

# What makes NPD teams work? A review of empirical, peer-reviewed literature

Master thesis

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*“My model for business is The Beatles. They were four guys who kept each other’s kind of negative tendencies in check. They balanced each other and the total was greater than the sum of the parts. That’s how I see business: great things in business are never done by one person, they’re done by a team of people.”*

*-Steve Jobs, 2003, 60 Minutes*

## **1. Introduction**

The past few decades, new product development (NPD) and innovation received significant attention in both research and practice. Several authors have underlined the importance of NPD as a crucial component of survival, sustainable growth, competitive advantage and sustained company performance (McNally, Akdeniz & Calantone, 2011; Sorescu & Spanjol, 2008; Cooper & Kleinschmidt, 2007; Cormican & O’Sullivan, 2004; Baumol, 2002; Ernst, 2002, McDonough, 2000; Lester, 1998). Moreover, results from the 2003 best practices study performed by the Product Development & Management Association (PDMA) revealed that 47% of the annual sales of the most successful companies derived from new products commercialized in the last five years (Barczak, Griffin & Kahn, 2009). In search for the factors that drive NPD success, scholars have emphasized the importance of organizational structure as a key component (Kim & Kim, 2009; Ernst 2002). Ernst (2002) performed a literature review on the success factors of new product development and found five essential organizational critical success factors: a cross-functional team; a strong and responsible project leader; a new product development team with responsibility for the entire project; the commitment of the project leader and the team members to the NPD project; and intensive communication among team members during the course of the NPD process. Thus, an NPD team can be considered as a critical success factor of new product development (Edmondson & Nembhard, 2009; Ernst, 2002; Cooper & Kleinschmidt, 1995).

NPD teams are seen as an important source of innovation since innovation no longer merely stems from the creative ideas of one single individual (Drach-Zahavy & Somech, 2001), but often arises in a team (Anderson & West, 1998). The use of teams in NPD activities indicates several important benefits, for example: reduction of development costs, (Kessler & Chakrabarti, 1996; Brown & Eisenhardt, 1995), faster time to market (Brown & Eisenhardt, 1995; Cooper & Kleinschmidt, 1994), higher quality of products (Patti, Gilbert & Hartman, 1997) and better financial performance of products produced by teams (Brown & Eisenhardt, 1995). Moreover, a survey of US firms revealed that over 84% of more innovative product development projects used cross-functional teams (Griffin, 1997). Thus, NPD teams are found to be essential for the success of new product development.

Numerous primary studies have been conducted in order to identify the critical factors that drive team performance and, as a result, several literature reviews have emerged on teams (e.g. Mathieu et al., 2008). Particularly, studies of virtual teams have often been subjected to a review (e.g. Powell, Piccoli, & Ives, 2004; Martins, Gilson, & Maynard, 2004; Hertel, Geister, & Konradt, 2005; Ebrahim, Ahmed, & Taha, 2009; Algesheimer, Dholakia, & Gurău, 2011). NPD teams, however, operate in a rather different environment than non-NPD teams: “Without an exception, NPD teams operate in nonroutinized, ambiguous, resource-constrained, and cross-functional environments tasked with creating innovative outcomes. These conditions are not always present in teams in general.” (Sivasubramaniam, 2012, p. 803). Thus, a literature review that particularly focuses on NPD team performance may present findings and future insights that differ from reviews that focus on teams in general or virtual teams.

Moreover, the current empirical evidence on NPD team performance consists of numerous studies, which often differ in terms of variables (factors and performance indicators) and level of analysis. A study may for example focus on the effect of team member co-location (*independent variable on team level*) on product quality (*dependent variable*), *moderated* by product innovativeness. To date, however, a comprehensive overview of the current state of knowledge on ‘what works’ for NPD teams is lacking. One exception here is the study conducted by Hülshager, Anderson and Salgado (2009), who researched team-level antecedents of creativity and innovation in the workplace. They conducted a thorough and comprehensive literature search and synthesized findings by means of a meta-analysis. However, while we acknowledge the existence of a literature review on NPD team performance, we believe that our study can make a significant contribution to both research and practice in a number of ways. First, our study, will not be limited to team-level variables, but will also be open to including other levels of analysis (e.g. individual level and organizational level) if they were identified in literature. In addition, whereas Hülshager et al. (2009) focuses on two performance indicators (creativity and innovation), we do not restrict on the inclusion of predefined performance indicators in our review, as we aim to identify the performance indicators used in NPD team performance research. Second, as opposed to the study of Hülshager et al. (2009), who synthesized findings by means of meta-analysis, we will employ a narrative synthesis. Third, Hülshager et al. (2009) included studies published in or before March 2007, whereas our study will incorporate studies published in or before July 2015, which will result in a more up to date review. Finally, as opposed to the study of

Hülshager et al. (2009), we present our findings graphically rather than through a tabular representation of the research findings, because we believe that a framework is visually more attractive and comprehensible for practitioners. and an appropriate way to represent the scope of the literature on NPD team performance.

Thus, in sum, current research is lacking an overview of knowledge on NPD team performance. In an attempt to fill this gap, this paper will provide a comprehensive overview of independent factors or characteristics that have been studied in empirical research for having an influence on NPD team performance as well as the used indicators of NPD team performance. In addition, we aim to identify possible moderators or mediators of the relationship between the independent and dependent variables. By organizing and synthesizing the findings of the literature search into a graphical framework, this study allows for a comprehensible representation of variables and performance indicators. As a result, this study may be particularly useful for practitioners (e.g. team manager), because the findings will be presented within a simplistic, graphical overview within one single document. For example, an NPD team manager assigned with the task to assemble an NPD team for a certain project will benefit from the concise overview of relevant factors that are associated with the team's performance. For scholars this paper may be useful as it presents a structured overview of empirical literature on NPD team performance, which may help identify matured research areas and future research avenues by identifying gaps in literature. This literature review may also provide a sound starting point for PhD scholars interested in NPD team performance and its antecedents. In the next section we will present our research questions, research design and elaborate on the methods used for data collection and analysis.

### ***1.1. Research goal and research questions***

The purpose of this paper is to provide a comprehensive overview of factors (independent variables) that have an impact on NPD team performance (dependent variable), as well as interaction effects between factors (moderators) and indirect effects of factors on NPD team performance only through another factor (mediators.) We aim to review and summarize the existing literature on NPD team performance and provide a sound foundation for practitioners to make evidence-based decisions by synthesizing and organizing the identified variables into a comprehensible, graphical framework. Finally, we aim to contribute to NPD team performance research, by identifying research areas that require further exploration and

investigation and provide some suggestions for future research. We will not include control variables in our analysis, because we aim to identify the more complex relationships between the independent, dependent, moderating and mediating variables. Control variables do not play a role in this relationships and will thus be omitted from further analysis.

The research goal can be , this study aims to answer the following research questions:

1. *What factors that influence NPD team performance can be found in empirical, peer-reviewed literature?*
2. *What NPD team performance indicators have been used in empirical, peer-reviewed literature of factors that influence NPD team performance?*
3. *What is the relationship between the independent variables identified in RQ 1 and the dependent variables in RQ 2?*
4. *What factors can be found in empirical, peer-reviewed literature that moderate the relationship between the independent and dependent variable?*
5. *What factors can be found that mediate the relationship between the independent and dependent variable?*

## ***1.2. Conceptual framework***

In our conceptual discussion, we aim to present clear definitions of the main concepts of our study, which will help identifying the key search words and search strings for our literature search process. Moreover, the conceptual discussion will provide a basis for setting and using the inclusion and exclusion criteria further on in the study.

### *New product development*

For our study, we follow the definition of new product development (NPD) as presented by Al-Zu'bi and Tsinopoulos (2012): “the entire process of generating and bringing to the market both entirely new products and variations to existing ones” (p. 668). In defining ‘new products’, Al-Zu'bi and Tsinopoulos (2012) emphasize on the inclusion of totally new products as well as modifications to existing products and whereas we acknowledge that software development is a part of product development, we will not identify ‘software’ as an outcome of the development process in our study. Although NPD and software development (SD) share several similarities and face common challenges (Nambisan & Wilemon, 2000), research within each field focuses on different aspects of product development. For example,

software development research focuses on development methodologies and techniques, whereas new product development literature emphasizes on organizational issues (e.g. team composition) (Nambisan & Wilemon, 2000). Research findings in the NPD domain hold relevance for the SD domain (and vice versa) (Nambisan & Wilemon, 2000), however, we decided to exclude software development as part of our definition of new product development, whereas they have often have been studied separately, as two different domains with a different focus and different theoretical and practical implications.

### *New product development team*

A new product development team can be defined as a team, comprised of personnel or functional specialists, that are temporarily or permanently assigned to develop new products, which may involve senior managers whose primary task is to supervise the development of new products (Millson & Wilemon, 2002). Besides the more obvious typologies of an NPD team, like R&D teams (e.g. Barczak, 1995) and innovation teams (e.g. Moenaert & Sounder, 1990), research has presented various types of teams that have been used for new product development activities, for example virtual teams (for a review see Ebrahim, Ahmed, & Taha, 2009) cross-functional teams (Barczak & Wilemon, 2001; Griffin, 1997) and working teams (Valle & Avella, 2003). For our study, a new product development team will be defined as a group of people, tasked with and focused on the development of new products. Thus, whether scholars may have used different typology or terminology, we will follow this definition to assess whether or not a study focuses on an NPD team.

### *New Product Development Team Performance*

NPD team performance can be defined as the degree to which expectations regarding the quality of the developed product are met by the team (effectiveness), as well as the adherence to schedules and budgets (efficiency) (Hoegl & Parboteeah, 2003). Team performance is often linked to project performance, which can be defined as “the extent to which a team is able to meet established project objectives” (Visser, Faems, Visscher & Weerd-Nederhof, 2014, p.1171). Moreover, scholars have used these concepts in different, sometimes interchangeable ways. For example, Hoegl and Gemuenden (2001) used team performance and team member performance as indicators of project success, whereas vice versa, Pirola-Merlo, Härtel, Mann and Hirst (2002) used project management performance as an indicator of team performance. Yet others define the relationship between team performance and project success as unclear (Argawal & Rathod, 2006; Freeman & Beale, 1992). In some

studies, team performance and project performance have been used interchangeable (e.g. Visser et al., 2014). In turn, scholars have also linked project success has to product success. For example, Baccarini (1999) suggests product success should be distinguished from project success, whereas Maltz, Shenhar, Dvir, & Gao (2013) argue that distinguishing between product success and project success is no longer appropriate because they are both part of ‘the same game’. For our study, we will use the term *team performance* (rather than project performance or product performance) to emphasize the team perspective of our study. We will adopt a broad conceptual definition, by defining NPD team performance as the extent to which an NPD team is able to meet team, project and product objectives. While we acknowledge that, for example, product performance in the market place is not under the direct influence of team control (e.g. environmental factors), we will be open to such consequences of NPD team performance. Moreover, we will distinguish between the different types of performance indicators, based on their relation to team performance, project performance or product performance. Thus, for our study, we will focus on team performance, its antecedents and performance indicators.

The remainder of this paper is structured as follows. In section 2, we will describe the systematic research method and the results of the review process. In section 3, we will present the results of the data analysis and data synthesis. Section 4 will present a discussion of the findings and future research directions. We will present our conclusion and limitations in section 5.

## **2. Methodology**

This study follows the methods of a literature review, because this data collection method is found to correspond best with the goals of this study. For example, a literature review distinguishes what has been done from what needs to be done (Hart, 1998); discovers important variables relevant to the topic (Hart, 1998); provides an understanding of the context and structure of the subject (Hart, 1998) and identify the main methodologies and research techniques that have been used (Hart, 1998).

Several scholars emphasize the importance of literature reviews within an academic field. Webster and Watson (2002) describe the relevance of a literature review as follows: “An effective review creates a firm foundation for advancing knowledge. It facilitates theory development, closes areas where a plethora of research exists, and uncovers areas where research is needed.” (p. xiii). Moreover, literature reviews are seen as a critical tool for

managing knowledge diversity (Tranfield, Denyer & Smart, 2003). However, despite their importance, many literature reviews are faulty and poorly done (Randolph, 2009; Boote & Beile, 2005).

The traditional literature review approach is a narrative review, which often does not include a methodology section (Cipriani & Geddes, 2003) and generally consist of three main steps: data collection, data analysis and data synthesis. As a result they have been criticized for frequently lacking thoroughness and rigour (Tranfield et al., 2003). As opposed to narrative reviews, systematic reviews adhere to the key principles of rigour, transparency and replicability (Mallett, Hagen-Zanker, Slater & Duvendack, 2012) and are generally presented as the review type that delivers “the best evidence for many decisions” (Booth, Pappaioannou & Sutton, 2011, p.3). Taking on a systematic approach allows for a transparent and thus, reproducible research process because it requires a detailed description of all the steps taken in the process (Denyer & Neely, 2004; Cipriani & Geddes, 2003). A transparent and rigorous research process, as a result, leads to greater validity and reliability of the research findings (Victor, 2008). Although conducting a systematic review requires substantially more effort (Kitchenham, 2004), we believe that the benefits of a transparent and thus reproducible research process clearly outweigh the disadvantage.

We will follow the guidelines of conducting a systematic literature review from Tranfield et al. (2003). By applying the specific principles of the systematic review methodology used in the medical sciences, their approach helps to limit bias in management research (Tranfield et al., 2003). Moreover, the increased legitimacy and authority of the research findings may provide practitioners and policy-makers with a reliable foundation for making evidence-based decisions (Tranfield et al., 2003).

The systematic review process of Tranfield et al. (2003) consists of the following three phases:

1. *Planning the review*: Identifying the need for a review; conceptual discussion and developing a review protocol;
2. *Conducting the review*: Identifying, selecting, evaluating and synthesizing the relevant research;
3. *Reporting and dissemination*: Reporting the results of a descriptive analysis and a thematic analysis.

Because the need for a review has been described in the introduction, we will proceed with a detailed description of the review protocol in section 2.1. The description of and results from the search process will be presented in in section 2.2.

### ***2.1. Review protocol***

The review protocol can be defined as: “a plan that helps protect objectivity by providing explicit descriptions of the steps to be taken” (Tranfield et al., 2003, p. 215) and may contain the following elements:

1. Identifying keywords and search terms
2. Identifying sources for data collection
3. Setting inclusion and exclusion criteria
4. Describing the process of data screening
5. Describing methods for data analysis
6. Describing methods for data synthesis

The following sub-sections will elaborate on each of the steps of the review protocol as described above.

#### **2.1.1. Writing the search strings**

The search strings that are used for the academic literature search will ultimately determine what articles we identify. Following our definitions of the main concepts presented in our conceptual framework, we first determine the relevant keywords and synonyms, followed by a translation of those keywords into a search string (Tranfield et al., 2003).

Following our conceptual definition, we will use the following synonyms of an NPD team, derived from previous experience with innovation management literature: “new product development team”, “product development team”, “development team”, “R&D team”, “research and development team” and “innovation team”. Synonyms for “performance” may result in the following: “effectiveness”, “efficiency” and “success”.

Before translating these synonyms into a search string, we first need to decide whether to use the full word combination (and synonyms) of “NPD team performance” or a combination (and synonyms) of “NPD team” AND “performance”. For example, searching for “new

product development team” AND “team performance” is likely to include more studies than searching for “new product development team performance”, because the latter would eliminate studies that may not have used the full word combination literally, but do focus on new product development and team performance. Therefore, we decided to construct our initial search string based on a combination (and synonyms) of “NPD team” and “team performance” using one of the basic Boolean operators “AND”. Finally, we will add an asterix (\*) to the word ‘team’ to ensure that the plural ‘teams’ is also included in the search.

We have constructed the following search string based on the search words and synonyms identified above:

```
<<(NPD team* OR development team* OR R&D team* OR innovation team*) AND  
(performance OR efficiency OR effectiveness OR success)>>
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If the search strings result in too many hits, too few hits or do not contain relevant studies, it is suggested that they are being revised (Hagen-Zanker & Mallet, 2013). Whereas this criterion is rather vague, we decided to incorporate around 100 studies for our review, with a minimum of 75 studies. Because the search words ultimately determine what materials we retrieve (Hagen-Zanker & Mallett, 2013) we will perform a pilot search and adjust the search string if necessary. The necessity of adjustment will be judged based on the number of hits and the focus of the articles. If we retrieve around 1,000 articles, we will quickly screen a number of titles and abstracts and check the articles, for example, for their focus on new product development, use of primary data or study design. Based on the overall impression of the set of articles, we will decide whether and how to adjust our search string. The results of the pilot search, the adjustments to the search strings and results of the search process are presented at the end of this section.

### **2.1.2. Determining the sources for data collection**

For this study, we will limit our data sources to ISI journals and thus, we do not pursue a grey literature search. The reasons for this are that management research is mostly published in peer-reviewed journals (Pfeffer, 2007) and articles published in peer-reviewed journals are considered to be validated knowledge (Crossan & Apaydin, 2010). In order to identify articles published in ISI journals, we will perform a computer-based search within the electronic database of ISI Web of Science (WoS). The advantage of searching academic databases is that it efficiently generates a large number of articles which contain the key

search words and which are published in a wide variety of journals (Zou & Stan, 1998). Moreover, ISI Web of Science is easy accessible and comprehensive in its coverage of peer-reviewed journals in the social sciences. Moreover, ISI Web of Science can handle an extensive search string, such as the one we conducted in the previous section. In order to provide a comprehensive overview of literature, we decided beforehand that the final set of papers should consist of at least 80 articles.

### **2.1.3. Setting the inclusion/exclusion criteria**

Determining the inclusion and exclusion criteria improves both the transparency and rigour of the review, by ensuring that the screening of the retrieved studies is performed consistently (Hagen-Zanker & Mallet, 2013).

We will include:

- Studies that focus on new product development team;
- Empirical, quantitative studies;
- Studies that investigate the influence of at least one antecedent factor on at least one team performance indicator or measure. Studies are not restricted on the number of factors investigated. Studies are not restricted on nature of influence. The effect may for example be positive, negative, linear, ‘inverted-U’ shaped or monotonically.

We will exclude:

- Articles not published in English (*because of translation difficulties*);
- Articles published in conference journals;
- Studies that focus on process development or program development (*‘NPD’ may be used to abbreviate ‘new process development’ or ‘new program development’. However, we focus on ‘new product development’*);
- Studies that focus on software development (*considered to be different in context compared to product development*);
- Studies not conducted in a real-life, organizational context.

#### **2.1.4. Data screening**

All articles that are found by using the search strings in ISI Web of Science will be screened for relevancy in two rounds. In the first round, the title, abstract and keywords are checked for relevancy, using the inclusion/exclusion criteria. An article should meet all inclusion criteria in order to be included in the second round of screening, whereas meeting one exclusion criteria will eliminate the article from the review (Tranfield et al., 2003). If an article met the inclusion/inclusion criteria or did not provide sufficient information in title, abstract and keywords to be either included or excluded, it will be included in the second round of screening, in which the full text will be screened for relevancy by using the inclusion/exclusion criteria. Again, an article should meet all inclusion criteria to be included in the final set of papers, whereas meeting one exclusion criteria results in elimination. Thus, the articles that are included after the second round of screening represent the final set of papers that will form the basis for our review.

#### **2.1.5. Data analysis**

In order to answer our research questions, the data (or articles in our case) will be further analysed by means of content analysis. Content analysis can be defined as “a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes and patterns” (Hsieh & Shannon, 2005, p. 1278). A unique characteristic of content analysis is that it allows using both inductive as well as deductive approaches, or a combination of these approaches in data analysis (Cho & Lee, 2014). Hsieh and Shannon (2005) define an inductive approach as ‘conventional content analysis’ and a deductive approach ‘directed content analysis’. The main difference between an inductive and deductive approach to content analysis originates from how the initial codes or categories are developed (Cho & Lee, 2014). An inductive approach draws codes, categories or themes directly from the data (Hsieh & Shannon, 2005). Thus, by following an inductive approach, researchers avoid using preconceived categories (Kondracki & Wellman, 2002). An inductive approach is argued to be appropriate when prior knowledge regarding the topic under investigation is limited or fragmented (Elo & Kyngäs, 2008). A deductive approach, on the other hand, starts with identifying key concepts or variables derived from prior theory, research or literature as the initial coding categories (Potter & Levine-Donnerstein, 1999). As a result, a deductive approach follows a more

structured process than an inductive approach (Hickey & Kipping, 1996) and is argued to be appropriate when the goal of the study is to test existing theory or retest existing data within a new context (Hsieh & Shannon, 2005).

For answering the research questions, we will follow an inductive approach to content analysis, because we do not test theory or build on previous research findings, on the contrary; this study aims to *identify* the antecedents and indicators of NPD team performance (as well as moderators or mediators of this relationship) in the empirical, peer-reviewed literature rather than ‘checking’ relevant literature for predefined factors and performance indicators. Moreover, this information is fragmented and scattered all over NPD team research literature, which makes an inductive approach appropriate for our data analysis.

We will follow the approach for conducting an inductive analysis presented by Elo and Kyngäs (2008), which consists of three main phases: preparation, organizing and reporting. In the preparation phase, the unit of analysis will be selected, which in our study is formed by the full text of the articles represented in the final set of papers. The second step is to organize the qualitative data, which includes open coding, creating categories and abstraction (Elo & Kyngäs, 2008). Open coding can be defined as: “the interpretive process by which data are broken down analytically” (Corbin & Strauss, 1990, p.12). We will start open coding by identifying independent, dependent, moderating and mediating variables from the text. After coding all variables, we aim to identify categories or groups of variables. Formulating categories refers to deciding by means of interpretation, which codes will be put into the same category (Dey, 1993). Finally, the formulated categories will be given a name (abstraction), which refers to the content of the codes that are in that category (e.g. ‘knowledge’, ‘trust’ or ‘satisfaction’). In sum, our main categories will consist of ‘independent variable’, ‘dependent variable’, ‘moderating factor’ and ‘mediating factor’, which again consist of categories such as ‘team-member level’, ‘team-level’ and ‘organizational level’. These categories then again consist of subcategories such as ‘cross-functionality’, ‘interaction’ and ‘satisfaction’. Finally, these subcategories consist of the actual variables as identified in the articles. The coding process is a very important part of the data analysis, because the success of the content analysis is largely dependent on this process (Hsieh & Shannon, 2005).

### **2.1.7. Data synthesis**

Finally, the data will be synthesized by means of a narrative synthesis and translated into a graphical representation of all identified variables and their relationships. We will present a simplistic model that represents an overview of the main categories of variables identified in the literature, that have an influence on NPD team performance. Rather than pooling the findings of the individual studies to estimate an average effect (meta-analysis) (Glass, 1976), we aim to identify and present the relationship among a wide variety of variables that play a role in NPD team performance.

### **2.1.8. Pilot search**

We performed a computer-based pilot search in the electronic database of ISI Web of Science by plugging the search string. The database checks the title, abstract and key words of citations for containing the search words of the search string. The search in ISI Web of Science initially resulted in 1,284 hits. By limiting to 'articles' we narrowed down the number of results to 840. We then excluded articles in conference/meeting journals as source type, which resulted in 796 articles. Finally, we excluded articles that were not published in English and identified 749 articles. After quickly screening around 100 titles and abstracts, we found that around 32 of them did not focus on new product development or (product innovation). 27 articles focused on software development and 16 articles were qualitative or theoretical in nature. Of the quantitative studies that focused on new product development, 4 did not meet the requirement of studying the influence of an antecedent factor on a performance indicator. 14 of the 100 articles in this pre-check meet all inclusion criteria. If this randomly selected sample of 100 articles is representable for the entire final set of papers, this could indicate that this search string will result in around 168 relevant articles. As a result of this pilot search, we argue that the initial search string indeed identified articles relevant for our review, however, a large number of the identified articles did not focus on new product development or product innovation. More specifically, the results show that around a third of the sample focused on software development. Finally, due to the broad search term 'development team', the results revealed a number of studies that did not focus on NPD teams in particular. Therefore, we decided to adjust our search string to eliminate articles that did not focus on new product development as well as articles that focused on software development. The following search string was plugged in ISI Web of Science:

<<((NPD team\* OR new product development team\* OR R&D team\* OR research and development team\* OR innovation team\*) AND (performance OR efficiency OR effectiveness OR success) AND (product development OR NPD OR innovation) NOT software )>>

## 2.2. Results of search process

The search of the adjusted search string resulted in 448 hits. ISI Web of Science presents a possibility for limiting or excluding your findings based on for example, language, journals, time period, source type, author, etc. We decided to exploit this possibility, whereas this would save time manually checking the articles for some of the inclusion/exclusion criteria.

We first eliminated 108 studies that were not identified as ‘articles’ and narrowed the number of studies further down by eliminating 16 studies that were conference or meeting publications. Finally, we eliminated 17 articles that were not published in English. Thus, 307 articles were identified for the first round of screening, in which the title and abstract were

**Figure 1. Results from screening process**

	Number of studies	Excluded	Reason for exclusion
<i>Number of hits from search string</i>	448		
ISI Web of Science		-108	Not 'articles'
		-16	Conference/Meeting publications
		-17	Not English
<i>Included after pre-screening</i>	307		
1st Round - Title & Abstract		-71	No focus on NPD / product innovation
		-40	Not empirical
		-4	No use of primary data
		-35	Not quantitative
<i>Included after 1st Round</i>	157		
2nd Round - Full text		-14	No full text available
		-1	Focus on Software Development
		-10	No focus on NPD team in organizational context
		-3	Not empirical
		-1	No use of primary data
		-8	Not quantitative
		-41	No team antecedent AND performance indicator
<i>Included after 2nd Round</i>	79		

checked for relevancy, using the inclusion/exclusion criteria. 71 studies did not focus on NPD or product innovation and 40 studies were not empirical studies. Of the empirical studies that

focused on NPD, 4 studies did not use primary data and 35 studies were identified as qualitative studies.

In total, 150 articles were excluded based on screening the title and abstract. A total of 157 studies could not be assessed properly based on the title and abstract. We downloaded the full text of 143 studies, whereas we were not able to retrieve the full text of 14 studies. We excluded another 64 studies, of which the main reason for was the lack of studying the influence of at least one team antecedent factor on at least one team performance indicator (41 studies). In total, 78 studies were excluded in the second round of screening, which resulted in a final set of papers of 79 studies. The results of the screening process are presented in Figure 1. During the analysis, we came across one paper that did not provide sufficient information regarding its findings, to draw appropriate conclusions from that were useful for our study. Therefore, we decided to also exclude it from the final set of papers, which ultimately consisted our of 78 articles. We aimed to include at least 75 studies for our review, thus we can conclude that the number of studies in our final set of papers is sufficient.

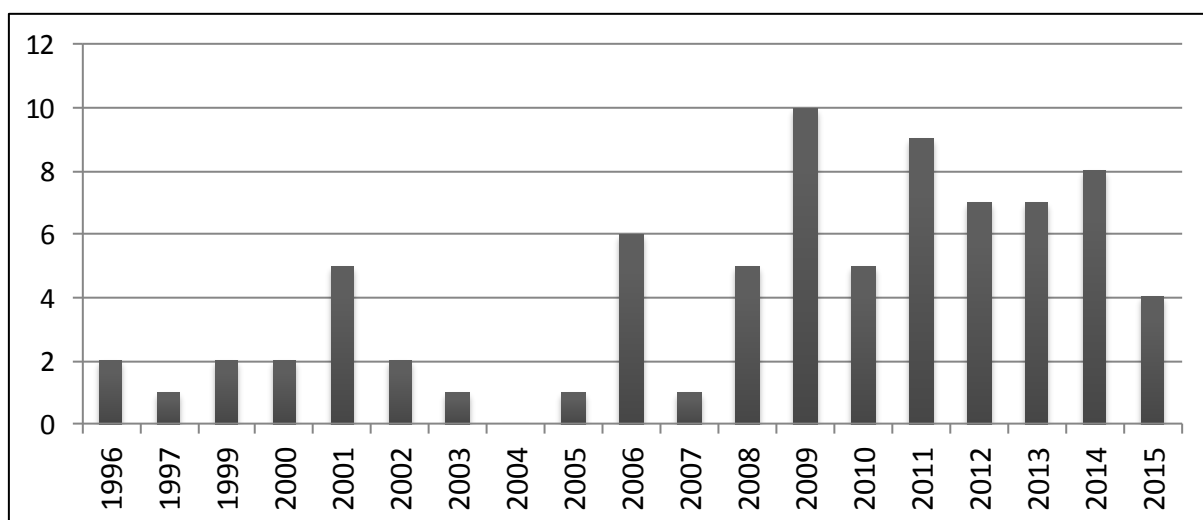
### 3. Results

Following Tranfield et al. (2003), next to our content analysis, we conducted a descriptive analysis (Figure 2 and Table 1) and a thematic analysis (Figure 3) of the selected articles. The descriptive analysis will report the findings by following “a very simple set of categories” (Tranfield et al., 2003, p. 218), and analyses the set of papers according to year of publication (Figure 2) and journal (Table 1).

#### 3.1. Descriptive statistics

The bar chart in Figure 2 presents the results of the analysis per year of publication of the identified articles. With the exception of the year 2006, we can conclude from the bar chart that the majority of the selected articles are published in or after 2009. This could indicate that there is an upward trend in NPD team performance research, peaking in 2009 with 10 published articles that year. However, in comparison to our study, Hülshager et al. (2009) were able to identify around 170 quantitative studies published in or before 2007. This finding is thus a consequence of the methodological approach taken. The limitations of our methodological approach will be discussed in section 4. Nevertheless, compared to the number of articles published per year over the time period 2011-2014, the 4 articles published in the first 7 months of 2015 indicate a growing interest in the topic.

**Figure 2: Number of articles per year of publication**



The analysis by journal (Table 1) gives an overview of the number of articles published per journal. Table 1 gives an overview of the journals in which the articles in our sample set are published. Our final set of articles consisted of 78 articles, published in 32 different journals.

Not surprisingly, 20 of the identified articles are published in the Journal of Product Innovation. This journal is thus responsible for almost 25% of the articles in our sample set. The other 58 articles of our final set of papers are spread over different journals, each responsible for 1 to 5 articles. The wide variety of journals covering the topic of NPD team performance suggests that there is a broad interest in empirical NPD team performance research. Moreover, this interest not only comes from fields commonly associated with NPD (e.g. management, innovation, engineering), but also from the field of psychology.

**Table 1: Number of articles per journal**

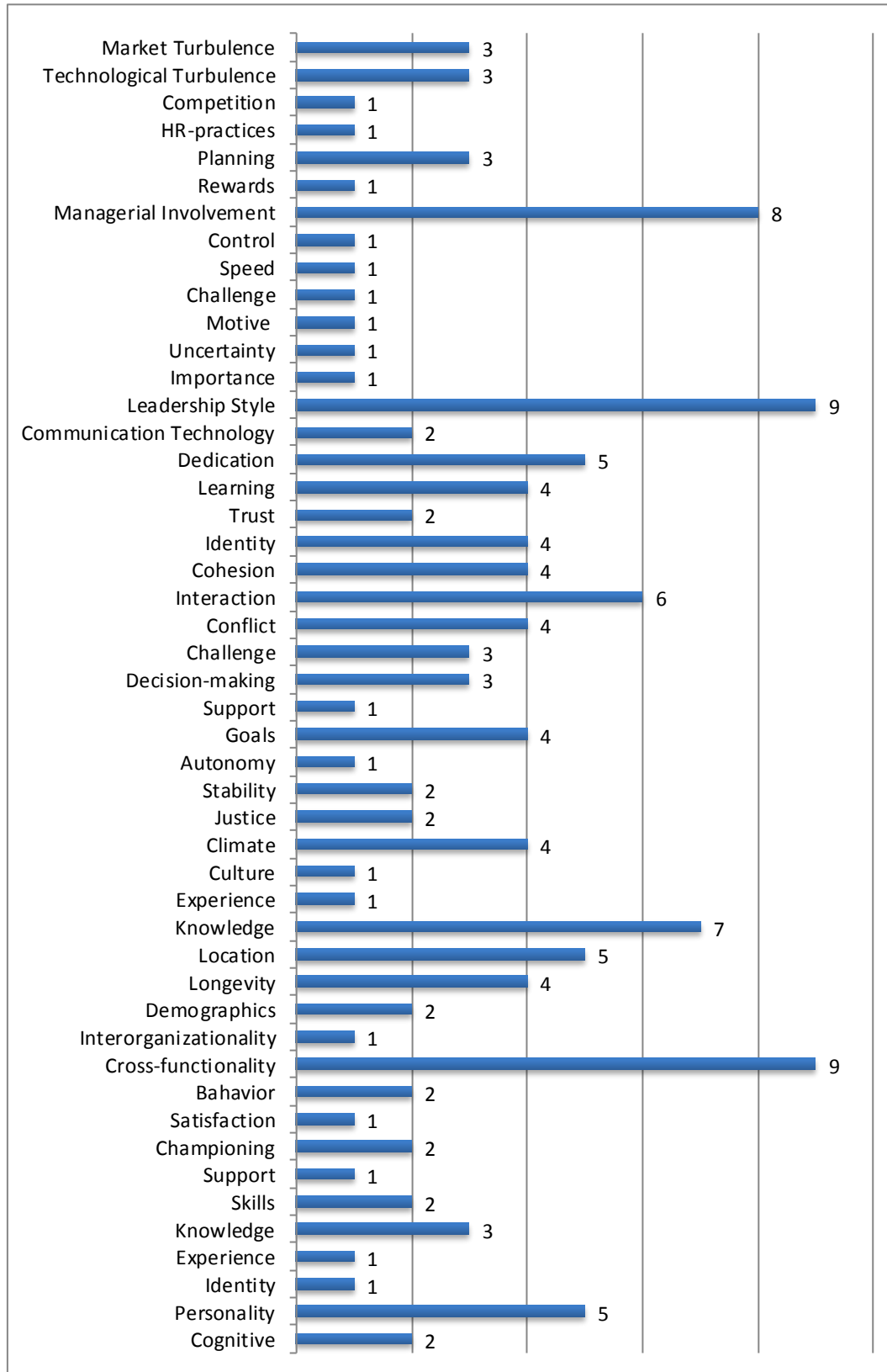
Journals	Number of articles
Academy of Management Journal	1
African Journal of Business Management	3
Asia Pacific Business Review	1
Asia Pacific Journal of Management	3
Creativity and Innovation Management	2
Engineering Management Journal	1
European Journal of Information Systems	1
Group & Organization Management	3
Ieee Transactions on Engineering Management	5
Industrial Management & Data Systems	1
Industrial Marketing Management	3
Information & Management	2
International Journal of Manpower	1
International Journal of Project Management	2
International Journal of Research in Marketing	1
International Journal of Technology Management	1
Journal of Applied Psychology	1
Journal of Business and Psychology	1
Journal of Business Research	2
Journal of Business Venturing	1
Journal of Engineering and Technology Management	4
Journal of Marketing	3
Journal of Occupational and Organizational Psychology	1
Journal of Organizational Change Management	1
Journal of Product Innovation Management	20
Journal of the Academy of Marketing Science	2
Leadership Quarterly	1
Marketing Letters	1
R & D Management	5
Research Policy	1
Technology Analysis & Strategic Management	1
Technovation	1

### ***3.2. Thematic analysis***

The classification in Figure 3, shows that Leadership style and cross-functionality are the most researched factors with both 9 publications, followed by 8 publications that focused on Managerial involvement. Apart from knowledge, personality, interaction dedication and

location, most of the identified topics have been addressed by only 1 or 2 studies. This indicates that team level research represent the majority of our sample set.

**Figure 3: Number of studies per independent variable**



### ***3.3. Results from the coding process: Levels and categories***

#### *Independent variables*

The results from the overall content analysis and coding process of the independent variables are presented in Table 2 (Appendix A), which present the independent, dependent, moderating and mediating variables identified per article along with a brief and abstract description of their interrelationship. The article number presented in the first column of Table 2 will be used as an index for the other articles in our study. Thus, the article number presented in the first column of Table 3-6 (Appendix A) refers to the study with the corresponding article number in Table 2. The remainder of this section will present the results from the overall content analysis. We will present our framework and narratively synthesize the identified independent, dependent, moderating and mediating variables from the perspective of the independent variables.

As a result from the coding process, we divided the identified independent variables into (a) team-member level, (b) team level, (c) team leader level, (d) project level, (e) organizational level, and (f) environmental level.

According to their content, the variables of *the team-member level* are then assigned to one of the following subcategories: Cognitive, personality, identity, experience, knowledge, skills, support, championing, satisfaction and behaviour.

At the team-level, we decided to differentiate between *input* variables (team-level input) and *process* variables (team-level process). We consider *input* variables to be relatively ‘hard to change’ or ‘given’, whereas *process* variables are rather dynamic in nature. The variables on the *team-level (input)* are divided into: Cross-functionality, interorganizationality, demographics, longevity, location, knowledge, experience and skills. For the *team-level (process)* variables, we identified the following subcategories: Culture, climate, justice, stability, autonomy, goals, support, decision-making, challenge, conflict, interaction, identity, trust, learning, behaviour, dedication and communication technology. For the *team leader level*, we identified two subcategories: Personality and leadership style.

At the *project-level*, we distinguished variables according the following categories: Uncertainty, complexity, motive, challenge and speed. The categories for the organizational level consist of Control, managerial involvement, rewards, HR-practices and planning.

Finally, at the *environmental level*, we identified independent variables related to: Technological turbulence, market turbulence and competition. The results of the coding process of the independent variables can be found in the first column of 3.

### *Dependent variables*

The dependent variables identified from the studies can be divided into the following levels: (a) team-member level, (b) team level, (c) project level, and (d) product level. In contrast to the independent variable classification, we decided to incorporate the team leader level into the team level, because there was only one variable that focused on team leadership. We decided that creating a separate performance level might lead to a distorted representation. The different levels are labelled as ‘team-member performance’, ‘team performance’, ‘project performance’ and ‘product performance’. Although we distinguish between these different types of performance, it deserves note that a few authors did not define their dependent variable in accordance to its measure. For example, Blindenbach-Driesen (2015) defined her dependent variable as ‘team performance’, but our analysis of the measures section of the study showed that the items used for measuring this construct evaluated the product’s financial- and market performance. Therefore, we decided to analyse the items that were used to measure the dependent variable for every study separately, instead of assigning them to one of the main categories based on their definition as presented in the text.

We created the following subcategories for *team-member performance*: Creativity and satisfaction. On the *team level*, the following subcategories are created: Behaviour, cooperation, creativity, identity, innovation, communication, learning, team performance (overall), process, productivity, quality, satisfaction and speed. On the *project level*, we distinguished the following subcategories: Innovation, project performance (overall), opportunities, speed and success. Finally, on the *product level*, we assigned the variables to one of the following subcategories: Creativity, market- & financial performance, quality, speed and success.

If the construct measure of the variable could not be assigned to one of the subcategories, because there was overlap between team performance, product performance and project performance measures, (e.g. product quality, managerial satisfaction, sales objectives, staying on budget) it is assigned to the subcategory ‘performance (overall)’. The results of the classification of the all identified dependent variables into levels and subcategories are presented in 4.

### *Moderating variables*

Coding the moderating variables from the text resulted in the following levels: (a) team-member level, (b) team level (input), (c) team level (process), (d) product level, (e) organizational level, and (f) environmental level. Again, the leadership level was incorporated into the product level.

The following subcategories emerged from the content of the moderating variables on the *team-member level*: Flexibility and demographics. For the *team level (input)*, we distinguished the following subcategories: Demographics, experience and familiarity. For the *team level (process)*, the subcategories are: Cohesion, knowledge, learning, autonomy, climate, communication technology, conflict, identity, justice, skills, task complexity, trust, virtuality and leadership style.

The subcategories on the *project level* are defined as: Complexity, risk, time pressure and project stage. The moderating variables on the *product level* are all related to ‘innovation’, which is thus chosen as the label for the single subcategory. For the *organization level*, we distinguished the following subcategories: HR practices, integration, managerial involvement, orientation and organizational structure. Finally, the subcategories of the *environmental level* are the following: Competition, industry turbulence, market turbulence and technological turbulence. The subcategories of the moderating variables identified from the studies are presented in Table 5.

### *Mediating variables*

We identified mediating variables on the following levels: (a) team-member level, (b) team level (input), (c) team level (process), and (d) product level. The subcategories on the *team-member level* are: Commitment, identity, motivation, performance and satisfaction. For the *team-level (input)* we divided the variables into cross-functionality and knowledge and for the *team-level (process)* we distinguished the variables according to the following subcategories: Behaviour, climate, cognitive, conflict, decision making, identity, interaction, justice, knowledge, learning, procedure, satisfaction, trust and leadership style. The subcategories of the mediating variables identified from the studies are presented in Table 6.

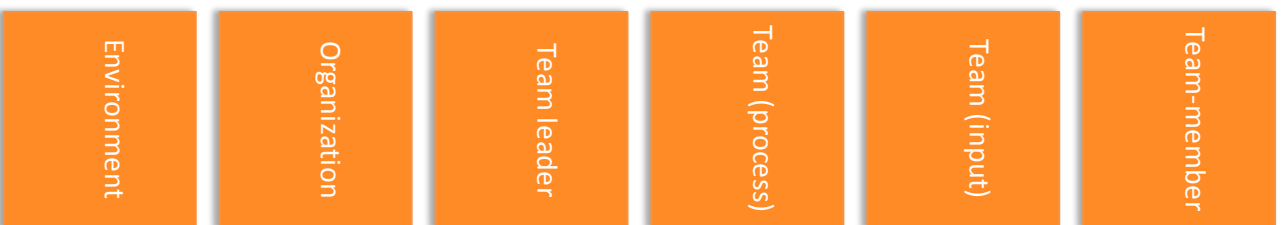
### ***3.4. Results from the content analysis: The relationship between independent, dependent, moderating and mediating variables.***

This part of the section focuses on the relationship between the different variables identified from the studies. After presenting our framework, we will briefly describe the relationships between the variables according to the different subcategories.

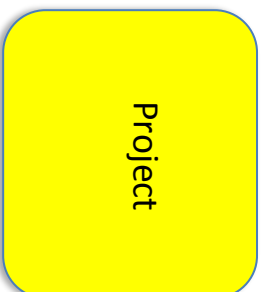
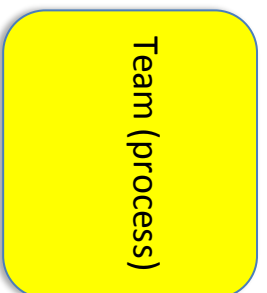
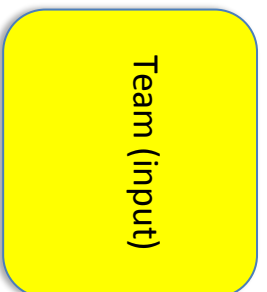
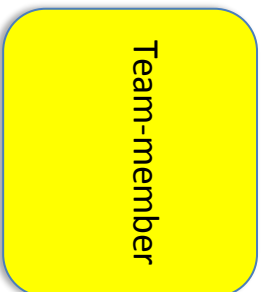
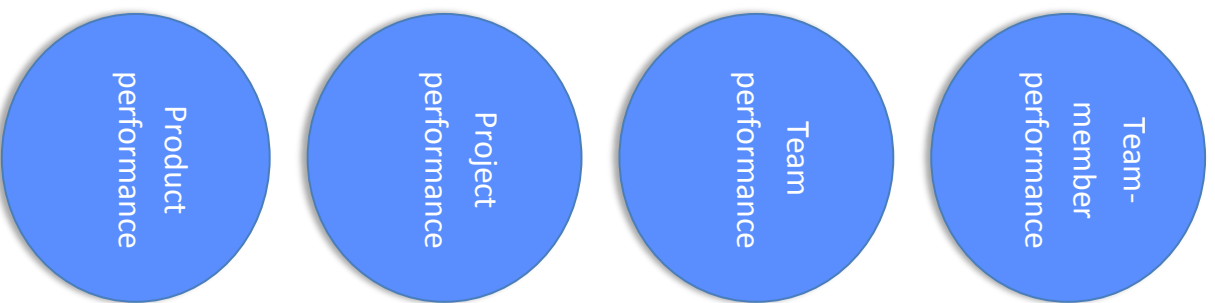
#### ***3.4.1. I-M-O Framework***

In studying team effectiveness, the IPO model (e.g. Hackman & Morris, 1975; McGrath, 1964) is a dominant framework (Martins et al., 2004). However, one of the main critiques is that the input-process-output model fails to distinguish multiple types of “processes” and outcomes (Mathieu et al., 2008). Moreover, the model refers to processes, rather than mediational factors in terms of factors that transmit the influence of team inputs to outcomes (Ilgen, Hollenbeck, Johnson, & Jundt, 2005). Therefore, we will present the identified variables along a different, although related approach of the IPO framework, the Input-Mediator-Output (IMO) model, introduced by Ilgen et al. 2005). A simplified model is presented in Figure 4, which gives an abstract representation of the different levels of analysis that are distinguished in studying independent, dependent, moderating and mediating variables in NPD team research. Figure 5 presents the different levels as well as the distinguished variable categories. The independent variables on the left side of the model are orange-coloured, the dependent variables on the right side of the model are blue-coloured, the moderating variables on the top and the bottom of the model are yellow-coloured and the mediating variables, positioned in the middle (between the independent and dependent variables) are green-coloured.

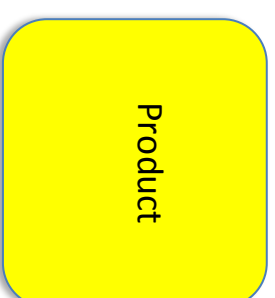
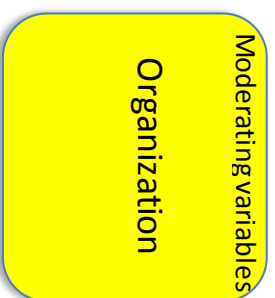
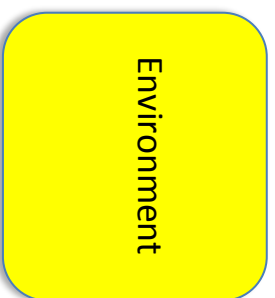
Independent variables



Dependent variables



Moderating variables



Mediating variables





Figure 5: I.M.O. Model with variable categories!

### ***3.3 Narrative summary and synthesis***

The relationships between the variables will be summarized and synthesized narratively in the next part of this section. For this analysis, we describe the relationships from the different categories and levels of the independent variables.

#### **3.3.1. Independent variables**

##### **Team-member level**

###### *Cognitive*

On the team-member level, two studies focused on the influence of team-member cognitive styles on team performance (e.g. Visser et al., 2014; Post, 2012). Visser et al. (2014) investigated the effects of NPD teams' cognitive styles on project performance in different kinds of NPD projects. They found that analytical information processing positively affects project performance in both incremental and radical NPD projects, whereas the relationship between intuitive information processing and project performance is contingent on the radicalness of the project, such that the level of intuitive information processing is positively related to team performance for radical projects, but negative for incremental projects (Visser et al., 2014). Post (2012) explored the relationship between two team cognitive styles (connective thinking and sequential thinking) and team innovation. She found that sequential thinking hinders team innovation by inhibiting psychological safety, whereas connective thinking facilitates team innovation through increased cooperative learning among team members (Post, 2012).

###### *Personality*

Aronson, Dominick & Wang (2014) studied the relationship between team member neuroticism and extraversion and their team leadership and facilitation behaviours. They found that team members who are similar emotionally (a low variety of neuroticism and extraversion) result into higher quality team leadership and facilitation behaviours (Aronson et al., 2014). Chen, Farh, Campbell-Bush, Wu & Wu (2013) investigated the relationship between proactive personality and individual performance. They found that this relation is mediated by members' motivational states and that individual performance is positively related to team innovative performance (Chen et al., 2013). Lee (2008) explored the relationship between team members' entrepreneurial proclivity and NPD performance. They found a positive relationship with team reflexivity and product innovativeness, which in turn

have a positive effect on NPD performance. They also found that the relationship between team reflexivity and product innovativeness on NPD performance is moderated by higher levels of team cohesiveness and higher knowledge practice (Lee, 2008). Finally, Mu, Zhang and MacLachlan (2011) studied the relationship between team member social competency and NPD performance and found that social competency has a direct, positive effect on NPD performance. Learning, technological competency and market knowledge further moderate this relationship.

### *Identity*

Investigating the effect of team identification and expertise identification, Tang & Ye (2014) found that these attributes of team member personality positively influence team members' creativity as the performance outcome, through knowledge sharing.

### *Experience*

The effect of past team member experience on product success and learning has been studied by Dayan & Elbanna (2011). They found that past team member experience has a positive effect on team intuition, which then has a positive effect on product success and learning (Dayan & Elbanna, 2011). Environmental turbulence (e.g. market turbulence and technological turbulence) moderates the relationship between team member experience and team intuition. The relationship between team intuition and product success as well as learning is also found to be contingent on both aspects of environmental turbulence (Dayan & Elbanna, 2011).

### *Knowledge*

Lee (2008) found that existing knowledge positively affects team reflexivity and product innovativeness, which in turn positively influences NPD performance. The relationship between existing knowledge and team reflexivity (1) and product innovativeness (2) is moderated by the level of team cohesiveness and knowledge practice. Exploring the relationship between team member expertise and team effectiveness, Stock (2006) found prove for a direct positive effect of this variable on team effectiveness. Whereas the relationship between team identification (*Identity*) and team members' creativity was positively mediated by knowledge sharing, Tang et al. (2014) found a positive direct relationship between expertise identification and team members' creativity.

### *Skills*

Lee (2008) explored the relationship between team members' project management skills, entrepreneurial proclivity, and existing knowledge and found that they all are positively related to team reflexivity and product innovativeness, which in turn have a positive effect on NPD performance. They also found that the relationship between team reflexivity and product innovativeness on NPD performance is moderated by higher levels of team cohesiveness and higher knowledge practice (Lee, 2008).

### *Support*

Ehrhard, Miller, Freeman & Hom (2014) explored the relationship between project support perceived by the team member and team performance. They found that perceived project support has a positive effect on team member's project commitment and that team member project commitment has a positive influence on team performance (Ehrhardt et al., 2014).

### *Championing*

Howell and Shea (2001) investigated the effect of champion behaviour on project performance and found a direct positive effect. In a later study, Howell & Shea (2006) also found a direct positive effect of champion behaviour on team performance, as well as a mediating effect: Champion behaviour has a positive influence on team potency, which in turn has a positive effect on team performance (Howell & Shea, 2006).

### *Satisfaction*

The relationship between team member's satisfaction with pay and advancement opportunities and R&D team productivity is investigated by Keller and Kedia (1996), who found a direct positive relationship between the variables.

### *Behaviour*

Lee & Chen (2007) examine how charged behaviour, referred to as "the extent to which NPD teams are enthusiastic and driven to develop superior products" (p. 608), influences NPD project performance. The authors found that NPD project performance is positively influenced by charged behaviour, and that the relationship between charged behaviour and NPD project performance is positively moderated by innovation degree (Lee & Chen, 2007).

### ***Team level (input)***

#### *Cross-functionality*

Cross-functionality is the biggest category of independent variables, in terms of studies that studied its relationship with a performance outcome. Akgün, Dayan and Di Benedetto (2008) investigated the effect of cross-functional diversity on new product creativity and new product success. They found that diversity in functions of team members was positively related to both new product creativity and new product success through team intelligence. Carbonell and Rodriguez (2006) found a curvilinear (inverted-U shape) relationship between cross-functional diversity and innovation speed. The influence of cross-functional balance within the NPD team (an even number of members from different functional areas) was found to be positive in the study of Kim and Kim (2009). Blindenbach-Driessen (2015) found no significant influence of cross-functionality on team performance, unless this relationship was moderated by organization type (functional organized vs. project-based), degree of activity separation and degree of organizational connectedness. Cross-functionality was found to be positively related to Concept-To-Customer (CTC) time and Total Time (TT) of product development by Griffin (1997). Lee & Chen (2007) also found a direct positive influence of cross-functionality, although on a different outcome; NPD project performance. Finally, cross-functionality has been studied for its influence on project performance by (Olson et al., 2001), who found a positive relationship with project performance, which is moderated by product innovativeness and project stage.

#### *Interorganizationality*

Stock (2006) found a positive relationship between team organizationality and team effectiveness, which is then positively moderated by task-related complexity, supplier adaption, market-related dynamism, competitive intensity and technological turbulence.

#### *Demographics*

The influence of demographic diversity of the NPD team on team learning and product success has been studied by Dayan and Di Benedetto (2010). They identified an inverted-U shaped relationship between team diversity and interpersonal trust, which again has a positive influence on team learning and product success. The influence of trust on team learning and product success is found to be moderated by task complexity (Dayan & Di Benedetto, 2010). Lopez Cabrioles et al. (2008) found a direct negative influence of team diversity on radical innovation as the outcome.

### *Longevity*

Longevity has been studied for its impact on team learning and product success by Dayan et al. (2010). They found that demographic diversity has a curvilinear relationship with trust development among team members (interpersonal trust). Interpersonal trust has a positive relationship with team learning and product success (Dayan & Di Benedetto, 2010). Sethi (2000b) found that although team longevity improves superordinate identity, it has no further effect on new product performance. Stock (2006) found a direct positive effect on team effectiveness. The organizational tenure diversity of the team has been studied by Chi et al. (2009), who found evidence of an inverted-U shaped relationship with team innovation, although the downside of this relationship is moderated by the use of organizational HR-practices.

### *Location*

Sethi & Nicholson (2001) studied the influence of physical proximity of the team members on new product market performance and found a direct positive effect. The relationship between team proximity and innovation speed was studied by Carbonell and Rodriguez (2006) who found that team proximity has a more positive effect on the speed of technologically complex projects than technologically simple ones. Chang et al. (2012) found that team proximity is positively related to team communication and this relationship is moderated by time pressure. Dayan et al. (2010) investigated the influence of team proximity on team learning and product success. They found that the influence of team proximity on team learning and product success is mediated by interpersonal trust and that the relationship between team proximity and interpersonal trust is moderated by task complexity (Dayan et al., 2010).

### *Knowledge*

Akgün et al. (2006b) studied the influence of team intelligence on new product success and found that this relationship is positively mediated by team learning. Akgün et al. (2008) found the same positive influence of team knowledge on new product creativity and new product success. Team knowledge diversity is found to be positively related to team radical creativity (Tang, 2015), while Tsai et al. (2014) found an inverted-U shaped relationship between knowledge heterogeneity and development speed, product quality, solution found, problem-solving speed and solution quality. A transactive memory system (TMS), defined by Li and Huang (2013) as “a collective memory system with respect to the encoding, storage,

retrieval, and communication of information from different knowledge domains” (p. 308) has a positive influence on exploitative learning, which again is positively related to project performance (Li & Huang, 2013). Dayan and Elbanna (2011) found a positive relationship between TMS and team intuition, which is positively related to product success and learning. Both relationships are moderated by environmental turbulence (Dayan & Elbanna, 2011).

### *Experience*

Carbonell and Rodriguez (2006) investigated the relationship between team experience and innovation speed and found a positive influence of team experience on innovation speed, which was further moderated by the level of task complexity.

### *Skills*

Two studies focused on the influence of team skills on performance (e.g. Haon et al., 2009; Nerkar, McGrath & Macmillan, 1996). Haon, Gotteland & Fornerino (2009) found that the relationship between competence diversity is mediated by use of information, which is positively related to new product performance. Moreover, this relationship is moderated by familiarity among team members (Haon et al., 2009). The influence of two interrelated team skills (e.g. comprehension and deftness) has been studied by Nerkar et al. (1996). They found that the influence of deftness, which can be defined as “the ability of the group to work effectively” (Nerkar et al., 1996, p. 172) on team innovation performance is positively mediated by social satisfaction. The relationship between comprehension (the understanding of what needs to be done to meet the project’s objectives) and innovation performance is mediated by instrumental satisfaction (satisfaction that comes from meeting goals) (Nerkar et al., 1996).

### ***Team level (process)***

#### *Culture*

The work climate in which the NPD team operates has been studied by Keller and Kedia (1996) for its influence on team productivity. The authors found that a participative/cooperative work climate as well as a climate of high work importance have a positive effect on R&D team productivity (Keller & Kedia, 1996). Pirola-Merlo (2010) explored the relationship between team climate and project performance and found a positive relationship between the two. Gu, Wang and Wang (2013) investigated the correlation between team creativity and the psychological safety of the team, referred to as “a shared

belief among the members that the team is safe for risk-taking behaviour” (Gu et al., 2013, p. 91). The authors found a positive correlation between the two constructs (Gu et al., 2013). Tu (2009) examines how organizational support and organizational control moderate the relationship between team affective tone and team creativity. Negative affective tone of the team can be described as the extent to which the team members have the feeling that they are not working hard enough (Tu, 2009) and is positively related to team creativity when organizational support is high and organizational control is low.

### *Justice*

Two studies (e.g. Dayan, Di Benedetto & Colak 2009; Dayan & Di Benedetto, 2010) focused on the influence of different types of justice (e.g. procedural, interactional and distributive justice) on product success, team learning and speed-to-market. Dayan et al. (2009) found a positive relationship between procedural justice and distributive justice on managerial trust, which has a positive effect on team learning, speed-to-market and product success. The latter relationship is moderated by both market and technological turbulence (Dayan et al., 2009). Dayan et al. (2010) found a positive relationship between procedural and interactional justice on interpersonal trust, which then has a positive effect on team learning and product success. The influence of interpersonal trust on team learning and product success is moderated by task complexity (Dayan et al., 2010).

### *Stability*

The relationship between team stability and project innovation speed has been explored by Carbonell and Rodriguez (2006), who found that team stability has a more positive effect on the speed of technologically complex projects than technologically simple projects. Thus the relationship between team stability and project speed is contingent on the technological complexity of the project. The study of Slotegraaf and Atuahene-Gima (2011) focused on the influence of team stability on new product advantage. The authors found that project team stability has a curvilinear (inverted-U shaped) relationship with both team-level debate and decision-making comprehensiveness. In turn, team level-debate has a positive influence on decision-making comprehensiveness, but not on new product advantage, whereas decision-making comprehensiveness has a curvilinear relationship with new product advantage (Slotegraaf & Atuahene-Gima, 2011).

### *Autonomy*

Only one study within our set of papers focused on the consequences of team autonomy (e.g. Sethi, 2000b). High team autonomy has a positive influence on superordinate identity, which in turn positively influences new product performance.

### *Goals*

Team goal clarity has been studied for its effect on cooperation (e.g. Bierly, Stark & Kessler, 2009) and innovation speed (e.g. Carbonell & Rodriguez, 2009). Bierly et al. (2009) found that the relationship between goal clarity and cooperation is positively mediated by trust. The relationship between goal clarity and trust is moderated by the degree of virtuality, such that for teams that are more virtual, goal clarity will have a less positive effect on trust (Bierly et al., 2009). Carbonell and Rodriguez (2009) found that the positive relationship between goal clarity and innovation speed is moderated by technology novelty and technology turbulence, such that the relationship is only significant when technology novelty is medium (not when high or low). When technological turbulence is low, the positive effect of goal clarity on innovation speed is altered (Carbonell & Rodriguez, 2009). The team's orientation on the goals of the project (team goal orientation) is positively related to team information exchange according to the findings of Gong, Kim, Lee and Zhu (2013). This relationship is further moderated by the trust relationship with the team leader. Team information exchange is positively related to both individual creativity and team creativity. The relationship between individual creativity and team creativity is mediated by a supportive creativity climate (Gong et al., 2013). Finally, the influence of shared goals on team innovation was studied by Gu et al. (2013), who found a direct positive relationship with team innovation and an indirect positive effect through both team psychological safety and learning from mistakes.

### *Support*

Dayan and Elbanna (2011) found evidence of a positive influence of team empowerment on product success and learning through team intuition. Thus, team empowerment has a positive effect on team intuition, which in turn has a positive influence on both product success and team learning.

### *Decision-making*

Team decision-making was found to have a direct positive direct impact on project performance (Susman & Ray, 1999). In contrast, Liu, Chen & Tao (2015) found that the relationship between joint-decision making and innovation performance is only significant when moderated by collective efficacy. Dayan and Elbanna (2011) investigated the influence of decision importance and decision motive on product success and learning. They found that an opportunity motive for decision-making has a positive effect on team intuition, whereas decision importance has a negative effect on team intuition (Dayan & Elbanna, 2011). Team intuition was found to be positively related to both product success and learning (Dayan & Elbanna, 2011).

### *Challenge*

Lee (2011) investigated the relationship between two types of stressors (challenge stressors and hindrance stressors) on new product success. Challenge stressors were found to have a direct positive effect on both team unlearning and new product success, whereas hindrance stressors have a direct negative effect on new product success (Lee, 2011). Team unlearning also has a direct positive influence on new product success (Lee, 2011).

### *Conflict*

Stark & Bierly (2009) investigated the direct relationship between relationship conflict among team members and team satisfaction and found that this relationship is negatively moderated by the level of virtuality of the team. A similar finding was presented by Bierly et al. (2009) who investigated the mediating role of trust between relationship conflict as the independent and team cooperation as the dependent variable. Trust has a positive effect on cooperation, although this relationship is negatively moderated by the level of virtuality of the team. Conflict between team members and management (managerial conflict) and its influence on team learning, speed-to-market and product success was investigated by Dayan et al. (2009). The authors found that managerial conflict has a negative impact on managerial trust, which has a positive effect on team learning, speed-to-market and product success. In terms of team stress, Lee and Sunoco (2011) found that team stress has a direct negative

influence on unlearning and product innovation, whereas unlearning is positively related to product innovation.

### *Interaction*

The relationship between social interaction and team innovation has been studied by (Gu et al., 2013), who found that social interaction has a positive effect on psychological safety and learning from mistakes, which in turn have a positive influence on team innovation. Intra-team communication, as a different type of team interaction, is found to have an inverted-U shaped relationship with the team's creative performance (Leenders, Van Engelen & Kratzer, 2003). The relationship between the exchange of information and innovation performance in teams is studied by Liu et al. (2015), who found a direct positive influence of information exchange on innovation performance. This relationship is also moderated by collective efficacy. Tang et al. (2014), who studied the influence of knowledge sharing on team members' creativity, found a direct positive relationship between the two. Product quality is also found to benefit from interaction between team members: Information integration has a positive influence on product quality, although this relationship is moderated by firm quality orientation (Sethi, 2000a).

### *Cohesion*

Cohesion has been studied for its influence on team performance (Kratzer, Leenders & Van Engelen, 2005), team effectiveness (Stock, 2006) and product competitive advantage (Im et al., 2013; Nakata & Im, 2010). Social cohesion has an indirect positive influence on product competitive advantage, through new product meaningfulness (Im, Montoya & Workman, 2013) as well as on new product performance, through cross-functional integration (Nakata & Im, 2010). A more direct impact of cohesion has been found by Stock (2006), who found that team cohesiveness has a direct positive effect on team effectiveness. Kratzer et al. (2005) aimed for a deeper understanding of team cohesion and investigated the relationship of two types of team ties (e.g. friendly informal ties and friendship informal ties) and identified an inverted-U shaped relationship between friendly informal ties and team performance, whereas friendship informal ties have a direct positive relationship with team performance.

### *Identity*

The independent variables in this category (superordinate identity, in team 'we-ness' and outcome interdependence) are all related to the extent to which the team members associate

and identify themselves as member of the NPD team, rather than their own functional background. As a result of investigating the influence of superordinate identity, Nakata and Im (2010) found that superordinate identity has a positive influence on cross-functional integration, which in turn has a positive influence on new product performance. A similar relationship is found by Markham and Lee (2014), who found that in team ‘we-ness’ activities improve NPD performance both directly and through knowledge sharing. In terms of outcome interdependence – “the extent to which team members are accountable to the team and not merely to their functional areas and their rewards are linked to the performance of the group rather than only to their performance on functional tasks” (Sethi & Nicholson, 2010, p. 158), Sethi and Nicholson (2010) found that charged behaviour fully mediates the relationship between outcome interdependence and new product market performance, whereas Sethi (2000b) found that the relationship between outcome interdependence and new product performance is fully mediated by superordinate identity.

### *Trust*

Muethel, Siebdrat & Hoegl (2012) hypothesized the relationship between interpersonal trust and NPD team effectiveness and found a direct positive relationship, which is also positively moderated by computer-mediated communication, team membership flexibility and national diversity. Gu et al. (2013) found a mediating role for psychological safety and learning from mistakes in the relationship between mutual trust and team innovation.

### *Learning*

Direct positive influences have been found between learning from mistakes, internal learning as well as team unlearning and team innovation, new product success and product innovation (Gu et al., 2013; Huang, 2011; Lee, 2011; Lee & Sukoco, 2011). The positive relationship found by Huang et al. (2015) between exploitative learning and NPD efficiency is also positively moderated by strategic consensus and T-shaped skills of team members, which can be defined as “the capabilities of individual specialists to maintain meaningful and synergistic conversations with others” (p. 761).

### *Behaviour*

Liu et al. (2015) studied the relationship between collaborative behaviour and team innovation performance and found a positive relationship between the two variables, only if this relationship is moderated by collective efficacy.

### *Dedication*

The influence of team member's time dedication to the NPD team on the innovation speed of the project is study by Carbonell and Rodriguez (2006), who found that full time dedication has a more positive effect on the speed of technologically complex projects than technologically simple projects. More specifically, the authors found that time dedication has a negative effect on innovation speed in terms of a technologically simple project and a positive effect on innovation speed in terms of a technologically complex project (Carbonell & Rodriguez, 2006).

### *Communication technology*

The use of an affiliated set of communication technologies has been found to have a positive influence on the performance of a global NPD team (McDonough, Kahn & Griffin, 1999). Akgün et al. (2008) found that IT-usage has a positive influence on team intelligence, which has a positive influence on new product creativity and new product success. In contrast, Kock Lynn, Dow & Akgun (2006) found a direct negative relationship between electronic communication media use (web usage, electronic written file transferring, email usage, voice messaging) and team effectiveness. Although, this relationship becomes indirect positive, when mediated by procedural structuring.

### ***Team leader level***

#### *Personality*

The study of Aronson, Reilly & Lynn (2008) is the only study that focused on the relationship between different team leader personality characteristics and NPD success. The authors found that the relationship between leader openness, emotional stability, leader extraversion and NPD success is positively moderated by innovation radicalness (Aronson et al., 2008).

#### *Leadership style*

The influence of a particular leadership style (e.g. transformational leadership, gatekeeping leadership) on team performance is one of the relationships that has been studied most in our sample set of papers (Figure 3). Transformational leadership has been studied for its influence on team performance (Sun, Xu & Shang, 2014; Ishikawa, 2012a; Ishikawa, 2012b; Pirola-Merlo, Hartel, Mann & Hirst, 2002), team innovation performance (Chen et al., 2013;

Paulsen et al., 2013) and team learning, product success and speed-to-market (Dayan et al., 2009).

Two studies identified direct positive relationships between transformational leadership and team performance (Sun et al., 2014) and R&D performance (Ishikawa, 2012a). The relationship between transformational leadership and team performance is found to be (partially) mediated by team climate (Sun et al., 2014; Chen et al., 2013; Pirola-Merlo et al., 2002), internal communication and norm for maintaining consensus (Ishikawa, 2012b) and individuals' identification with the team (Paulsen, 2013). For gatekeeping leadership, Ishikawa (2012a) found a direct positive influence on R&D performance, whereas Ishikawa (2012b) found an indirect positive relationship with team performance through internal communication and norm for maintaining consensus.

Lee, Fu, Li & Chen (2011) studied the influence of different leadership styles on product prototype development and launch proficiency, technological core competency, innovation level, design change frequency and product development cycle time. They found that higher levels of participating leadership style have a positive influence on product prototype development and launch proficiency, technological core competency and product development cycle time. A selling leadership style has a positive influence on technological core competency, whereas a telling leadership style has a positive influence on innovation level, but a negative influence on design change frequency. Delegating leadership style was found to have a positive influence on product prototype development and launch proficiency. Thus, a different leadership style has different influences on different measures of NPD performance (Lee et al., 2011).

Ehrhardt et al. (2014) explored the effect of team leader's encouragement of self-expedition in team members have a positive effect on team member's project commitment. The authors found that project commitment mediates the relationship between team leader's encouragement of self-expedition and team performance.

### ***Project level***

#### *Uncertainty and Complexity*

Ahmad, Mallick & Schroeder (2013) investigated the impact of project uncertainty and project complexity on NPD performance and found that project complexity is positively related to NPD performance and is also positively moderated by team integration. The

relationship between project uncertainty and NPD performance is moderated by process concurrency and has a more negative impact on NPD performance (Ahmad et al., 2013).

### *Importance and Motive*

The relationship between project importance and speed-to-market and project motive and speed-to-market has been hypothesized by Dayan, Elbanna & Di Benedetto (2012), who identified a positive influence of project importance and project motive on political behaviour, which has a positive influence on speed-to-market.

### *Challenge*

McDonough, Kahn & Barczak (2001) explored the relationship between project management challenges and project performance and found a negative influence of project management challenges on project performance, regardless of type of team (global, virtual, co-located).

### *Speed*

Chen et al. (2012) identified a curvilinear (inverted-U shaped) relationship between new product development speed and new product success, under the circumstances of high technological uncertainty, high market turbulence and low market newness of the product.

## ***Organizational level***

### *Control*

Bonner, Ruekert & Walker (2002) studied the relationship between two types of organization control (operational control and formal process control) on project performance. The results of their study indicate that the degree of operational control has a direct positive effect on project performance, whereas the degree of formal process control has a negative effect on project performance. The latter relationship is moderated by the degree of project integration within a larger program (Bonner et al., 2002).

### *Managerial involvement*

The influence of managerial intervention, involvement, support and encouragement on team has been investigated more frequently than the other independent variables within the organization level of analysis (Figure 3). Bonner et al. (2002) studied the influence of management intervention on project performance and found a negative relationship with project performance, which is further moderated by the degree of project integration with a

larger program. Salomo, Kleinschmidt & de Brentani (2010) investigated the influence of senior management involvement and global NPD performance and found a full mediating effect of global dispersion of the NPD effort, whereas Im and Nakata (2008) found a mediating effect of cross-functional integration on the positive relationship between managerial involvement in NPD projects and new product advantage.

Managerial encouragement to take risk has a direct positive influence on radical innovation (Lopez Cabrales, Cabello, Carmona & Valle, 2008) and an indirect positive influence on new product advantage through cross-functional integration (Im & Nakata, 2008; Nakata & Im, 2010). Sethi and Sethi (2009) identified a positive influence of the level of encouragement to take risk on product novelty, but a negative affect on product appropriateness. In turn, product appropriateness fully mediates the relationship between managerial encouragement to take risk and product performance, which indicates that managerial encouragement to take risk, has an indirect negative relationship with product performance (Sethi & Sethi, 2009).

### *Rewards*

Carbonell and Rodriguez (2009) found a curvilinear (inverted-U shaped) relationship between speed-based rewards and innovation speed, which is also moderated by technological turbulence. Market-based rewards have a positive influence on new product novelty, which in turn has a positive effect on product competitive advantage (Im et al., 2013). Im and Nakata (2008) identified an indirect positive effect of market-oriented rewards on new product advantage through cross-functional integration. Lopez Cabrales et al. (2008) found that use of long- and short-term incentives has a negative influence on radical innovation performance.

Sarin and Mahajan (2001) examined the effects of different reward systems on NPD team performance. They found a positive relationship between position-based rewards and satisfaction among team-members, which is moderated by the ease of individual performance evaluation. Position-based and equal rewards have a negative influence on performance, when ease of evaluation is low. The relationship between outcome based rewards and product quality is monotonically decreasing and is moderated project risk, competitive intensity and industry dynamism. They also found that process-based rewards have a negative affect on team performance and that these relationships are moderated by project complexity and project risk. In contrast, outcome based rewards have a positive influence on team performance. Susman and Ray (1999), who studied the influence of project-based rewards on

project performance found a similar relationship: Project-based rewards are positively related to project performance.

### *HR-practices*

Chong, van Eeerd, Rutte & Chai (2014) investigated how managers can induce a transactive memory system in new product development teams with a set of systematic management practices. They found that transactive memory system (TMS) mediates the positive relationship between the high commitment work system (HCWS) implemented with NPD team members and new product performance.

### *Planning*

Im et al. (2013) studied the antecedents and consequences of creativity of product innovation teams, found that planning process formalization is negatively related to NP novelty and that NP novelty has a positive effect on product competitive advantage. Im and Nakata (2008) as well as Nakata and Im (2010) found that planning formalization is positively related to cross-functional integration, which in turn has a positive influence on new product advantage.

### *Environmental level*

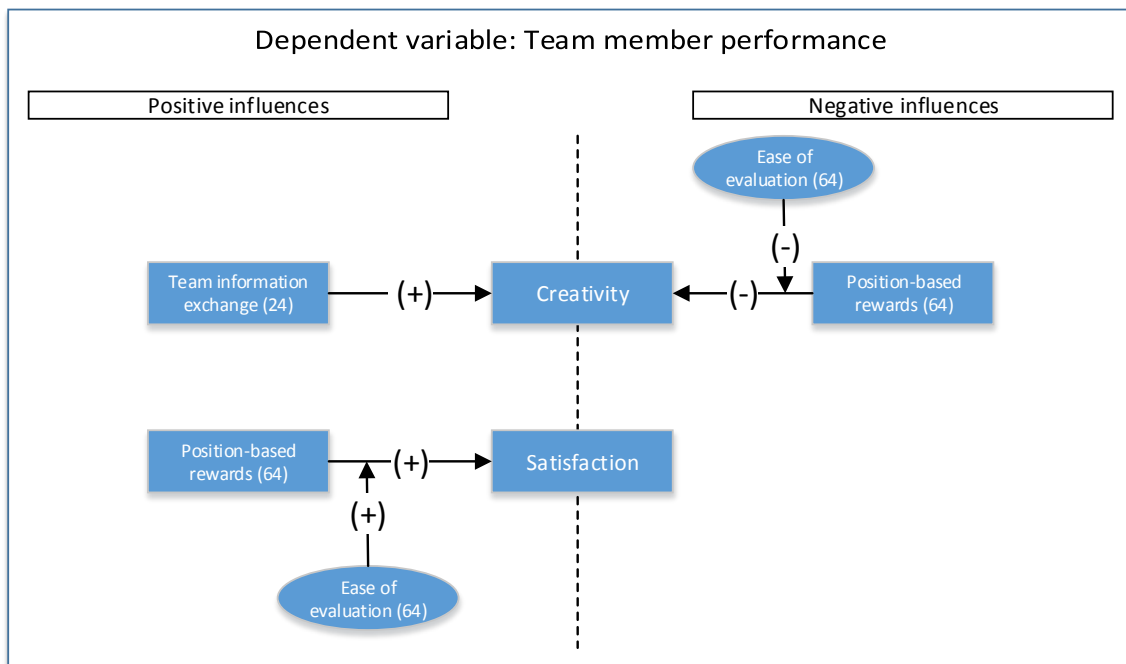
#### *Technological turbulence and Market turbulence*

Akgün, Lynn and Byrne (2006a) who investigated unlearning in new product development (NPD) teams found that environmental turbulence (technological turbulence and market turbulence) is positively related to unlearning. Team unlearning is positively related to information knowledge implementation, which is positively related to new product success (Akgün et al., 2006a). Dayan and Di Benedetto (2011) researched team intuition and its effect on the team's ability to generate creative new products and found that market turbulence and technological turbulence are positively related to intuitive decision-making. Intuitive decision-making has a curvilinear relationship with new product creativity, which is moderated by team experience. Researching the influence of environmental dynamism, Lee (2011) found that market and technological dynamism positively influence the level of team strain, which is negatively related to the level of product innovation. Although, the negative relationship with the level of product innovation is weakened by perceived diversity climate. The author further found that market dynamism has a direct positive influence on product innovation (Lee, 2011).

### 3.3.2. Analysis from the perspective of the dependent variables

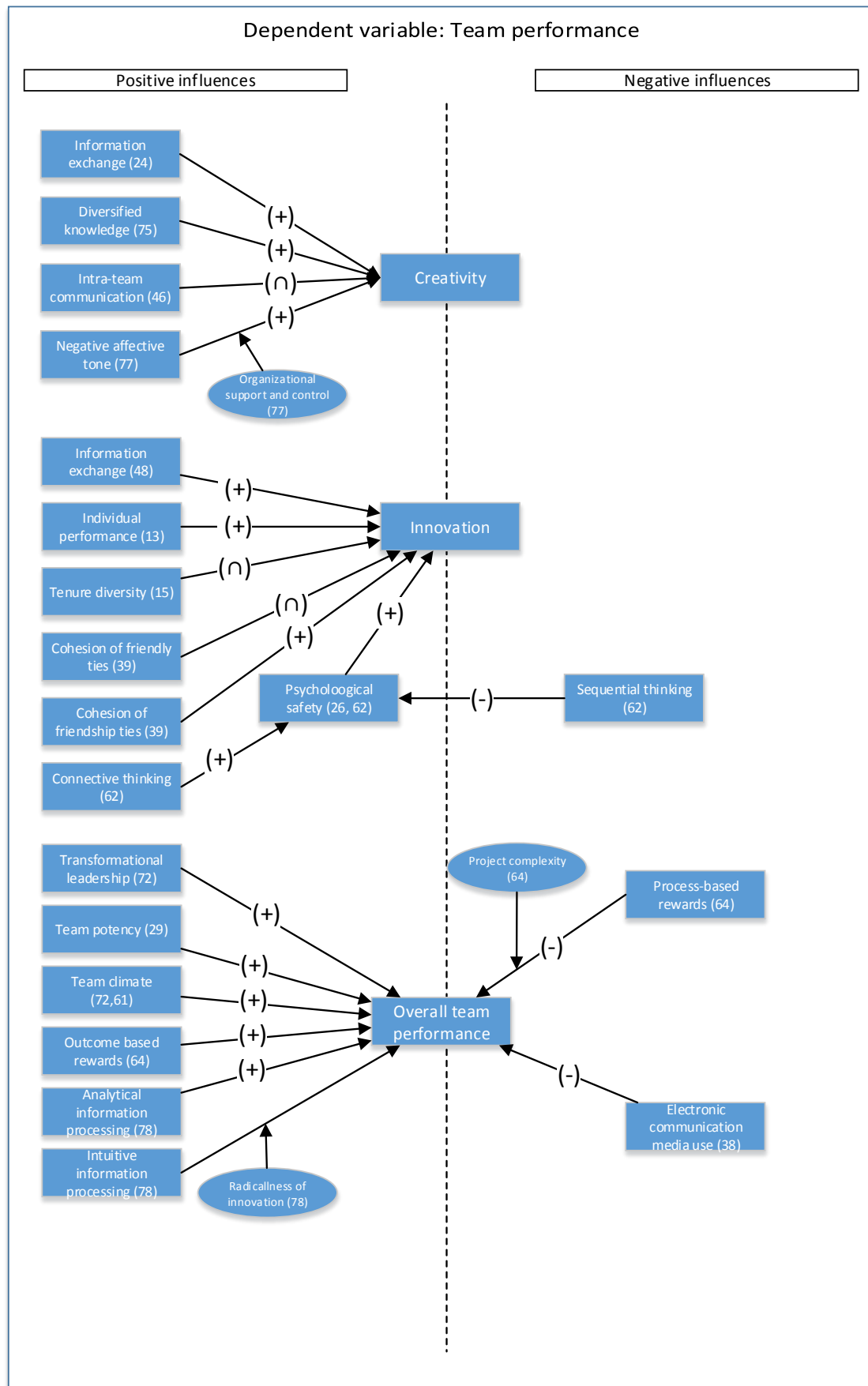
In addition to the narrative synthesis of the relationships from the perspective of the independent variables, we will also synthesize the identified variables and their relationships from the perspective of the dependent variables. That is, the influence of various independent variables on one single category of performance indicators (e.g. Satisfaction, product quality, speed-to-market). We integrated our findings into four different relationship frameworks, each of which focuses on a particular level of performance outcomes (e.g. team-member performance, team performance, product performance and project performance). We will further distinguish between factors that have a positive influence on a certain performance outcome and factors that have a negative influence on a particular performance outcome. The factors that influence team-member creativity and team member satisfaction are presented in Figure 6. The factors each have a number that corresponds to the number of the study that found this significant relationship according to Table 2 (Appendix A).

**Figure 6: Positive and negative influences on NPD team member performance**

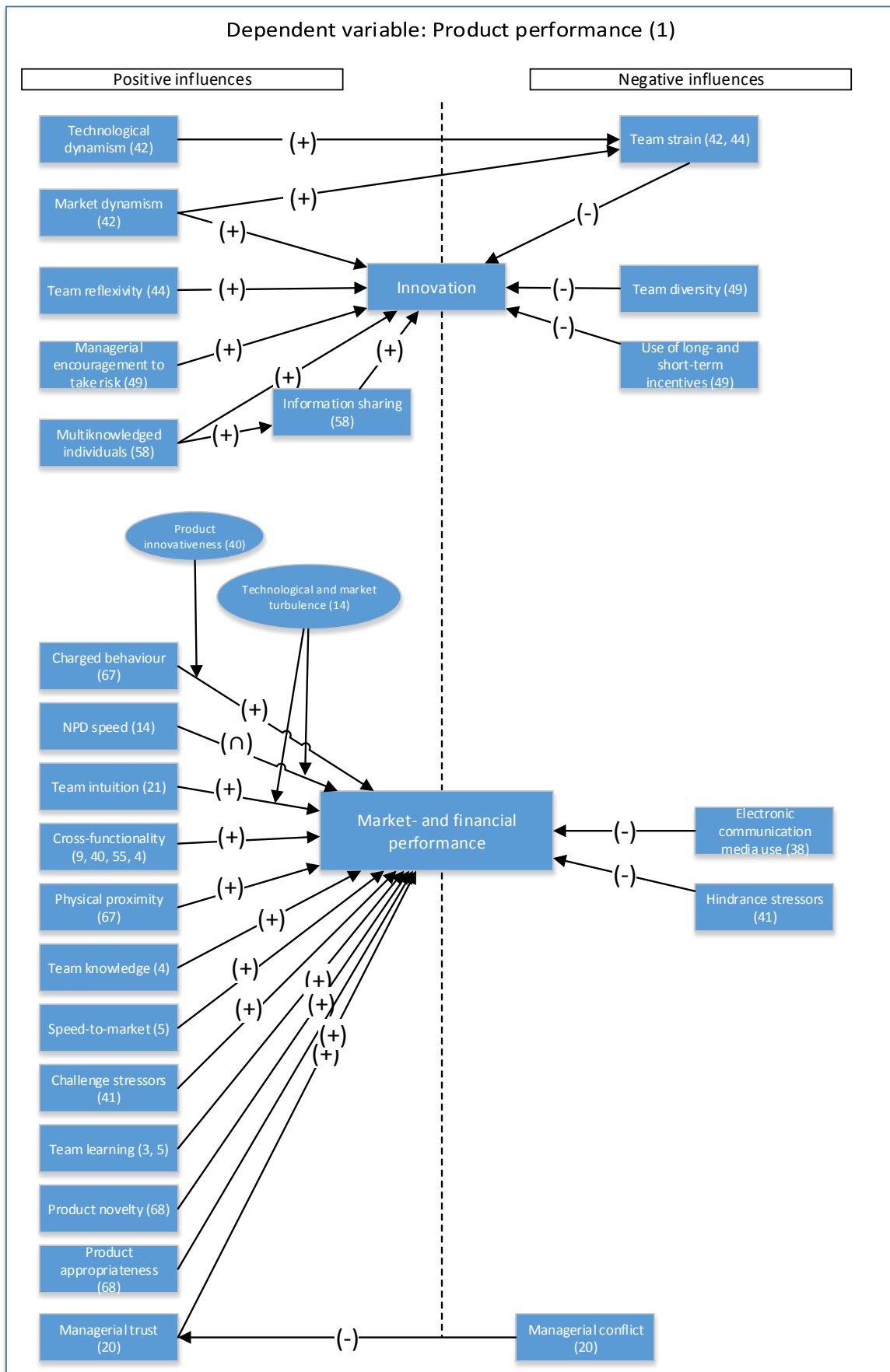


The factors that influence team performance, product performance and project performance are presented in Figures 7 to 9. For the sake of clarity, we chose to incorporate relationships between variables that we considered to be important, or interesting to for further discussion. The main findings of the relationship frameworks and the other analyses we performed will be discussed in the next section.

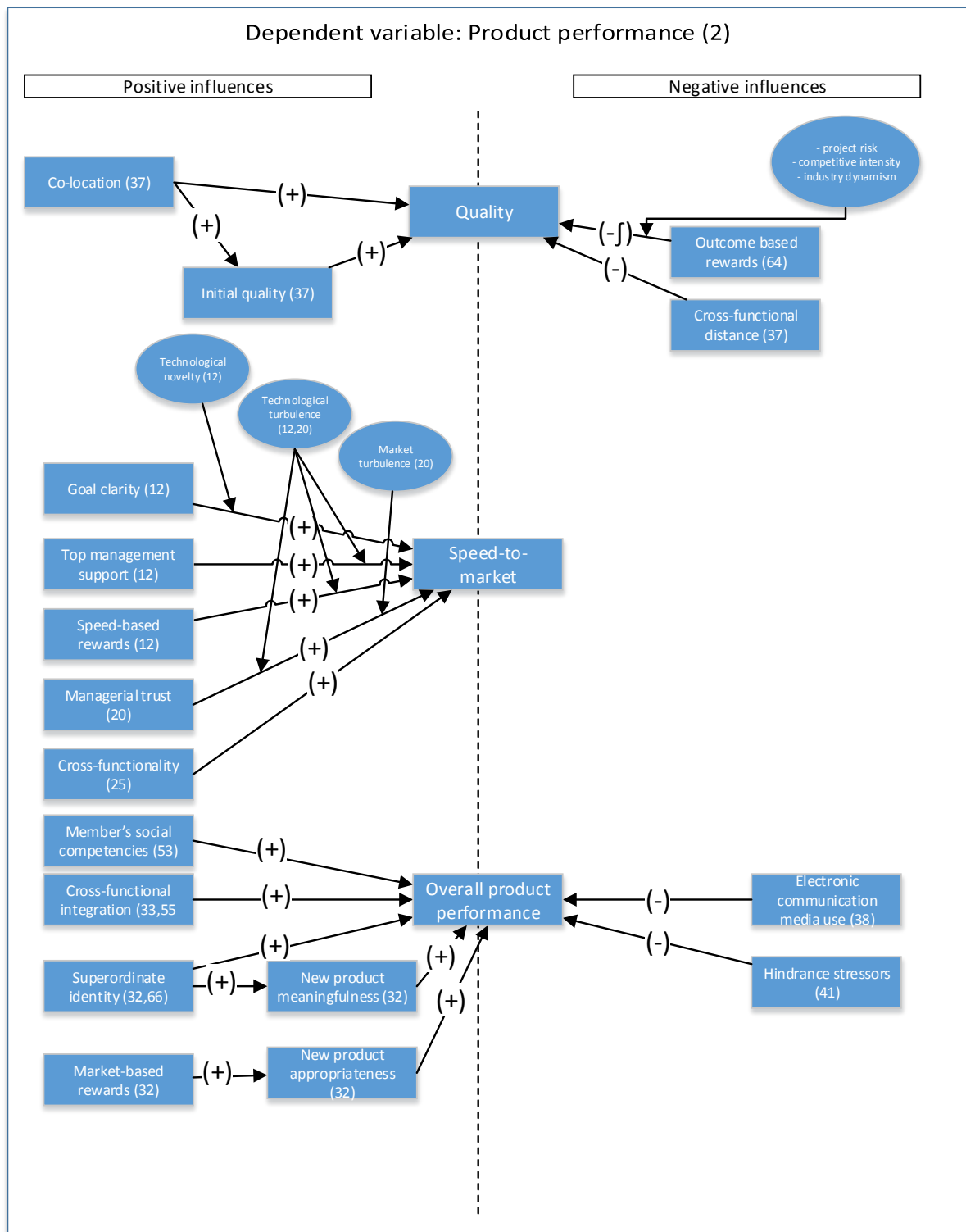
**Figure 7: Positive and negative influences on NPD team performance**



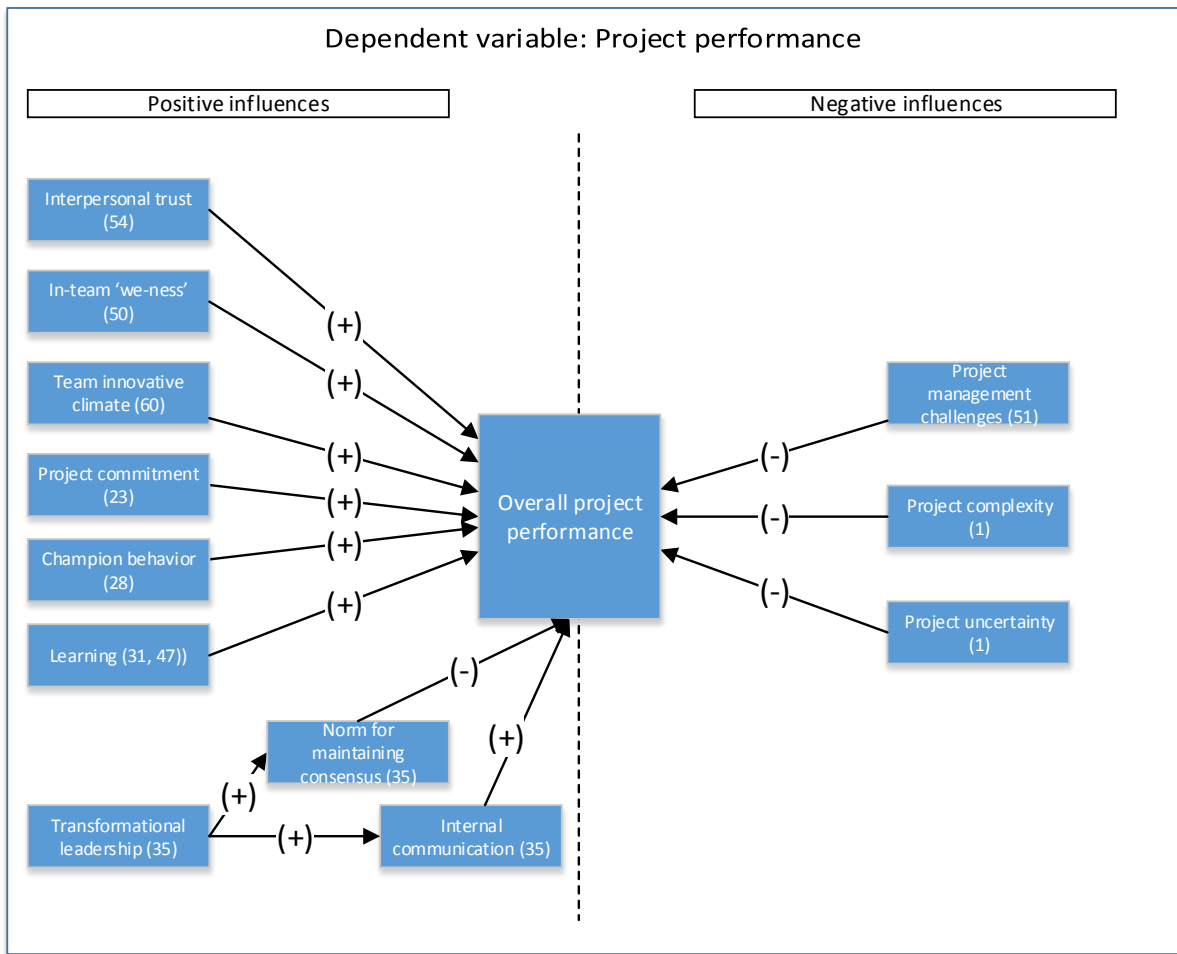
**Figure 8a: Positive and negative influences on NPD product performance (1)**



**Figure 8b: Positive and negative influences on NPD product performance (2)**



**Figure 9: Positive and negative influences on NPD project performance**



#### 4. Discussion

The goal of our study was twofold: First, we aimed to identify the independent, dependent, moderating and mediating variables in empirical, peer-reviewed research, and second, we aimed to provide a comprehensive overview that represents the interrelation of the identified variables as well as the scope of the current body of research on NPD team performance. The results of the content analysis and the introduction of our model have been presented in Section 3, indicating that both elements of our research goal are achieved.

In the previous section, we have identified the relationships between independent factors and frequently studied performance indicators, on each of the distinguished performance levels (e.g. team-member performance, team performance, product performance and project performance). The extensive analysis of the relationships between the independent and dependent variables, as well as the role of mediators and moderators in this relationship (Table 2, Appendix A), emphasizes the complex and diverse character of NPD team performance research, which makes it difficult to unravel the main relationships between the variables. The relationship frameworks, presented in Figure 6 to 9, aimed to capture a selection of factors that are important for either fostering or impeding NPD team performance. More specifically, we provided a different perspective of the important independent factors, by means of an analysis of both drivers and hindrances from the viewpoint of the different NPD performance measures. Thus, next to the identification of the influence of groups of independent variables on several performance outcomes, we also presented an overview of the drivers and hindrances of specific NPD team performance outcome measures.

Overall, we identified very few negative relationships between independent and dependent variables. A simple explanation for this could be that the identification of a negative relationship between variables in itself does not have any implications for what it is that *does* work. Therefore, it is likely that the research has the tendency to focus on positive influences. However, we do believe that it is important to investigate potential negative relationships between variables, as well as possible factors that may counteract the negative influence through interaction or mediating.

Based on the results of the construct measure analysis, we found that there is an overall lack of clarity in defining team performance, product performance and project performance in

NPD team performance literature. Scholars have used different terminology to describe the same performance indicator or measured the same construct items. If research is not clear about what is actually meant by a particular performance definition (e.g. team performance or project performance), this can lead to difficulties in interpreting findings from the literature, as well as the application of these findings in practice (Korde, Li & Russel, 2005). It is suggested for future research, to reach consensus about the differences between the concepts team performance, project performance and product performance.

We will continue with a discussion of the main results of the analyses for the independent, dependent and moderating variables. The mediating variables will not be discussed in further detail, because there is considerable overlap in the variables that we defined as independent and as mediating variables. Moreover, in a way, mediating variables are at the same time independent variables, that have an influence on NPD team performance. Subsequently, we provide some suggestions for NPD team managers to enhance the performance of the NPD team. We will focus on the factors that we consider to be important for management to consider, in order to achieve superior team, project and product performance. We will conclude with a discussion of the main limitations of our research and provide suggestions for future research to diminish or neutralize these limitations.

#### ***4.1. Independent variables***

Overall, the results of our analyses show that there are several factors of which the influence on NPD team performance has been proven frequently. For example, the significant influence of cross-functionality, cross-functional diversity and cross-functional balance on NPD team performance, for example, is found by multiple scholars (Blindenbach-Driesssen, 2015; Olsen, Walker, Ruekert & Bonner, 2011; Nakata & Im, 2010; Kim & Kim, 2009; Akgün et al., 2008; Lee and Chen, 2007; Carbonell & Rodriguez, 2006; Griffin, 1997). Whereas some relationships were mediated or moderated, there seems to be general consensus among scholars that cross-functionality improves NPD team performance. However, cross-functionality seems to have different relationships with different performance indicators. For example, Carbonell and Rodriguez (2006) found a curvilinear relationship between cross-functional diversity and innovation speed, whereas Lee & Chen (2007) found a direct positive relationship between cross-functionality and NPD project performance. These findings indicate that cross-functionality may have different relationships with different performance indicators. On the other hand, cross-functionality has also been used as a control variable

(e.g. Visser et al., 2014), which indicates that the use of a cross-functional team for new product development activities is more a matter of course, rather than an actual choice. However, we believe that the differences in the relationships between cross-functionality and specific NPD performance measures (e.g. product quality, development speed) is likely to benefit from further investigation. Furthermore, we observe that the independent variable 'information sharing' is frequently mentioned in the relationship models, presented in Figure 7-9. Information sharing has a direct positive influence on team member creativity (Gong et al., 2013), team creativity (Gong et al., 2013), team innovative performance (Liu et al., 2015) and product innovation (Park et al., 2009). This finding suggests that information sharing is a key factor in driving NPD team performance on different performance levels. As a result, we suggest future research to investigate the role of information sharing further, to enhance our understanding of the relationship with different indicators of NPD team performance. Moreover, it would be interesting to investigate the abilities of information sharing to counteract negative relationships between variables. For example, could information sharing positively moderate the negative effect of team background diversity (Lopez Cabrales et al., 2008)? Or mediate the direct negative relationship between team strain (Lee, 2011; Lee & Sukoco, 2011) and product innovation performance? We encourage the future investigation of possible interaction between such central factors to enhance our understanding of the impact of such interaction effects on NPD team performance.

We also noticed that multiple studies have found a significant positive influence of top management involvement (Salomo et al., 2010; Im & Nakata, 2008), top management support (Carbonell & Rodriguez, 2009) and top management encouragement to take risk (Nakata & Im, 2010; Sethi & Sethi 2009; Im & Nakata, 2008; Lopez Cabrales et al., 2008) on different indicators of NPD performance. Not surprisingly, managerial conflict is found to hinder managerial trust, which in turn is positively related to product success after commercialization (Dayan et al., 2009). This finding indicates that management is able to influence NPD outcomes significantly. Moreover, as opposed to environmental dynamism (Lee, 2011), management can actually influence their own influence on team performance. It is suggested for future research to investigate if managerial involvement and encouragement have the potential to mediate or moderate negative relationships between variables.

#### ***4.2. Dependent variables***

Table 4 (Appendix A) presents the results of the classification of the dependent variables based on the investigation of how the dependent variables were actually measured in the study. There are two things that stand out. First, it seems that the majority of the dependent variables focus on the product level and that these measures are focused on either the market and financial performance of the new product or the overall product performance. Scholars have frequently used the item measurement scale conducted by Cooper & Kleinschmidt (1987) to measure product, project or team performance. This scale measures to what extent the new product met or exceeded volume expectations, sales dollar expectations, the first year number expected to be produced and commercialized, overall sales expectations, profit expectations, return on investment, senior management expectations, market share expectations and customer expectations. All these items are focused on the performance of the product in the market place. This finding suggest a strong tendency for determining new product success based on its market and financial performance. In contrast, surprisingly few studies focused on windows of opportunities that originate from the development of the new product. To be precise, no more than one study (e.g. Salomo et al., 2010) in our review used items that addressed the extent to which the NPD program has opened new markets and new technologies to the firm, and if the NPD program has led the firm into new product arenas. Although, the study by Salomo et al. (2010) focused on the performance of the global NPD program, this does not mean that the measurement scale is not be useful for measuring outcomes of non global NPD teams. Furthermore, the market and financial performance of a product might be different from the new opportunities that the new product created for the firm. Whereas we acknowledge the importance of market and financial performance, we encourage future research to take another perspective towards NPD team performance measurement. As a results of the dependent variable measurement analysis, used to classify the dependent variables according to how they were measured, we noticed that the vast majority of the studies measured NPD team performance through one single construct, comprised of several interrelated items. Frequently used measurements consisted of several items about, for example, product quality, management satisfaction, sales objectives, planning objectives, cost effectiveness, adherence to budget, adherence to schedule, etc. However, several studies emphasize the different influences that factors might have on different performance outcomes. For example, Sarin & Mahajan (2001) found that particular reward structures (e.g. outcome-based, process-based) have different effects (positive,

negative) on different performance measures (e.g. team performance, team member creativity) under different circumstances (e.g. high project complexity, high project risk). We believe that aggregating different elements of NPD team performance into one construct measure may lead to different results, than when the construct were measured separately. Thus, aggregating different outcome measures into one single construct may give a distorted view of the relationship between the independent variable and the different items of the NPD team performance measure. Therefore, we recommend future research to investigate the relationship between a particular factor and NPD team performance for each item of NPD team performance separately.

### ***4.3. Moderating variables***

We identified several relationships that were moderated by another factor. The two most frequently identified moderators are technological turbulence and market turbulence (Chen et al., 2012; Dayan & Elbanna, 2011; Carbonell & Rodriguez, 2009; Dayan et al. 2009; Stock, 2006), which indicates that the degree of environmental turbulence has a significant effect on the relationship between an independent variable and a dependent variable. These environmental factors cannot be influenced by either top management or the NPD team, so it is important to investigate how exactly they influence specific relationships and identify particular interaction effects that have a positive influence and negative influence on team performance.

### ***4.2. Managerial implications***

In this section, we will provide some managerial implications in terms of factors that can easily be influenced or exercised by NPD team managers, or that hinder performance in such a way, that team managers should be aware of the negative consequences of such factors. We strongly emphasize on the conciseness of these implications, and suggest that these implications are used as a means of how the identified relationships should be interpreted.

#### ***4.2.1. Team performance***

In order to enhance the creative performance of the NPD team, managers should include members with various expertise backgrounds. Moreover, a negative affective tone among team members will lead to improved creative performance if they perceive high organizational support and low organizational control.

In order to enhance the innovative performance of the NPD team, team managers could include team members that have friendship relationships with each other. Friendly relationships between team members only improve innovative team performance only to a certain extent, so team managers should be aware of this. The inclusion of team members that have a connective thinking cognitive style, will improve innovative team performance, because they feel safe enough to take risks. However, team members that have a sequential thinking cognitive style will not feel safe to take risk and they will not contribute to the innovative performance of the team. Inclusion of team members with differences in organizational tenure will have a positive effect on team innovative performance, but only to a certain extent, thus managers should balance the inclusion of team members with different organization tenure.

To enhance overall team performance, managers could select team leaders who take on a transformational leadership style. The inclusion of team members with an analytical cognitive style will have a positive effect on overall team performance, regardless of the radicalness of the innovation project. However, the inclusion of team members who think more intuitively will be more beneficial for radical NPD projects. Managers can use outcome-based rewards to improve overall team performance, whereas process-based rewards will have a negative affect on overall team performance, especially when the project is also complex. The use of electronic media to communicate with other members of the team will have a negative influence on the overall team performance, thus it is suggested to prevent this use as much as possible.

#### *4.2.2. Product performance*

In order to improve the innovativeness of the product as an outcome of the NPD project, managers should encourage the team members to take risk. The inclusion of individuals with knowledge of both technology as well as marketing will have a positive influence on product innovation as well as sharing information with each other. Managers should be aware of the environmental dynamism, whereas a dynamic technological environment leads to team strain, which ultimately has a negative influence on product innovation. Also, including team members with a high variety in demographic and educational backgrounds will have a negative influence on the innovative performance of the product. Finally, team managers should not use a long-and-short-term system of incentives, because this will have a negative effect on the innovativeness of the product.

Managers should design the NPD team in such a way that it consists of members from different functional areas and is located physically near to each other, to enhance the market and financial performance of the product. We also suggest that managers avoid conflict with the team, in order to improve product performance in the market place.

For risky and complex projects within a highly competitive or relatively stable industry, outcome based-rewards will have a negative influence on team performance and should thus be avoided. Moreover, management should aim to include an equal amount of members from each of the different functional areas to ensure low cross-functional distance within the NPD team.

Managers should include members with various functional backgrounds, to positively influence speed-to-market of the product. Moreover, only if the product is very novel in terms of technology and there is a high degree of technological turbulence, top management support will have a positive effect on speed-to-market. When the technology novelty is medium, it is suggested that managers enhance goal clarity, to improve the speed of the innovation to the market.

To improve the overall product performance, managers should include team members from various functional areas and with good social competencies. Moreover, market-based rewards have a positive influence on overall product performance, if the product the team is working on is appropriate for the market.

#### *4.2.3. Project performance*

To enhance overall project performance, managers should aim to create an innovative team climate to improve overall project performance. The team managers should be aware of challenges in the management of the project, whereas this will have a negative influence on the overall project performance. Moreover, managers should aim to avoid complexity and uncertainty of a project in order to avoid the negative impact of such complexity on the overall performance of the project.

#### ***4.6. Limitations and future research suggestions***

One of the main limitations of our study arises from our choice to only include significant relationships between variables for our review. Whereas our review makes significant contributions to NPD team performance research by identifying and organizing its drivers and hindrances from different perspectives, we cannot draw unambiguous conclusions in terms of gaps between variables. As noted by Smith, Busi, Ball & Van Der Meer (2008), innovation management research tends to treat the factors that influence the performance of innovation activities, as if they are mutually exclusive, suggesting that they influence innovation independently from one another. Whereas our analyses revealed that many relationships significantly between independent and dependent variables are mediated and moderated (Table 2, Appendix A), we can not draw the conclusion that the absence of a significant interaction among different factors is indeed the result of a lack of investigation or whether no significant interaction has been found. In order to make valuable recommendations and contributions to future NPD team performance research, we strongly suggest future researchers to include all investigated relationships and interaction effects between different variables. This could be done, for example, by means of presenting two separate relationship frameworks: One gives an overview of significant relationships, whereas the other presents an overview of insignificant relationships. As a result, future research should be able to draw the unambiguous conclusion that an unidentified significant relationship between variables is for example, empirically tested but turned out to be insignificant. On the other hand, if the relationship cannot be identified in either of the frameworks, this is due to a gap in research that needs further investigation.

In relation to the methodological part of our review, we can identify several limitations. This part of the section will briefly address those limitations and present suggestions for future research to encounter these limitations.

One of the main critiques regarding narrative literature reviews in the field of management is their lack of thoroughness and rigour (Tranfield et al., 2003). In order to diminish this criticism, we followed the main steps of a systematic literature review as presented by Tranfield et al. (2003), which requires a detailed description of methods used. Higher transparency of the steps taken and choices made will lead to greater validity and reliability of research findings (Victor, 2008). However, our study has some validity issues, which will be discussed in the remainder of this section.

One of the main validity threats of our study relates to single researcher's bias, whereas the study was performed by one single researcher. Overall, the search and selection process is a relatively subjective process, in which decisions are made based on the interpretation of the researcher (Tranfield et al., 2003). The screening process is particularly prone to researcher bias, because decisions for inclusion or exclusion rely solely on the researcher's interpretation of 'soft' measures. Therefore, it is suggested for future researchers, to perform this part of the study by at least one other reviewer (Tranfield et al., 2003).

Moreover, we have restricted our search for relevant studies to one single database; the electronic database of ISI Web of Science. Although a computer-based search may identify a large amount of data in a short amount of time, Tranfield et al. (2003) suggest an additional search for relevant data in unpublished studies, conference papers, on the Internet and from field experts. However, while we acknowledge the importance of multiple sources for data collection in terms of research comprehensiveness, we believe the importance of including grey literature, does not outweigh the validity and reliability of conclusions that can be drawn from a set of peer-reviewed, high quality articles.

Moreover, the electronic database of ISI Web of Science only checks the title and abstract for presence of the entered key words in the search string. As a consequence, there is a possibility that we have missed studies relevant for our study, due to the absence of our keywords in the title and abstract of the studies. The search string plays an important role in this limitation. We have chosen the key words in our search string, because of their broad conceptual coverage of NPD team performance ('performance', 'effectiveness', 'efficiency' and 'success'). Although, we believe that we might actually have missed relevant studies, because of the use of general performance synonyms. Future research could benefit from a focused computer-based search, by using predefined performance indicators (e.g. team creativity, project speed, product quality), which is likely to result in more focused (relevant) and less irrelevant identified studies. Another action to counteract the limitation of our electronic database search process would be to perform a manual search through journals or references of already identified studies.

## **5. Conclusion**

In this study, we aimed to provide a comprehensive overview of independent, dependent, moderating and mediating variables that influence NPD team performance. We aimed to review and summarize the existing literature on NPD team performance and, at the same time, provide a sound foundation for practitioners to make evidence-based decisions by synthesizing and organizing the identified variables into a comprehensible, graphical framework. Finally, we aimed to provide suggestions for future research on NPD team performance, by identifying research areas that require further exploration and investigation. By means of a systematic research approach as suggested by Tranfield et al. (2003) and a computer-based search within the electronic database of ISI Web of Science, we identified 448 studies, that have been screened in two rounds for relevancy based on a predefined set of inclusion and exclusion criteria. Ultimately, we included 78 articles for our literature review. Following a review and synthesis of the literature, we presented a model that gives an overview of all identified factors in NPD team performance research that have a significant influence on NPD team performance. We distinguished between variables related to the team-member level, team level (input), team level (output), team leader, organization and environment. After analysis of the construct measures used in the selected studies, we made a distinction between team-member performance, team performance, product performance and project performance. We identified significant relationships from the perspective of each of these categories and presented four separate relationship models, which contain a selection of the identified relationships. The total picture of research evidence reinforces the critical importance of NPD team performance for the success of new product development (Edmondson & Nembhard, 2009; Ernst, 2002; Cooper & Kleinschmidt, 1995). We identified key independent variables, related to multiple levels of NPD team performance, which are cross-functionality, information exchange among team members and top management involvement, support and encouragement to take risk. We encourage future research to explore the interaction effects between such central factors in order to deepen our understanding of how they impact NPD team performance. Based on the analysis, we provided several implications for the manager, assigned with the task to form a NPD team. The overall results, further suggested that, from the perspective of NPD team performance, there is a strong tendency of scholars to measure performance using item scales that focus solely on market and financial performance indicators. Only one paper measured performance to the extent that the NPD program creates windows of opportunities for the

firm in terms of new technologies, markets and product arena's. Whereas we acknowledge the importance of market and financial performance, we encourage future research to take a less unilateral view of NPD team performance measurement. Moreover, we noticed that the vast majority of the studies measured NPD team performance through one single construct, comprised of several interrelated items. However, we argue that aggregating different outcome measures into one single construct may give a distorted view, thus we suggested future research to investigate the influence of a particular independent variable on separate items of NPD team performance. Finally, we argue that both research and practice would benefit from clear and consistent definitions and terminology of the concepts related to NPD team performance.

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## Appendix A

### Table 2: Independent variable categories and relationships with other variables

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
1	Ahmad et al. 2013)	Project uncertainty, project complexity	Overall NPD performance	Moderated	Process concurrency, team integration		Project complexity is positively related to NPD performance and is also positively moderated by team integration. The relationship between project uncertainty and NPD performance is moderated by process concurrency and has a more negative impact on NPD performance.
2	Akgün et al. 2006)	Technological turbulence, Market turbulence	New Product Success	Mediated		Unlearning, Information knowledge implementation	Environmental turbulence is positively related to unlearning. Team unlearning is positively related to information knowledge implementation, which is positively related to new product success.
3	Akgün et al. 2006)	Team intelligence	New Product Success	Mediated		(Dimensions of) Team Learning	Team intelligence is positively related to Team learning and team learning is positively related to new product success.
4	Akgün et al. 2008)	Team knowledge, IT-usage, cross-functional diversity	New product creativity, new product success	Mediated		Team intelligence	Team knowledge, IT-usage and Cross-functional diversity each have a positive influence on Team intelligence. Team intelligence has a positive influence on new product creativity and new product success.
5	Akgün et al. 2010)	Team culture	New Product Success	Mediated		Procedural Justice, Team learning, speed to market	4 team culture variables (employee orientation, customer orientation, innovativeness orientation and systematic management control) have a positive effect on Procedural Justice Climate, which has a positive effect on both team learning and speed-to-market, which both have a positive influence on new product success.
6	Aronson et al. 2008)	Leader openness, leader emotional stability, leader conscientiousness, leader extraversion	NPD Success	Moderated	Radicalness of innovation		The relationship between leader openness, emotional stability, leader extraversion and NPD success is positively moderated when the innovation is radical, but not when innovation is incremental
7	Aronson et al. 2014)	Team member personality (neuroticism and extraversion)	Team leadership behaviours and facilitation behaviours	Linear			When it comes to team composition, members of an NPD project team who are similar emotionally, as illustrated by a low variety of neuroticism and extraversion, demonstrate higher quality team leadership and facilitation behaviours, important team process behaviours.

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
8	Bierly et al. (2009)	Relationship conflict, goal clarity	Cooperation	Moderated and mediated	Virtuality	Trust	The relationship between relationship conflict and trust as well as goal clarity and trust is moderated by the degree of virtuality. For teams that are more virtual, relationship conflict will have a more negative effect on trust, whereas goal clarity will have a less positive effect on trust. The relationship between trust and cooperation is moderated by virtuality, for teams that are more virtual, trust will have a less positive effect on cooperation.
9	Blindenbach-Driessen (2015)	Cross-functionality	Team performance, Project performance	Moderated	Organization type, degree of innovation activity separation, degree of organization connectedness		There is no support for a direct relationship between cross-functionality of the innovation team and team performance. The relationship between cross-functionality and performance is moderated by organization type (functional organization vs. project-based), degree of activity separation and degree of organizational connectedness.
10	Bonner et al. (2002)	Formal control, team-based rewards, management intervention	Project Performance	Moderated	Project integration		The degree of operational control has a positive direct effect on project performance. The degree of formal process control and management intervention have a negative effect on project performance, and is moderated by the degree of integration of the NPD project within a larger program.
11	Carbonell & Rodriguez (2006)	Functional diversity, team experience, team proximity, time dedication, team stability	Innovation Speed	Linear, Curvilinear and Moderated	Project complexity		The relationship between functional diversity and innovation speed is curvilinear and moderated by technological complexity. Team experience has a more positive impact on the speed of technologically simple projects than technologically complex projects. Team proximity, full time dedication and team stability have a more positive effect on the speed of technologically complex projects than technologically simple projects. More specifically, time dedication has a negative effect on innovation speed in terms of a technologically simple project and a positive effect on innovation speed in terms of a technologically complex project.

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
12	Carbonell & Rodriguez (2009)	Top management support, goal clarity, speed-based rewards	Innovation Speed	Moderated	Technological turbulence, Technological novelty		The positive effect of top management support on innovation speed is stronger when technology novelty and technology turbulence is high and non significant when technology novelty and technology turbulence is low . The relationship between goal clarity and innovation speed is significant when technology novelty is medium, but not when technology novelty is high or low . The positive effect of goal clarity on innovation speed is greater when technology turbulence is low . The relationship between speed-based rewards and innovation speed is positive curvilinear, and moderated by technological turbulence.
13	Chen et al. 2013)	Transformational leadership, Proactive personality	Team innovative performance	Mediated		Innovation climate support, member motivation, individual innovative performance	The relationship between proactive personality and individual performance is mediated by members' motivational states. Individual performance is positively related to team innovative performance. The relationship between transformational leadership and team innovative performance is mediated by a supportive innovation climate.
14	Chen et al. 2012)	NPD Speed	NPD Success	Curvilinear and moderated	Technological uncertainty, market turbulence, market newness		NPD speed has a curvilinear relationship with NPS (1), if technological uncertainty and market turbulence are high, not when low (2) and if market newness is low, but not when high (3)
15	Chi et al. 2009)	Organizational tenure diversity	Team Innovation	Curvilinear and moderated	Team-oriented HR-practices		The relationship between team innovation and organizational tenure diversity is curvilinear (1) and team-oriented HR practices moderate the downside in the curvilinear relationship between organizational tenure diversity and team innovation (2).
16	Chiang et al. 2014)	Implementing High commitment work system (HCWS)	New product performance	Mediated		Team's transaction memory system	The relationship between implementing HCWS with NPD teams and New product performance is mediated by the team's transactional memory system
17	Chong et al. 2012)	Team proximity	Team communication	Moderated	Time pressure		The relationship between team proximity and team communication is moderated by time pressure. Teams communicate more effectively when their members are located proximately and when they experienced high challenge time pressure or low hindrance time pressure.

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
18	Dayan et al. (2010)	Demographic diversity, proximity, longevity, procedural justice, interactional justice	Team learning, product success	Mediated and moderated	Task complexity	Interpersonal Trust	No significant influence is found of functional diversity on performance. Demographic diversity has a curvilinear relationship with trust development among team members. Proximity, Longevity, Procedural and Interactional Justice have a positive relationship with interpersonal trust. Interpersonal trust has a positive relationship with team learning and product success. The relationship between proximity (1) and longevity (2) and trust is moderated by task complexity. The relationship between trust and team learning (1) and product success (2) is moderated by task complexity.
19	Dayan & Di Benedetto (2011)	Technological turbulence, Market turbulence	New Product creativity	Mediated and moderated	Team experience	Intuitive decision making	Market turbulence (1) and Technological turbulence (2) are positively related to intuitive decision making. Intuitive decision-making has a curvilinear relationship with new product creativity, only when moderated by team experience.
20	Dayan et al. (2009)	Transformational leadership, procedural justice, interactional justice, managerial conflict, transactional leadership, distributive justice	Team learning, speed-to-market, product success	Mediated and moderated	Technological turbulence, Market Turbulence (Environmental turbulence)	Managerial Trust	There is a positive relationship between transformational leadership (1), procedural justice (2) and distributive justice (3) and managerial trust in NPD projects. Conflict between team members on management has a negative impact on managerial trust. Managerial trust has a positive effect on team learning, speed-to-market and product success, and this relationship is moderated by both market and technology turbulence.
21	Dayan & Ebanna (2011)	Past team member experience, TMS, Team empowerment, decision importance	Product Success, Learning	Mediated and moderated	Technological turbulence, Market Turbulence (Environmental turbulence)	Team intuition	Past team member experience, TMS, team empowerment and an opportunity motive for decision-making have a positive effect on team intuition. Decision importance has a negative effect on team intuition. The relationship between past team member experience (1) and TMS (2) and team intuition is moderated by environmental turbulence. The relationship between team intuition and product success (1) and learning (2) is also moderated by environmental turbulence.
22	Dayan et al. (2012)	Project importance, Project uncertainty, project motive, interpersonal trust, functional diversity, demographic diversity	Speed-to-market	Mediated		Political behaviour	The positive relationship between project importance, project motive, functional diversity and speed-to-market is mediated by political behaviour.

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
23	Enrhardt et al. 2014)	Perceived project support, team leader's encouragement (team leader behaviour)	Team performance	Linear and mediated		Project commitment	Perceived project support and team leader's encouragement of self-expectation in team members have a positive effect on team member's project commitment. Team member project commitment has a positive influence on team performance. Project commitment mediates the relationship between team leader's encouragement of self-expectation and team performance.
24	Gong et al. 2013)	Team goal orientation	Team Creativity and Individual Creativity	Mediated and moderated	Trust Relationship with Team Leader	Team Information Exchange, Individual Creativity and Supportive Creativity Climate	Team goal orientation is positively related to Team Information Exchange and this relationship is also moderated by the trust relationship with the team leader. Team Information Exchange is positively related to Team Creativity as well as Individual Creativity. The relationship between Individual Creativity and Team Creativity is mediated by a supportive creativity climate.
25	Griffin (1997)	Cross-functionality	Concept-to-customer time, total time				The use of a cross-functional team has a positive relationship with the Concept-to-customer time (CTC) and Total Time (TT). There was no significant relationship between the use of a CFT and the development time, suggesting that cross-functionality of a team only affects time early in the process.
26	Gu et al. 2013)	Social interaction, mutual trust, shared goals, psychological safety, learning from mistakes (LFM)	Team innovation	Linear and mediated		Psychological safety, learning from mistakes (LFM)	Both team psychological safety and LFM partially mediated the relationship between social interaction and shared goals and team innovation, and fully mediated the relationship between mutual trust and team innovation.
27	Haon et al. 2009)	Competence diversity	New Product Performance	Moderated and mediated	Familiarity	Use of Information	The relationship between competence diversity and use of information is mediated by familiarity. Use of information is positively related to new product performance.
28	Howell & Shea (2006)	Champion Behaviour	Project Performance	Linear			Championship behaviour has a positive effect on project performance.
29	Howell & Shea (2001)	Champion Behaviour	Team Performance	Linear and mediated		Team potency	Champion behaviour is positively related to team potency, which positively influences team performance. Team potency also has a direct positive influence on team performance.
30	Huang (2011)	Team learning	Team innovation	Linear			Internal learning has a direct positive effect on teams' technological innovation capability (team innovation).
31	Huang et al. 2015)	Exploitative Learning	NPD efficiency	Moderated	T-shaped skills, Strategic consensus		Exploitative learning has a direct positive influence on NPD efficiency. This relationship is altered by T-shaped skills of team members (1) and strategic consensus (2).

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
32	Im et al. (2013)	Social cohesion, superior/ordinate identity, market-based reward system, planning formalization	Product Competitive Advantage	Mediated		NP creativity (novelty and meaningfulness)	Social cohesion and superior/ordinate identity are both positively related to NP meaningfulness. Market-based reward systems positively related to NP novelty. Planning process formalization is negatively related to NP novelty. NP novelty and NP meaningfulness have a strong positive effect on Product competitive advantage.
33	Im & Nakata (2008)	Market-oriented reward system, planning formalization, top mgt. encouragement, risk taking, managerial involvement in NPD projects	New Product Advantage	Mediated		Cross-functional integration	Market-oriented reward system, planning formalization, managerial encouragement to take risk and managerial involvement in NPD projects are all positively related to cross-functional integration. Cross-functional integration has a positive influence on new product advantage.
34	Ishtkawa (2012a)	Transformational leadership, Gatekeeping leadership	R&D Team performance	Linear and Mediated		Norm for maintaining consensus, shared leadership	Transformational leadership has a positive effect on the norm for maintaining consensus and gatekeeping leadership has a negative effect on the norm for maintaining consensus. The norm for maintaining consensus is negatively related to shared leadership, while shared leadership has a positive influence on R&D team performance. The relationship between transformational leadership (1) and gatekeeping leadership (1) and R&D Team performance is moderated by norm for maintaining consensus and its negative influence on shared leadership. However, there is a direct positive relationship between gatekeeping leadership and shared leadership (1) and R&D performance (2).
35	Ishtkawa (2012b)	Transformational leadership, Gatekeeping leadership	R&D Team performance	Mediated		Norm for maintaining consensus, Internal communication	The relationship between transformational leadership and team performance as well as between gatekeeping leadership and team performance is positively mediated by internal communication (1) and norm for maintaining consensus (2).
36	Keller & Kedra (1996)	Participative/cooperative work climate, climate of high work importance, satisfaction with pay and advancement opportunities	R&D team productivity	Direct			A participative/cooperative work climate, a climate of high work importance, and satisfaction with pay and advancement opportunities each have a positive effect on R&D team productivity. Satisfaction with supervision has no significant effect on R&D team productivity.
37	Kim & Kim (2009)	Co-location, cross-functional distance	Product quality improvement	Linear and mediated		Initial quality	Co-location has an indirect (via the initial quality) positive impact and a direct positive impact on quality improvement. The effect of CFT distance (i.e., balanced CFT) on quality improvement is a rather direct, negative one.

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
38	Kock et al. 2006)	Electronic communication media use	Team effectiveness	Linear and Mediated		Procedural structuring (Process coordination, reviewing)	There is a direct negative relationship between electronic communication media use (web usage, electronic written file transferring, email usage, voice messaging) and team effectiveness. However, this relationship is indirect positive, when mediated by procedural structuring and is found to be stronger than the negative direct relationship between electronic communication media usage and team effectiveness.
39	Kratzer et al. 2005)	Cohesion of friendly ties, cohesion of friendship ties	Team performance	Curvilinear and Linear			Friendly informal ties have an inverted-U shaped relationship with team performance, whereas friendship informal ties have a direct positive relationship with team performance.
40	Lee & Chen (2007)	Cross-functionality, charged behaviour (enjoyment, commitment, open information sharing, challenging ideas, cooperation)	NPD Project performance	Linear and moderated	Degree of innovation		Cross-functionality (1) and charged behaviour (2) have a direct, positive influence on NPD project performance and the latter is moderated by the degree of innovation. Cross-functionality has a negative direct influence on charged behaviour.
41	Lee (2011)	Challenge stressors, hindrance stressors	New Product Success	Linear, mediated and moderated	Relationship conflict	Team unlearning	Challenge stressors have a direct positive effect on team unlearning (1) and new product success (2). Hindrance stressors have a direct negative effect on new product success. Team unlearning has a direct positive influence on new product success. This relationship is also moderated by relationship conflict. The relationship between task conflict and new product success is curvilinear.
42	Lee (2011)	Environmental dynamism (market dynamism and technological dynamism)	Product innovation (Product advantages and product newness)	Direct, mediated and moderated	Perceived diversity climate	Team strain (team crisis, team anxiety)	Market and technological dynamism positively influence the level of team strain. Market dynamism has a direct positive influence on product innovation. No significant influence of technological dynamism on product innovation is found. Team strain is negatively related to the level of product innovation, although perceived diversity climate weakens the negative influence of team strain on product innovation.

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
43	Lee (2008)	Project management skills, entrepreneurial proclivity, existing knowledge	NPD performance	Mediated and moderated	Team cohesiveness, knowledge practice	Team reflexivity, product innovativeness	Project management skills, entrepreneurial proclivity and existing knowledge each have a positive influence on both team reflexivity and product innovativeness and these relationships are moderated by team cohesiveness (1) and knowledge practice (2). Team reflexivity has a direct positive influence on product innovativeness and NPD performance, and product innovativeness also has a positive influence on NPD performance.
44	Lee & Sukoco (2011)	Team reflexivity, team stress (anxiety and crisis), team unlearning	Product innovation (Product advantages and product newness)	Linear and moderated	Procedural Justice	Unlearning	Team reflexivity has a direct positive relationship with team unlearning and product innovation. Team stress has a direct negative relationship with unlearning and product innovation. Team unlearning is positively related to product innovation. Team Procedural Justice moderates the relationship between team reflexivity and team unlearning, as well as between team stress and unlearning (1) and product innovation (2).
45	Lee et al. 2011)	Delegating (1), participating (2), selling (3) and telling leadership style (4)	NPD performance (Product prototype development + launch proficiency, technological core competency, design change frequency, innovation level)	Linear			Higher levels of participating leadership style have a positive influence on product prototype development + launch proficiency, technological core competency and product development cycle time. Selling style has a positive influence on technological core competency. Telling style has a positive influence on innovation level, but a negative influence on design change frequency. Delegating leadership style has a positive influence on product prototype development + launch proficiency. Thus, different leadership styles has different influences on different measures of NPD performance.
46	Leenders et al. 2003)	Intra-team communication, presence of central team members	Team creative performance	Linear and curvilinear			Intra-team communication has an inverted-U shaped relationship with team creative performance, while presence of central team members is negatively associated with team creative performance.
47	Li & Huang (2013)	Transactive memory system (specialization, credibility, coordination)	Project performance (Project efficiency, project effectiveness)	Linear and mediated		Team learning (exploitative learning, exploratory learning)	Specialization, credibility and coordination are positively related to exploitative learning, which again is positively related to project performance. Credibility and coordination are positively related to exploratory learning, which is positively related to project performance.

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
48	Liu et al. (2015)	Behavioural integration (collaborative behaviour, information exchange, joint-decision making)	Team innovation performance	Linear and moderated	Collective efficacy		Information exchange is directly and positively related to innovation performance in teams and moderated by collective efficacy. The relationship between collaborative behaviour (1) and joint decision-making (2) and innovation performance only exists when moderated by collective efficacy.
49	Lopez Cabrales et al. (2008)	Team diversity, encouragement to take risk, use of long and short-term incentives	Radical product innovation	Linear			Team diversity (1) and use of long- and short-term incentives (2) has a negative influence on radical innovation as an outcome. Encouragement to take risk has a positive influence on radical innovation.
50	Markham & Lee (2014)	In-team 'We-ness', knowledge sharing	NPD performance	Linear and mediated		Knowledge sharing	There is a positive relationship between in-team 'w-e-ness' activities and knowledge sharing in NPD teams (1) and NPD performance (2). Knowledge sharing has a positive effect on NPD performance and thus partially mediates the relationship between in-team 'w-e-ness' and NPD performance.
51	McDonough et al. (2001)	Project management challenges	Project Performance	Linear			Project management challenges have a negative influence on project performance, regardless of type of team (global, virtual, co-located). The use of an affiliated set of communication technologies for Global NPD teams has a positive influence on the performance of such a team.
52	McDonough et al. (1999)	Communication technologies	Team performance	Linear			The social competency of individual team members has a direct, positive influence on NPD performance. This relationship is further moderated by learning, technological competency and market knowledge. Only partial support is found for the mediating role of learning between social competency and NPD performance. Social competency has a positive influence on learning, but the effect on NPD performance dropped significantly through the mediation of learning.
53	Mu et al. (2011)	Social competency of individuals	NPD performance	Linear and moderated	Learning, technological competency, market knowledge		There is a positive, direct relationship between interpersonal trust and NPD team effectiveness. This relationship is also positively moderated by computer-mediated communication, team membership flexibility and national diversity.
54	Muehrel et al. (2012)	Interpersonal trust	NPD team effectiveness	Linear and moderated	Computer-mediated communication, team member flexibility, national diversity		Social cohesion, superordinate identity, market-oriented reward system, planning formalization and managerial encouragement to take risk each have a positive influence on cross-functional integration. Cross-functional integration, in turn, has a positive influence on new product performance.
55	Nakata & Im (2010)	Social cohesion, superordinate identity, market-based reward system, planning formalization, managerial encouragement to take risk	New Product Performance	Linear and mediated		Cross-functional integration	

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
56	Nerkar et al. 1996)	Comprehension, deftness	Innovation Performance	Mediated		Instrumental satisfaction, social satisfaction	The relationship between comprehension and innovation performance is mediated by instrumental satisfaction, whereas the relationship between deftness and innovation performance is mediated by social satisfaction.
57	Olson et al. 2001)	Cross-functionality	Project performance	Linear and mediated	Project stage, product innovativeness		Cooperation between marketing and R&D, and cooperation between operations and R&D is high during the early stages of the project has a positive influence on project performance. In the late stage of the project, cooperation between marketing and operations, and R&D and operations has a positive impact on project performance for innovative products, but not for non-innovative products. Early stage cooperation between marketing and operations leads to superior performance for non-innovative products, but to poor performance for innovative products.
58	Park et al. 2009)	Proportion of multiknowledge individuals with both marketing & technology knowledge	Product innovativeness, NPD time efficiency	Direct and mediated		Information sharing	The proportion of multiknowledge individuals with both marketing & technology knowledge is positively related to product innovativeness through information sharing (1) and directly positively related to NPD time efficiency.
59	Paulsen et al. 2013)	Transformational leadership	Team innovation	Mediated		Team identification	Transformational leadership has a direct positive effect on team innovative efforts (1) and stronger identification with the team by individuals (2). Stronger identification with the team by individuals also has a positive effect on team innovative efforts and is thus partly mediating the relationship between transformational leadership and team innovation.
60	Pirola-Merlo (2010)	Team climate for innovation	R&D project performance, project progress	Linear and exponential			Team climate for innovation is positively related to both R&D project performance as well as faster rates of project progress among R&D teams, where the latter is an exponential relationship. For every score above average of team climate, the project progress increased exponentially.
61	Pirola-Merlo et al. 2002)	Obstacles, Transformational leadership	Team performance	Linear, moderated and mediated	Transformational leadership	Team climate	Overall, the results provide evidence that obstacles have a negative impact on team climate. However, leaders may counterbalance this effect by adopting more facilitative and transformational styles, thereby reducing the negative effect of obstacles on climate. There was evidence of strong relations between team climate and performance. Additionally, it was found that team climate mediated the relation between leadership and team performance.

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
62	Post (2012)	Cognitive styles (Connective thinking, sequential thinking)	Team innovation	Mediated		Cooperative learning, psychological safety	Sequential thinking hinders team innovation by inhibiting psychological safety, while connective thinking facilitates team innovation through increased cooperative learning among team members.
63	Salomo et al. 2010)	Senior management involvement	Global NPD performance	Mediated		Global dispersion	There is a positive relationship between senior management involvement and global NPD performance, which is fully mediated by global dispersion of the NPD effort
64	Sarin & Mahajan (2001)	Position-based rewards, equal rewards, process-based rewards, outcome-based rewards (reward structures)	Team member satisfaction, product quality, team performance	Linear, monotonically decreasing and moderated	Ease of individual evaluation, length of development cycle, Project/product complexity, Project risk, Competitive intensity, Industry dynamism		Different reward systems (position based rewards, equal rewards, process based rewards and outcome based rewards) have different effects on different team performance indicators (product quality, team member satisfaction and overall team performance). These relationships are all moderated by either ease of evaluation, project complexity, project risk, competitive intensity, length of development cycle and industry dynamism.
65	Sethi (2000a)	Information integration	New product quality	Linear and moderated	Quality orientation		Information integration is positively related to product quality and this relationship is negatively moderated by firm quality orientation.
66	Sethi (2000b)	Team longevity, team autonomy, outcome interdependence	New product performance	Linear, mediated and moderated	Interdepartmental connectedness	Superordinate identity	Team longevity improves superordinate identity but has no effect on new product performance. Instead, a special team structure (i.e., high autonomy and outcome interdependence) improves both superordinate identity and new product performance. If interdepartmental connectedness in the firm is high, there is a reduced need for high autonomy in the team. Finally, outcome interdependence and autonomy influence new product performance only through superordinate identity.
67	Sethi & Nicholson (2001)	Outcome interdependence, physical proximity	New Product Market performance	Linear and mediated		Charged behaviour	The positive relationship between outcome interdependence and new product market performance is fully mediated by charged behaviour. Physical proximity has a direct positive effect on new product performance (and no effect on charged behaviour).
68	Sethi & Sethi (2009)	Encouragement to take risk	Product performance	Linear, mediated and moderated	Autonomy	Novelty and appropriateness	The level of encouragement to take risk is positively related to novelty (which is positively moderated by autonomy), and negatively related to product appropriateness. Product appropriateness is positively related to product performance. Product novelty is positively related to product performance. The relationship between encouragement to take risk and performance is fully mediated by appropriateness.

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
69	Stoiegrat & Atuahene-Gina (2011)	Team stability	New Product Advantage	Curvilinear and mediated		Team-level debate, decision-making comprehensiveness	Project team stability has a curvilinear relationship with team-level debate and decision-making comprehensiveness. Team-level-debate has a positive influence on decision-making comprehensiveness, but not on new product advantage, whereas decision-making comprehensiveness has a curvilinear relationship with new product advantage.
70	Stark & Bierly (2009)	Relationship conflict	Team satisfaction	Linear and moderated	Virtualness		The negative relationship between relationship conflict and team satisfaction is negatively moderated by the level of virtualness.
71	Stock (2006)	Team interorganizationality, team cohesiveness, expertise of team members, team longevity.	Team effectiveness	Linear and moderated	Task-related complexity, supplier adaptation, market-related dynamism, competitive intensity, technological turbulence		There is a positive relationship between team organizationality and team effectiveness, which is positively moderated by task-related complexity, supplier adaptation, market-related dynamism, competitive intensity and technological turbulence. Team cohesiveness, expertise of team members and team longevity all have a direct positive effect on team effectiveness.
72	Sun et al. 2014)	Transformational leadership	Team performance	Linear and mediated		Team climate	Transformational leadership has a positive effect on team performance (1) and team climate (2). NPD team climate is positively related to team performance.
73	Susman & Ray (1999)	Team decision making, project-based rewards	Project performance	Linear			Team-decision making and project-based rewards are both positively related to project performance.
74	Tang et al. 2014)	Team identification, expertise identification, knowledge sharing	Team members' creativity	Linear and Mediated		Knowledge sharing	Team identification, expertise identification and knowledge sharing each have a direct, positive influence on team members' creativity. Team identification has a positive effect on knowledge sharing, which has a positive effect on individual creativity.
75	Tang (2015)	Diversified knowledge from insiders of R&D team	Team radical creativity	Linear			There is a positive relationship between diversified knowledge from insiders of the R&D team and team radical creativity.
76	Tsai et al. 2014)	Knowledge heterogeneity	Development speed, product quality, solution found, problem-solving speed, solution quality	Curvilinear			Knowledge heterogeneity has an inverted-U shaped relationship with all the dimensions of NPD team performance: Development speed, product quality, solution found, problem-solving speed and solution quality.

Article No.	Author	Independent variable(s)	Dependent Variable(s)	Relationship	Moderating Variable(s)	Mediating Variable(s)	Main findings (abstract)
77	Tu (2009)	Negative affective tone	Team creativity	Moderated	Organizational control, organizational support		Negative affective tone is positively related to team creativity when organizational support is high and organizational control is low .
78	Visser et al. 2014)	Intuitive information processing, analytical information processing	Project Performance	Moderated	Radicalness' of innovation		The relationship between intuitive information processing and project performance is moderated by radicalness of innovation. Analytical information processing is directly, positively related to project performance.

**Table 3: Independent variable categories and relationships with dependent, moderating and mediating variables**

Art. No.	Independent variable	Moderator	Mediator	Mediator (2)	Dependent variable
	<b>Team-member level</b>				
	<b>Cognitive</b>				
78	Intuitive information processing	Radicalness of innovation			NPD Team performance
78	Analytic information processing				NPD Team Performance
62	Connective thinking		Cooperative learning		Team innovation
62	Sequential thinking		Psychological safety		Team innovation
	<b>Personality</b>				
7	Team member personality				Team leadership behaviours
7	Team member personality				Team facilitation behaviours
13	Pro-active personality		Motivation	Individual innovative performance	Team innovative performance
43	Entrepreneurial proclivity	Team cohesiveness	Team reflexivity		NPD performance
43	Entrepreneurial proclivity	Team cohesiveness	Product innovativeness		NPD performance
43	Entrepreneurial proclivity	Knowledge practice	Team reflexivity		NPD performance
43	Entrepreneurial proclivity	Knowledge practice	Product innovativeness		NPD performance
53	Social competency	Learning			NPD performance
53	Social competency	Technology competency			NPD performance
53	Social competency	Market knowledge			NPD performance
	<b>Identity</b>				
74	Team identification				Team member creativity
74	Team identification		Knowledge sharing		Team member creativity
	<b>Experience</b>				
21	Past experience	Technological turbulence	Team intuition		Product success
21	Past experience	Technological turbulence	Team intuition		Learning
21	Past experience	Market turbulence	Team intuition		Product success
21	Past experience	Market turbulence	Team intuition		Learning
	<b>Knowledge</b>				
43	Existing knowledge	Team cohesiveness	Team reflexivity		NPD performance
43	Existing knowledge	Knowledge practice	Product innovativeness		NPD performance
71	Expertise				Team effectiveness
74	Expertise identification				Team member creativity

Art. No.	Independent variable	Moderator	Mediator	Mediator (2)	Dependent variable
	<b>Team-member level (2)</b>				
	<i>Skills</i>				
43	Project management skills	Team cohesiveness	Team reflexivity + product innovativeness		NPD performance
43	Project management skills	Knowledge practice			NPD performance
	<b>Support</b>				
23	Perceived project support		Project commitment		Team performance
	<b>Championing</b>				
28	Champion behaviour				Project performance
29	Champion behaviour		Team potency		Team performance
	<b>Satisfaction</b>				
36	Satisfaction with pay				Team productivity
	<b>Behaviour</b>				
40	Charged behaviour	Degree of innovation			Project performance
	<b>Team-level (Input)</b>				
	<b>Cross-functionality</b>				
4	Cross-functional diversity		Team intelligence		New Product creativity
4	Cross-functional diversity				New Product Success
11	Cross-functional diversity	Technological complexity			Innovation speed (project)
22	Cross-functional diversity		Political behaviour		Speed-to-market
37	Cross-functional balance				Product quality improvement
9	Cross-functionality	Organization type			Team Performance
9	Cross-functionality	Activity separation			Team Performance
9	Cross-functionality	Organizational connectedness			Team Performance
78	Cross-functionality				NPD team performance
25	Cross-functionality				Development time
40	Cross-functionality				Project performance
40	Cross-functionality				Charged behaviour
57	Cross-functional cooperation	Project stage			Project performance
57	Cross-functional cooperation	Product innovativeness			Project performance

Art. No.	Independent variable	Moderator	Mediator	Mediator (2)	Dependent variable
	<b>Interorganizationality</b>				
71	Interorganizationality	Task complexity			Team effectiveness
71	Interorganizationality	Supplier adaption			Team effectiveness
71	Interorganizationality	Market dynamism			Team effectiveness
71	Interorganizationality	Competitive intensity			Team effectiveness
71	Interorganizationality	Technological turbulence			Team effectiveness
	<b>Demographics</b>				
18	Demographic diversity		Interpersonal trust		Team learning
18	Demographic diversity		Interpersonal trust		Product success
49	Team diversity				Radical product innovation
	<b>Longevity</b>				
18	Team longevity	Task complexity	Interpersonal trust		Team learning
18	Team longevity	Task complexity	Interpersonal trust		Product success
66	Team longevity				Superordinate Identity
71	Team longevity				Team effectiveness
15	Organizational tenure diversity	HR Practices			Team innovation
	<b>Location</b>				
11	Team proximity	Technological complexity			Innovation speed (project)
17	Team proximity	Time pressure			Team communication
18	Team proximity	Task complexity	Interpersonal trust		Team learning
18	Team proximity	Task complexity	Interpersonal trust		Product success
67	Team proximity				New Product Market Performance
37	Co-location				Product quality improvement
37	Co-location		Initial product quality		Product quality improvement
37	Co-location		Cross-functional distance		Product quality improvement
	<b>Knowledge</b>				
58	Multiknowledge individuals		Information sharing		Product innovation
58	Multiknowledge individuals				NPD time efficiency
3	Team intelligence		Team Learning		New Product Success
4	Team knowledge		Team intelligence		New Product Success
4	Team knowledge		Team intelligence		New product creativity
75	Knowledge diversity				Team radical creativity
76	Knowledge heterogeneity				Development speed
76	Knowledge heterogeneity				Product quality
76	Knowledge heterogeneity				Solution found
76	Knowledge heterogeneity				Problem-solving speed

Art. No.	Independent variable	Moderator	Mediator	Mediator (2)	Dependent variable
	<b>Team-member level (4)</b>				
	<b>Knowledge (2)</b>				
76	Knowledge heterogeneity				Solution quality
47	Transactive memory system		Team learning		Project performance
21	Transactive memory system	Technological turbulence	Team intuition		Product success
21	Transactive memory system	Technological turbulence	Team intuition		Speed-to-market
21	Transactive memory system	Market turbulence	Team intuition		Product success
21	Transactive memory system	Market turbulence	Team intuition		Speed-to-market
	<b>Experience</b>				
11	Team experience	Technological complexity			Innovation speed (project)
	<b>Skills</b>				
27	Competence diversity	Familiarity	Use of information		New product performance
56	Deftness		Social satisfaction		Innovation performance
56	Comprehension		Instrumental satisfaction		Innovation performance
	<b>Team-level (Process)</b>				
	<b>Culture</b>				
5	Team culture		Procedural Justice	Team learning	New product success
5	Team culture		Procedural Justice	Speed-to-market	New product success
	<b>Climate</b>				
36	Work climate				Team productivity
60	Team climate				Project performance
26	Psychological safety				Team innovation
77	Negative affective tone	Organizational control			Team creativity
77	Negative affective tone	Organizational support			Team creativity
	<b>Justice</b>				
18	Procedural justice		Interpersonal trust		Team learning + Product success
20	Procedural justice	Environmental turbulence	Managerial trust		Team learning
20	Procedural justice	Environmental turbulence	Managerial trust		Product Success
20	Procedural justice	Environmental turbulence	Managerial trust		Speed-to-market
18	Interactional justice		Interpersonal trust		Team learning
18	Interactional justice		Interpersonal trust		Product success
20	Distributive justice	Environmental turbulence	Managerial trust		Product success
20	Distributive justice	Environmental turbulence	Managerial trust		Team learning
20	Distributive justice	Environmental turbulence	Managerial trust		Speed-to-market

Art. No.	Independent variable	Moderator	Mediator	Mediator (2)	Dependent variable
	<b>Team-level (Process) (2)</b>				
	<b>Stability</b>				
11	Team stability	Technological complexity			Innovation speed (project)
69	Team stability				New Product Advantage
69	Team stability		Team-level debate		New Product Advantage
69	Team stability		Decision making comprehensiveness		New Product Advantage
	<b>Autonomy</b>				
66	Team autonomy	Interdepartmental connectedness	Superordinate identity		New Product Performance
	<b>Goals</b>				
8	Team goal clarity	Virtuality	Trust		Cooperation
12	Team goal clarity	Technological turbulence			Speed-to-market
12	Team goal clarity	Technological novelty			Speed-to-market
24	Team goal orientation	Trust relationship w/ith team leader	Team information exchange	Supportive climate	Individual creativity
24	Team goal orientation	Trust relationship w/ith team leader	Team information exchange	Supportive climate	Team creativity
26	Shared goals		Psychological safety		Team innovation
26	Shared goals		Learning from mistakes		Team innovation
	<b>Support</b>				
21	Team empowerment		Team intuition		Product success
21	Team empowerment		Team intuition		Learning
	<b>Decision-making</b>				
21	Decision importance		Team intuition		Product success
21	Decision importance		Team intuition		Learning
21	Decision motive		Team intuition		Product success
21	Decision motive		Team intuition		Learning
48	Joint-decision making		Team intuition		Team innovative performance
73	Team decision making	Collective efficacy			Project performance
	<b>Challenge</b>				
41	Challenge stressors				New product success
41	Challenge stressors		Team unlearning		New product success
41	Hindrance stressors				New product success
61	Obstacles	Transformational leadership			Team Performance

Art. No.	Independent variable	Moderator	Mediator	Mediator (2)	Dependent variable
	<b>Team-level (Process) (3)</b>				
	<b>Conflict</b>				
8	Relationship conflict	Virtuality	Trust		Cooperation
70	Relationship conflict	Virtuality			Team satisfaction
20	Managerial conflict	Environmental turbulence	Managerial trust		Team learning
20	Managerial conflict	Environmental turbulence	Managerial trust		Product success
20	Managerial conflict	Environmental turbulence	Managerial trust		Speed-to-market
44	Team stress	Procedural Justice			Product innovation
44	Team stress	Procedural Justice	Team unlearning		Product innovation
	<b>Interaction</b>				
26	Social interaction				Team innovation
46	Intra-team communication		Psychological safety + LFM		Team creative performance
48	Information exchange				Team innovative performance
65	Information integration		Firm quality orientation		New Product Quality
74	Knowledge sharing				Team member creativity
46	Central team members				Team creative performance
	<b>Cohesion</b>				
39	Cohesion of friendly ties				Team performance
39	Cohesion of friendship ties				Team performance
32	Social cohesion		New Product Novelty		Product competitive advantage
32	Social cohesion		New Product Meaningfulness		Product competitive advantage
55	Social cohesion		Cross-functional integration		New product performance
71	Team cohesion				Team effectiveness
	<b>Identity</b>				
55	Superordinate identity		Cross-functional integration		New product performance
50	In-team 'we-ness'		Knowledge sharing		NPD performance
66	Outcome interdependence		Superordinate identity		New product performance
67	Outcome interdependence		Charged behaviour		New product market performance
	<b>Trust</b>				
54	Interpersonal trust	Computer-mediated communication			NPD team effectiveness
54	Interpersonal trust	Team member flexibility			NPD team effectiveness
54	Interpersonal trust	National diversity			NPD team effectiveness
26	Mutual trust		Psychological safety + LFM		Team innovation

Art. No.	Independent variable	Moderator	Mediator	Mediator (2)	Dependent variable
	<b>Team-level (Process) (4)</b>				
	<i>Learning</i>				
26	Learning from mistakes				Team innovation
30	Team learning				Team innovation
31	Exploitative learning	T-shaped skills			NPD efficiency
31	Exploitative learning	Strategic consensus			NPD efficiency
41	Team unlearning	Relationship conflict			New product success
44	Team reflexivity				Product innovation
44	Team reflexivity	Procedural Justice	Team unlearning		Product innovation
	<i>Behaviour</i>				
48	Collaborative behaviour	Collective efficacy			Team innovative performance
	<i>Dedication</i>				
11	Team time dedication	Technological complexity			Innovation speed (project)
	<i>Communication technology</i>				
4	IT-usage		Team intelligence		New Product Success
4	IT-usage		Team intelligence		New product creativity
38	Electronic communication media use				Team effectiveness
38	Electronic communication media use		Procedural structuring		Team effectiveness
52	Communication technologies				Team performance
	<b>Team leader</b>				
	<i>Personality</i>				
6	Team leader openness	Radicalness of innovation			NPD Success
6	Team leader emotional stability	Radicalness of innovation			NPD Success
6	Team leader consciousness	Radicalness of innovation			NPD Success
6	Team leader extraversion	Radicalness of innovation			NPD Success
	<i>Leadership style</i>				
13	Transformational leadership		Supportive climate		Team innovative performance
20	Transformational leadership	Environmental turbulence	Managerial trust		Team learning
20	Transformational leadership	Environmental turbulence	Managerial trust		Product success
20	Transformational leadership	Environmental turbulence	Managerial trust		Speed-to-market
34	Transformational leadership		Norm for maintaining consensus	Shared leadership	Team performance
35	Transformational leadership		Internal communication		Team performance

Art. No.	Independent variable	Moderator	Mediator	Mediator (2)	Dependent variable
	<b>Team-level (Process) (2)</b>				
	<b>Leadership style (2)</b>				
35	Transformational leadership		Norm for maintaining consensus		Team performance
59	Transformational leadership		Team identification		Team innovation
59	Transformational leadership		Team climate		Team innovation
61	Transformational leadership		Team climate		Team performance
72	Transformational leadership		Team climate		Team performance
34	Gatekeeping leadership		Norm for maintaining consensus		Team performance
34	Gatekeeping leadership			Shared leadership	Team performance
34	Gatekeeping leadership				Team performance
35	Gatekeeping leadership		Internal communication		Team performance
35	Gatekeeping leadership		Norm for maintaining consensus		Team performance
23	Team leader encouragement		Project commitment		Team performance
45	Delegating leadership style				NPD performance
45	Participating leadership style				NPD performance
45	Selling leadership style				NPD performance
45	Telling leadership style				NPD performance
	<b>Project-level</b>				
	<b>Uncertainty</b>				
1	Project uncertainty	Process concurrency			Overall NPD performance
1	<b>Complexity</b>	Team integration			Overall NPD performance
22	<b>Importance</b>				
	Project importance		Political behaviour		Speed-to-market
	<b>Motive</b>				
22	Project motive (threat/crisis)		Political behaviour		Speed-to-market
51	<b>Challenge</b>				
	Project management challenges				Project performance
	<b>Speed</b>				
14	NPD Speed	Technological uncertainty			NPD Success
14	NPD Speed	Market turbulence			NPD Success
14	NPD Speed	Market newness			NPD Success

Art. No.	Independent variable	Moderator	Mediator	Mediator (2)	Dependent variable
	<b>Organizational-Level</b>				
	<i>Control</i>				
10	Formal process control	Project integration			Project Performance
10	Operational control				Project Performance
	<b>Managerial Involvement</b>				
10	Management intervention	Project integration			Project Performance
33	Managerial involvement in NPD		Cross-functional integration		New product advantage
63	Top management involvement	Global dispersion			Global NPD performance
12	Top management support	Technological turbulence			Speed-to-market
12	Top management support	Technological novelty			Speed-to-market
33	Top management encouragement		Cross-functional integration		New product advantage
49	Top management encouragement				Radical product innovation
55	Top management encouragement		Cross-functional integration		New product performance
68	Top management encouragement	Autonomy	Product novelty		Product performance
68	Top management encouragement		Product appropriateness		Product performance
	<b>Rewards</b>				
12	Speed-based rewards	Technological turbulence			Speed-to-market
33	Market-oriented rewards		Cross-functional integration		New product advantage
32	Market-based rewards		New product novelty		Product competitive advantage
55	Market-based rewards		Cross-functional integration		New product performance
64	Position-based rewards	Ease of evaluation			Team member satisfaction
64	Position-based rewards	Ease of evaluation			Team performance
64	Equal rewards	Ease of evaluation			Team member satisfaction
64	Process-based rewards	Project complexity			Speed-to-market
64	Process-based rewards	Project risk			Team performance
64	Process-based rewards	Development cycle length			Team performance
64	Process-based rewards	Development cycle length			Product quality
64	Outcome-based rewards	Project complexity			Team performance
64	Outcome-based rewards	Project risk			Product quality
64	Outcome-based rewards	Competitive intensity			Product quality
64	Outcome-based rewards	Industry dynamism			Product quality
73	Project-based rewards				Project performance
49	Use of long- and short term incentives				Radical product innovation
	<b>HR practices</b>				
16	Implementing HCWS		Team TMS		New Product Performance

Art. No.	Independent variable	Moderator	Mediator	Mediator (2)	Dependent variable
	<b>Environmental-level</b>				
	<b>Planning</b>				
32	Planning formalization		New product novelty		Product competitive advantage
33	Planning formalization		Cross-functional integration		New product advantage
55	Planning formalization		Cross-functional integration		New product performance
	<b>Technological turbulence</b>				
2	Technological turbulence		Unlearning	Information knowledge implementation	New Product success
19	Technological turbulence	Team experience	Intuitive decision making		New product creativity
42	Technological dynamism	Perceived diversity climate	Team strain		Product innovation
	<b>Market turbulence</b>				
2	Market turbulence				New product success
19	Market turbulence	Team experience	Intuitive decision making		New product creativity
42	Market dynamism				Product innovation
42	Market dynamism	Perceived diversity climate	Team strain		Product innovation

**Table 4: Dependent variables classifications**

Art. No.	Dependent variable (identified from text)
	<b><i>Team-member performance</i></b>
	<b><i>Creativity</i></b>
24	Individual creativity
74	Team member creativity
	<b><i>Satisfaction</i></b>
64	Team member satisfaction
	<b><i>Team level performance</i></b>
	<b><i>Behaviour</i></b>
40	Charged behaviour
	<b><i>Cooperation</i></b>
8	Cooperation
	<b><i>Identity</i></b>
66	Superordinate identity
	<b><i>Innovation</i></b>
13	Team innovative performance
15	Team innovation
26	Team innovation
30	Team innovation
39	Team performance
39	Team performance
48	Team innovative performance
59	Team innovation
62	Team innovation
	<b><i>Communication</i></b>
17	Team communication
	<b><i>Learning</i></b>
18	Team learning
20	Team learning
21	Learning
41	New product success
	<b><i>Performance (overall)</i></b>
29	Team performance
38	Team effectiveness
52	Team performance
61	Team performance
64	Team performance
71	Team effectiveness
72	Team performance
78	Team performance

Art. No.	Dependent variable (identified from text)
	<b>Team level performance (2)</b>
	<b>Process</b>
76	Solution found
	<b>Productivity</b>
36	Team productivity
	<b>Creativity</b>
24	Team creativity
46	Team creative performance
75	Team radical creativity
77	Team creativity
	<b>Quality</b>
76	Product quality
76	Solution quality
	<b>Satisfaction</b>
70	Team satisfaction
	<b>Speed</b>
76	Development speed
76	Problem-solving speed
	<b>Behaviour (team leader)</b>
7	Team leadership behaviours
7	Team facilitation behaviours
	<b>Product level performance</b>
	<b>Creativity</b>
4	New product creativity
19	New product creativity
	<b>Innovation</b>
42	Product innovation
44	Product innovation
49	Radical product innovation
58	Product innovation
	<b>Market-&amp; Financial performance</b>
67	New product Market Performance
3	New product Success
4	New product Success
5	New product success
6	NPD Success
9	Team performance
14	NPD Success
18	Product success
20	Product success
21	Product success
27	New product performance
41	New product success
66	New product performance
68	Product performance

Art. No.	Dependent variable (identified from text)
	<b><i>Product level performance (2)</i></b>
	<b><i>Performance (overall)</i></b>
16	New product performance
32	Product competitive advantage
33	New product advantage
40	Project performance
53	NPD performance
55	New product performance
69	New Product Advantage
	<b><i>Quality</i></b>
37	Product quality improvement
64	Product quality
65	New product quality
	<b><i>Speed</i></b>
12	Speed-to-market
20	Speed-to-market
22	Speed-to-market
25	Development time
	<b><i>Success</i></b>
2	New product success
	<b><i>Project level performance</i></b>
	<b><i>Innovation</i></b>
56	Innovation performance
	<b><i>Performance (overall)</i></b>
1	Overall NPD performance
23	Team performance
28	Project performance
31	NPD efficiency
34	Team performance
35	Team performance
45	NPD performance
47	Project performance
50	NPD performance
51	Project performance
54	NPD team effectiveness
57	Project performance
60	Project performance
	<b><i>Opportunities</i></b>
63	Global NPD performance
	<b><i>Speed</i></b>
58	NPD time efficiency
	<b><i>Success</i></b>
73	Project performance

**Table 5: Moderating variables classifications**

Art. No.	Moderating variable (identified from text)
	<b><i>Team-member level</i></b>
	<b><i>Flexibility</i></b>
54	Team member flexibility
	<b><i>Demographics</i></b>
53	Technology competency
53	Market knowledge
	<b><i>Team level (input)</i></b>
	<b><i>Demographics</i></b>
54	National diversity
	<b><i>Experience</i></b>
19	Team experience
	<b><i>Familiarity</i></b>
27	Familiarity
	<b><i>Team level (process)</i></b>
	<b><i>Cohesion</i></b>
43	Team cohesiveness
1	Team integration
	<b><i>Knowledge</i></b>
43	Knowledge practice
	<b><i>Learning</i></b>
53	Learning
	<b><i>Autonomy</i></b>
68	Autonomy
9	Activity separation
	<b><i>Climate</i></b>
42	Perceived diversity climate
31	Strategic consensus
	<b><i>Communication technology</i></b>
54	Computer-mediated communication
	<b><i>Conflict</i></b>
41	Relationship conflict
	<b><i>Identity</i></b>
48	Collective efficacy
	<b><i>Justice</i></b>
44	Procedural Justice
44	Procedural Justice
	<b><i>Skills</i></b>
31	T-shaped skills

Art. No.	Moderating variable
	<b><i>Team level (process) (2)</i></b>
	<b><i>Task complexity</i></b>
18	Task complexity
18	Task complexity
71	Task complexity
	<b><i>Trust</i></b>
24	Trust relationship with team leader
	<b><i>Virtuality</i></b>
8	Virtuality
70	Virtuality
63	Global dispersion
	<b><i>Leadership style (team leader)</i></b>
61	Transformational leadership
	<b><i>Project level</i></b>
	<b><i>Complexity</i></b>
11	Technological complexity
12	Project complexity
64	Project complexity
	<b><i>Risk</i></b>
64	Project risk
	<b><i>Time pressure</i></b>
17	Time pressure
	<b><i>Project stage</i></b>
57	Project stage
	<b><i>Product level</i></b>
	<b><i>Innovation</i></b>
6	Radicalness of innovation
40	Degree of innovation
57	Product innovativeness
78	Radicalness of innovation
	<b><i>Organizational level</i></b>
	<b><i>HR Practices</i></b>
15	HR Practices
	<b><i>Integration</i></b>
10	Project integration
1	Team integration
Art. No.	<b><i>Managerial involvement</i></b>
77	Organizational control
77	Organizational support

Art. No.	Moderating variable
	<b><i>Orientation</i></b>
65	Firm quality orientation
	<b><i>Organizational structure</i></b>
9	Organization type
9	Organizational connectedness
66	Interdepartmental connectedness
71	Supplier adaption
	<b><i>Environmental level</i></b>
	<b><i>Competition</i></b>
71	Competitive intensity
	<b><i>Industry turbulence</i></b>
64	Industry dynamism
	<b><i>Market turbulence</i></b>
14	Market turbulence
14	Market newness
20	Market turbulence
21	Market turbulence
71	Market dynamism
	<b><i>Technological turbulence</i></b>
12	Technological turbulence
12	Technological novelty
14	Technological uncertainty
20	Technological turbulence
21	Technological turbulence
71	Technological turbulence

**Table 6: Mediating variables**

Art. No.	Mediating variables (identified from text)
	<b><i>Team-member level</i></b>
	<b><i>Commitment</i></b>
23	Project commitment
	<b><i>Identity</i></b>
59	Team identification
	<b><i>Motivation</i></b>
13	Motivation
	<b><i>Performance</i></b>
13	Individual innovative performance
	<b><i>Satisfaction</i></b>
56	Instrumental satisfaction
	<b><i>Team level (input)</i></b>
	<b><i>Cross-functionality</i></b>
33	Cross-functional integration
37	Cross-functional balance
55	Cross-functional integration
	<b><i>Knowledge</i></b>
4	Team intelligence
	<b><i>Team level (process)</i></b>
	<b><i>Behaviour</i></b>
22	Political behaviour
67	Charged behaviour
	<b><i>Climate</i></b>
13	Supportive climate
26	Psychological safety
61	Team climate
62	Psychological safety
72	Team climate
	<b><i>Cognitive</i></b>
21	Team intuition
29	Team potency
	<b><i>Conflict</i></b>
42	Team strain
	<b><i>Decision-making</i></b>
19	Intuitive decision making
69	Decision making comprehensiveness

Art. No.	Mediating variables
	<b><i>Team level (process) (2)</i></b>
	<b><i>Identity</i></b>
66	Superordinate identity
	<b><i>Interaction</i></b>
24	Team information exchange
27	Use of information
34	Norm for maintaining consensus
35	Internal communication
35	Norm for maintaining consensus
50	Knowledge sharing
58	Information sharing
69	Team-level debate
74	Knowledge sharing
	<b><i>Justice</i></b>
5	Procedural Justice
	<b><i>Knowledge</i></b>
2	Information knowledge implementation
	<b><i>Learning</i></b>
2	Unlearning
3	Team learning
5	Team learning
16	Team TMS
26	Learning from mistakes
41	Team unlearning
43	Team reflexivity
44	Team unlearning
47	Team learning
62	Cooperative learning
	<b><i>Procedure</i></b>
38	Procedural structuring
	<b><i>Satisfaction</i></b>
56	Social satisfaction
	<b><i>Trust</i></b>
8	Trust
18	Interpersonal trust
20	Managerial trust
	<b><i>Leadership style (leadership)</i></b>
34	Shared leadership

Art. No.	Mediating variables
	<b><i>Product level</i></b>
	<b><i>Innovation</i></b>
32	New product novelty
43	Product innovativeness
68	Product novelty
68	Product appropriateness
32	New product meaningfulness
	<b><i>Quality</i></b>
37	Initial product quality
	<b><i>Speed</i></b>
5	Speed-to-market