has reviewed the study?**

This study was given ethical approval by the Head of Department of the Dyson School of Design Engineering and Joint Research Compliance Office (JRCO).

Contact for Further Information

Please contact Margot Sandy (m.sandy18@imperial.ac.uk or +44 07554316484) for further information. You will be given a copy of the written information and signed Informed Consent form to keep.

Thank you for participating in our study!

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Appendix: Transparency Notice

HOW WILL WE USE INFORMATION ABOUT YOU?

Imperial College London is the sponsor for this study and will act as the data controller for this study. This means that we are responsible for looking after your information and using it properly. Imperial College London will keep your personal data for:

- 10 after the study has finished in relation to data subject consent forms.
- 10 after the study has completed in relation to primary research data.

We will need to use information from you for this research project.
This information will include your **identifiers held by the sponsor for the research**. People will use this information to do the research or to check your records to make sure that the research is being done properly.

People who do not need to know who you are will not be able to see your name or contact details. Your data will have a code number instead.

We will keep all information about you safe and secure.
Once we have finished the study, we will keep some of the data so we can check the results. We will write our reports in a way that no-one can work out that you took part in the study.

LEGAL BASIS
As a university we use personal information to conduct research that will be in the legitimate interests of the College.
As a publicly-funded organisation we have to ensure that when we use personally-identifiable information from people who have agreed to take part in research, it is in our legitimate purposes are both properly notified to you and are not overridden by your rights.
We will conduct scientific research in compliance with the law and the recommendations and guidance published by the UK Information Commissioners Office (ICO).

INTERNATIONAL TRANSFERS
There may be a requirement to transfer information to countries outside the European Economic Area (for example, to a research partner). Where this information contains your personal data, Imperial College London will ensure that it is transferred in accordance with data protection legislation. If the data is transferred to a country which is not subject to a

European Commission (**EC**) adequacy decision in respect of its data protection standards, Imperial College London will enter into a data sharing agreement with the recipient organisation that

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incorporates EC approved standard contractual clauses that safeguard how your personal data is processed.

SHARING YOUR INFORMATION WITH OTHERS

For the purposes referred to in this privacy notice and relying on the bases for processing as set out above, we will share your personal data with certain third parties.

- Other College employees, agents, contractors and service providers (for example, suppliers of printing and mailing services, email communication services or web services, or suppliers who help us carry out any of the activities described above). Our third party service providers are required to enter into data processing agreements with us. We only permit them to process your personal data for specified purposes and in accordance with our policies.

WHAT ARE YOUR CHOICES ABOUT HOW YOUR INFORMATION IS USED?

You can stop being part of the study at any time, without giving a reason, but we will keep information about you that we already have.

- We need to manage your records in specific ways for the research to be reliable. This means that we won't be able to let you see or change the data we hold about you.

WHERE CAN YOU FIND OUT MORE ABOUT HOW YOUR INFORMATION IS USED

You can find out more about how we use your information

- by asking one of the research team
- by sending an email to m.sandy18@imperial.ac.uk, or
- by ringing us on +44 07554316484.

COMPLAINT

If you wish to raise a complaint on how we have handled your personal data, please contact Imperial College London's Data Protection Officer via email at dpo@imperial.ac.uk, via telephone on 020 7594 3502 and/or via post at Imperial College London, Data Protection Officer, Faculty Building Level 4, London SW7 2AZ.

If you are not satisfied with our response or believe we are processing your personal data in a way that is not lawful you can complain to the Information Commissioner's Office (ICO). The

ICO does recommend that you seek to resolve matters with the data controller (us) first before involving the regulator.

A7: Chapters 4 & 5 – Informed Consent Form

Imperial College London

Consent Form for Participants Able to Give Consent (interviews)

Full Title of Project: Better Understanding Collaboration & Communication in Multidisciplinary NPD (New Product Development) Teams

Name of Principal Investigator: Stephen Green / Margot Sandy

	Please initial box
1. I confirm that I have read and understand the participant information sheet dated May 22, 2020 version 4 for the above study and have had the opportunity to ask questions which have been answered fully.	
2. I understand that my participation is voluntary, and I am free to withdraw at any time, without giving any reason and without my legal rights being affected.	
3. I give permission for Imperial College London to access my data that are **relevant to this research**.	
4. I give consent to being audio recorded for interviews using the Zoom conferencing platform.	
5. I consent to take part in the above study.	
6. I give consent to using direct quotes from the interview (if there is no identifiable data to me).	
7. I give/do not give consent to being contacted to potentially take part in other research studies.	

_____ Name of Participant	_____ Signature	_____ Date
_____ Name of Person taking consent (if different from Principal Investigator)	_____ Signature	_____ Date
_____ Principal Investigator	_____ Signature	_____ Date

Consent Form, version 2, April 2019 Version 4.0

 Date 22/05/20

A8: Chapters 4 & 5 – Interview Guide (Prep Questions Provided to Participants)

Title: Better Understanding Collaboration & Communication in Multidisciplinary NPD (New Product Development) Teams

Purpose: To understand contributing factors to effective multidisciplinary team working concerning interpersonal communication, functional perspectives, expertise and team member values.

Methods: Semi-structured interviews with below question guide around participant's (1) background/experience, (2) multidisciplinary team experience and (3) perspectives / values. Please note, follow up questions to participant responses may be asked that are not listed below.

Length of Interview: 45-60 minutes

Data Collection: Audio recordings through Zoom Online Conferencing Platform to be transcribed and analysed (participant anonymity)

Sampling Procedures: Selected a range of participants involved with a multidisciplinary NPD team (different disciplines)

QUESTION GUIDE:

Background / Experience

Tell me about yourself. Which roles have you fulfilled in your career? Is this a different path than what you studied at university?

What is your role at your current organisation? What does a regular day look like for you in this role?

What types of products have you developed in teams over the years? How long have you been in product development?

From a work standpoint, what do you think are your top 3 most effective skills or attributes?

Given the following, rank the top 3 that best describe you in terms of your interests and aspirations: (1) Realistic – 'the do-er', (2) Investigative – 'the thinker', (3) Artistic – 'the creator', (4) Social – 'the helper', (5) Enterprising – the persuader', (6) Conventional – 'the organiser'

Multidisciplinary Team Experience

Typically, how many team members are in a core project team for a new project? In your experience, does the size of the team matter for it to be effective?
For your day-to-day project tasks, which team members do you interact with most frequently? Average frequency? Least frequent (i.e., different disciplines)? Which of those interactions do you feel most comfortable in navigating and why?

What part of teamwork do you find the most challenging or your biggest barrier to being effective and why?

Based on your experience, what aspect of the product development team is the most influential to a product's success? What do you consider product success?

With the current Covid-19 situation, what platforms have you been using to work as a team? How many people are typically involved? What has worked well? What has not worked well?

Perspectives / Values

When you start working on a project, what are your motivations for completing that project? In your opinion, do you think motivations differ among your team members?

Which field do you consider your company to be in? Is it more tech-, market- or design-driven? And why would you categorize them that way? How has that impacted your team?

When there is a new project starting, what is the first thing you are concerned about (i.e. the first steps, nothing proprietary)? When the project is finished, what is your metric for determining whether the team has been effective?

If you were to build a team from scratch in your organisation, how would you fill 5 spots with disciplines for the project to be the most effective? Why would you choose them?

Rate your preference from 1(avoid) to 10 (relish / enjoy), for working with (1) data, (2) people, (3) ideas and (4) things. Explain why.

A9: Chapter 6 – Questionnaire Structure & Rationale

Questions based on insights from chapter 4 and 5

[SURVEY SCENARIO] You are preparing to identify the best individual hire for a New Product Development team (e.g., a team that works to develop ideas into products for sale) and therefore you need to evaluate the team that they will join. The next 17 questions will help establish criteria for the individual that is the best team fit. [The estimated time to complete the survey is ~10 minutes].

1. **Qualifying Survey Question:** Do you currently or have you ever worked in teams developing new products?
   ANSWER: [yes or no]

---

2. **Team members have the freedom to choose their own work location**
ANSWER: [Strongly Disagree; Disagree; Slightly Disagree; Slightly Agree; Agree; Strongly Agree]

*>>> **Question Aim**: Measure level of workplace autonomy alignment in team arrangements (individual alignment)*

3. *Follow-up question: Do most team members work….?*
***ANSWER:** (a) at home, (b) in person, (c) combination or (d) other (please specify)*

4. **People on the team interact socially**
ANSWER: [Strongly Disagree; Disagree; Slightly Disagree; Slightly Agree; Agree; Strongly Agree]

*>>> **Question Aim**: Measure level of hybrid sociability alignment (team alignment)*

5. *Follow-up question: What type of social interactions occur, if any?*
***ANSWER:** virtual interactions [open answer]*
in person interactions [open answer]
other (please specify) [open answer]

6. **Tools are available to help facilitate goal clarity**
ANSWER: [Strongly Disagree; Disagree; Slightly Disagree; Slightly Agree; Agree; Strongly Agree]

*>>> **Question Aim**: Measure level of hybrid technology alignment (organisational alignment)*

7. *Follow-up question: What are the most helpful / least helpful types of tools?*
***ANSWER:** most helpful [open answer]*
least helpful [open answer]

8. **The team goals align with the organisational goals**
ANSWER: [Strongly Disagree; Disagree; Slightly Disagree; Slightly Agree; Agree; Strongly Agree]

*>>> **Question Aim**: Measure level of organisational purpose alignment (organisational alignment)*

9. *Follow-up question: If there is misalignment, what are the major areas of disagreement?*
ANSWER: [open answer]

10. Team members have similar functional backgrounds (ex. all engineers or all design)
ANSWER: [Strongly Disagree; Disagree; Slightly Disagree; Slightly Agree; Agree; Strongly Agree]

*>>> **Question Aim**: Measure level of team commitment alignment (team alignment)*

11. Follow-up question: What types of functional backgrounds are on the team? Select all that apply.

ANSWER: *[ ] Engineers*
[ ] Marketing or Business
[ ] Design
[ ] Project or Program Managers
[ ] Operations or Manufacturing
[ ] Other (please specify) [open answer]

12. Team member functional (ex. engineer or design) goals align with the team goals
ANSWER: [Strongly Disagree; Disagree; Slightly Disagree; Slightly Agree; Agree; Strongly Agree]

*>>> **Question Aim**: Measure level of functional balance alignment (team alignment)*

13. Follow-up question: If there is misalignment, what are the major areas of disagreement?
ANSWER: [open answer]

14. Our team has some individuals with broad backgrounds (e.g., 3-4 different functional experiences) that work to improve interactions with other team members and/or challenge the team for the better
ANSWER: [Strongly Disagree; Disagree; Slightly Disagree; Slightly Agree; Agree; Strongly Agree]

*>>> **Question Aim**: Measure level of functional alignment brokers (individual alignment)*

15. Closing Survey Question: What are the biggest reasons people leave companies?
ANSWER: [open answer]

16. / 17. Demographic Questions:

- How many years of work experience do you have developing new products?
  ANSWER: [open answer]

- What is the typical size of teams you have worked in (ex. 4 – 7)?
  ANSWER: [open answer]

A10: Chapter 6 – Open Response (Qualitative Portion) Coding Structure

Question #5: Hybrid Sociability Alignment - Open Answer Coding

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
• Video Meetings (Zoom / Teams / Google Meet / Skype) • Online Chats (Slack / Teams / Zoom)	Online Interactions (20%)	Formal Interactions (65%)
• Spontaneous office interactions (chats / visits / greetings)	In-Person Interactions (45%)	
• Program Meetings • Situational Meetings (Project specific / Kick-offs / Ad-hoc) • Team Reviews (Prototype / Testing / Brainstorming)		
• Retreats • Team Building • Games (Bowling, Basketball)	Company Sponsored Events (14%)	Informal Interactions (35%)
• Food-Drink Gatherings • Socials / Parties • Special Celebrations (birthday, retirement, service)	Food & Beverage Socials (14%)	
• Acquaintance Meetings • Recurring Updates	Personal Debriefs (7%)	

Question #7: Did not use data.

Question #9: Organisational Purpose Alignment – Open Answer Coding

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
• Timeline conflicts • Project urgency	Time-related (26%)	Team Related Issue (80%)
• Functional goals / targets differences • Strategy differences • Solution / Standard differences	Function/Design-related (54%)	
• Passion differences		
• Responsibility assignments • Resources allocation • Time Management • Organising	Resource-related (8%)	Org Related Issue (20%)
• Organisational Structure	Structure-related (8%)	
• Organisational Communication • Transparency	Communication-related (4%)	

Question #13: Functional Balance Alignment – Open Answer Coding

1st Order Concepts	2nd Order Themes	Aggregate Dimensions
• Personal demeanours • Different ideas • Expertise differences	Individual disagreements (5%)	Functional Differences (79%)
• Functionality goal differences • Metric / Target issues • Task priority differences • Effort / focus differences	Goals/priorities disagreements (56%)	
• Schedule differences • Financial differences	Budget/Timeline disagreement (18%)	
• Process differences • Solution differences • Design differences	Strategy disagreement (21%)	Team Differences (21%)

Question #15: Did not use data.

A11: Chapter 6 – Coded Open Response Questionnaire Example

Participant: SURV-8
Location: Silicon Valley
Age: 30-44
Gender: Female
Work Experience: 25 years

Open Answer #	Question	Answer	Code
5	What type of social interactions occur, if any?	Team meetings Product testing	• Team Reviews
9	If there is misalignment, what are the major areas of disagreement?	Allocation of corporate and team resources	• Resources allocation
13	If there is misalignment, what are the major areas of disagreement?	Prioritization of critical tasks	• Task priority differences