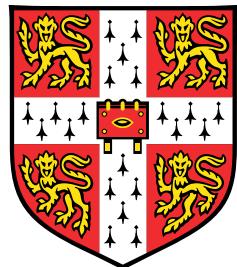


# **Inter-functional citizenship behaviour**

## **A novel scale validated for the integration of Research and Development and Intellectual Property team members**



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*Doctor of Philosophy*

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July 2021

## **Declaration**

This thesis is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the Preface and specified in the text. I further state that no substantial part of my thesis has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. It does not exceed the prescribed word limit for the relevant Degree Committee

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July 2021

## **Abstract**

### **Inter-functional citizenship behaviour: A novel scale validated for the integration of Research and Development and Intellectual Property team members.**

**Cihat Cengiz**

Increased complexity of current technological advancements requires a well-orchestrated and integrated research and development (R&D) process in order to innovate and profit from new commercialisation. However, scholars have long argued that R&D processes are mismanaged and thus result in little benefit to the organisation. For the past decades, scholars have researched the problems, inconveniences and tensions in R&D processes from the process-perspective, assuring that inter-functional processes between employees from different functions are aligned and that cross-functional integration (CFI) from the process-perspective is achieved. However, findings about the benefits of CFI are still uncertain, poorly understood, arouse controversy in academia and do not capture the holistic problem of CFI in R&D processes. Only a few researchers have addressed the problems from the behavioural perspective, and consequently, an adequate scale to measure behaviours between employees from different functions towards each other is lacking. This research fills this gap by developing the novel inter-functional citizenship behaviour (IFCB) scale to characterise inter-functional behaviours between employees from different functions who inhabit different thought worlds. Further, this research tests the scale with R&D and intellectual property (IP) employees to establish an association with perceived organisational support for innovation (POSI) - an organisational culture variable which proxies the innovation culture in the R&D function.

Results suggest that POSI is associated with a collaboration-based integration for inter-functional conscientiousness and inter-functional tolerance (task-oriented IFCBs). R&D employees display as much task-oriented IFCBs towards their IP colleagues as they perceive and maintain a behavioural equilibrium which appears to be related to R&D employees' high POSI. On the contrary, results also suggest that POSI is associated with a contribution-based

integration for inter-functional altruism and inter-functional constructiveness (relationship-oriented IFCBs). R&D employees indicate a discrepancy for relationship-oriented IFCBs, meaning that they do not display as much relationship-oriented IFCBs towards their IP colleagues as they perceive from them. They do not maintain a behavioural equilibrium, and it appears to be that a behavioural disequilibrium is related to R&D employees' high POSI. With these results, this research makes three contributions: Firstly, a novel inter-functional citizenship behaviour scale is proposed. It progresses the citizenship research domain with an adequate scale to measure inter-functional behaviours during the integration between employees from different functions who inhabit different thought worlds. Secondly, by applying the IFCB scale in the integration of two functions who inhabit different thought worlds, this research opens a new pathway to research CFI from an additional, behavioural (citizenship) perspective. It supports the process perspective in integration research and aims to shed light on the behavioural factors which might inhibit or foster CFI. Finally, this research revisits the organisational equilibrium theory and operationalises it from the behavioural perspective. The proposed behavioural equilibrium lens can be seen as a revival of the organisational equilibrium theory from the behavioural perspective. It allows a unique understanding of behaviours and aims to explain tensions caused by thought worlds.

This dissertation is anticipated to be a starting point for further research to establish IFCB as a scale in the CFI and citizenship domain and support it with an adequate theoretical lens to generate more research for academia but also insights to practitioners on how to manage CFI. The IFCB scale can be used as a "diagnostics" tool to measure and evaluate inter-functional behaviours of employees from different functions who inhabit different thought worlds. By gaining insights into this additional perspective, managers can develop process interventions, can create cross-functional teams based on IFCBs or can aim to influence the organisational culture and change management processes by analysing/ promoting appropriate behaviours between employees from different functions.

I would like to dedicate this thesis to my loving Grandpa.

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Aile ne demektir, yuvadan ucunca, uzaklasinca, özlegince anliyorsun. Her aile ferdinin degerini, ailede rolünü, kendi hayatında anlamını anliyorsun. Kendi rolünü anliyorsun. Bana

bu unutamiyacagim firsati verdiginiz icin size her zaman minnettaram. Bu doktora tezim,  
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## **Publications**

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# **Nomenclature**

## **Acronyms / Abbreviations**

- AOCB Affiliation-oriented organisational citizenship behaviour
- CCB Customer citizenship behaviour
- CFA Confirmatory factor analysis
- CFI Cross-functional integration
- COCB Challenge-oriented organisational citizenship behaviour
- CTO Chief technology officer
- ECB Environmental citizenship behaviour
- EFA Exploratory factor analysis
- EPC Expected parameter change
- HQ Headquarter
- HTMT Heterotrait-monotrait
- ICB Inter-organisational citizenship behaviour
- ICCS Integrated information and communication systems
- IFCB Inter-functional citizenship behaviour
- IP Intellectual Property
- KPI Key performance indicator
- ML Maximum Likelihood

- MLM Maximum Likelihood mean adjusted
- NFL National football league
- OB Organisational behaviour
- OCB Organisational citizenship behaviour
- OE Organisational equilibrium
- OT Organisational theory
- PCA Principcal component analysis
- PCB Project citizenship behaviour
- PE Person-environment
- POC Proof of Concept
- POSI Perceived organisational support for innovation
- R&D Research and Development
- RQ Research question
- SAA Similarity-attraction approach
- SCT Social categorisation theory
- SEM Structural equation modelling
- SIT Social identity theory
- SRMR Root mean square residual
- VIF Variance inflation factor
- ZEW Zentrum für europäische Wirtschaftsforschung

# **Chapter 1**

## **Introduction**

### **1.1 Research background**

Increasing levels of research and development (R&D) costs, high global competitive pressure and the complexity of modern products have put organisations under pressure to profit from innovation and the introduction of new technologies and products (Artz et al., 2010). The creation of successful innovation is fundamentally a multidisciplinary process and requires multiple inputs from various sources (Olson et al., 2001). These sources are internal functions that contribute to the innovation process by supporting key activities with specialised knowledge and resources (Steinberg, 2018). Among other sources for support, innovative organisations increasingly use patents and the intellectual property (IP) function to secure their place in the market, develop better and more innovative products and fight competitors (Cohen et al., 2000; Di Minin and Faems, 2013; Ernst and Fischer, 2014; Gassmann and Bader, 2011; Somaya, 2012).

The IP function is essential for innovation, and it supports the innovation process along its development stages. Several organisations created specific functions for the management of IP, where the integration of IP and R&D functions opens up new opportunities for successful innovation. I.a., IP employees support technology mapping to discover new technological areas (An et al., 2018; Lee et al., 2015) or develop technology road maps to plan R&D projects strategically (Lee et al., 2006). However, the primary role of the IP function and its employees is to consult scientists with legal aspects with regards to inventions, inform decision-makers about the strategic importance of the technological development and advise R&D colleagues with regards to existing IP rights, landscapes and strategies (Ernst, 2017; Ernst and Soll, 2003; Somaya et al., 2007).

The R&D and the IP functions are considered inter-dependent (Ernst and Fischer, 2014).

Generally, R&D is divided into exploration and exploitation-oriented R&D. The exploration-oriented R&D function carries out several activities which fundamentally differ from the activities carried out by other functions, as well as the exploitation-oriented part of R&D within the same organisation. March (1991) defines exploration-oriented R&D as [...] "*actions captured by terms such as search, variation, risk-taking, experimentation, play, flexibility, discovery, and innovation*" (p.71) and indicates the new technology development part of R&D.<sup>1</sup> The technical immaturity of technologies, the highly complex technological environment and the distinct expertise of R&D employees set the culture and behaviours of the exploration-oriented part of the R&D function and its employees. It is a very vivid, technically-oriented, creative and less hierarchical function and is one of the main seeding points for future technologies, products and inventions.

Unlike the exploration-oriented part of the R&D function, the IP function is newly developed, and its role as a strategic and sole corporate function is still highly discussed in academia and practice. IP is generally treated as an output of R&D efforts and the genuine role of IP (mostly linked to the law function) is to secure inventions with appropriate IP rights. Only recently, Ernst (2017) summarised the evolution of IP (patent) management as a sole managerial discipline. He described its evolution from a reactive and administrative-oriented function to a strategically important function with board-level ties, advising and guiding R&D employees throughout the innovation process to secure competitive advantage.

The exploration-oriented part of the R&D function with its distinct abilities, competences, cultures and behaviours is examined as the primary research setting to which the IP function contributes frequently. Cooper (2007), Steinberg (2018), and Clausing (1994) argue that exploration-oriented processes are mismanaged and result in poor deliverables with little benefit to the organisation. Arch Wilkinson Shaw, one of the earliest management scholars, had long argued that inter-dependent processes need to be managed comprehensively to maximise organisational outcome (Shaw, 1916). Thus, researching the integration between the exploration-oriented part of the R&D and the IP functions might offer unique insights on how to improve exploration-oriented processes and utilise the resources of the IP function to maximise organisational outcomes. Ernst and Fischer (2014) and Somaya et al. (2007) are among the few scholars who have researched the cross-functional integration (CFI) of R&D and IP functions, and they have reported a significant positive correlation between cross-functional integration on product success and patent count. However, intriguingly (and also contrary to their hypotheses), both studies indicate a missing link in the interaction

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<sup>1</sup>Note that contrary to exploration, March (1991) defines exploitation as [...] "*as actions captured by terms such as refinement, choice, production, efficiency, selection, implementation and execution*" (p.71) and indicates the new product development part of R&D

between R&D and IP employees in highly innovative contexts and a lack of complementary effect of high R&D spending and patent law expertise. These surprising results relating to the integration between both functions initiated this research. So far, the integration between functions, including the R&D and IP functions, have been analysed from the process perspective. However, Ellinger et al. (2006) points out that "*the behavioural factors that facilitate (or inhibit) inter-functional collaboration*" (p.2) are not yet fully understood. Hence, rather than following integration research from the process perspective, a behavioural perspective to shed light on the intriguing results mentioned above is proposed.

Dougherty (1992) presents a starting point to research functional integration from the behavioural perspective by introducing the term of "*thought worlds*" (p.179). Different functions have unique thought worlds, resulting from different cultures, languages, structures, and routines, as well as from goals, performance metrics, and linked incentive systems (Dougherty, 1992). These differences influence the behaviour of individuals and might increase the tension and the conflict potential during inter-functional work (Ernst and Fischer, 2014; Song et al., 1996). The tension might arise due to differences in fundamental inclinations. For example, R&D employees are technically-oriented, and they appear to be more risk affine, whereas IP employees are legally-oriented and tend to be more risk-averse. Both functions also adhere to seemingly different "languages": R&D employees use technical language to explain a phenomenon, while IP employees might use legal language to describe the same phenomenon, introducing communication difficulties between both functions and its employees at the workplace (Ernst and Fischer, 2014).

Until now, many researchers from organisational behaviour (OB) have investigated workplace behaviours where organisational citizenship behaviours (OCB) (Smith et al., 1983) are among the most researched theories (Podsakoff et al., 2014). OCBs are behaviours that are beneficial for the organisation even though they are neither directly nor explicitly linked to reward systems, nor based on any formal contractual agreements (Bateman and Organ, 1983; Gerke et al., 2017; Organ, 1988, 1990a,b; Podsakoff, 1994). This dissertation aims to advance the OCB theory and develops a scale to measure citizenship behaviours of employees from different functions who inhabit different thought worlds. The proposed inter-functional citizenship behaviour (IFCB) scale can be seen as a progression of the OCB theory with the focus on inter-individual behaviours of employees from one function towards another function (and vice versa). By applying this directionality, this dissertation aims to characterise the inter-functional work between employees from different functions from the behavioural perspective and aims to test the IFCB scale in the integration of R&D and IP employees - employees who inhabit different thought worlds. Further, this dissertation

examines the effect of IFCBs on R&D employees' perceived organisational support for innovation - an organisational culture variable which proxies the innovation culture in the R&D function.

## 1.2 Research gap

Integration of fundamentally different "*thought worlds*" (Dougherty, 1992, p.179) that results in different behaviours is a challenging issue. Employees try to accommodate conflicting goals, interests, abilities, and objectives into an overall process and strategy, which can cause tension and conflict between employees. Therefore, each interaction point between employees needs to be designed carefully to create organisational value in the form of sales, customer support or technological inventions.

Prior CFI research has predominantly focused on the process perspective of integration, making sure that processes, systems, and workflows were optimised (Williams et al., 2013). Positive outcomes of implementing CFI are empirically supported by i.a. Neely (1998); Prajogo and Olhager (2012) and Foerstl et al. (2013). However, 'the more, the better' approach to integration might not always be beneficial. Numerous scholars and practitioners have indicated difficulties, inconveniences, tensions, conflict and increased costs of integration (Homburg and Kuehnl, 2014). Recent research confirms these and reports neutral, and even negative effects of CFI on organisational outcome variables and advocate for more research to examine additional factors that might impact CFI (Gray et al., 2002; Nakata and Im, 2010; Pagell et al., 2004; Williams et al., 2013). The sole focus on the process perspective of integration appears to be insufficient to overcome major issues reported by scholars and practitioners (Homburg and Kuehnl, 2014).

These challenging inquiries created a new research focus of people-oriented integration, which examines employee workplace behaviours - an area which is under-researched but might play an important role in shedding light on the CFI research (Enz and Lambert, 2015; Fawcett et al., 2012; Oliva and Watson, 2011; Ralston et al., 2013). Stank et al. (1999) argue that the focus on trust, commitment and mutual respect among the functional groups and members is critical to the success of integration. Thus, inter-functional processes need to be designed, taking more than the task, the process and the objectives of CFI into account. The behavioural perspective might be able to inform scholars and practitioners about the "*behavioural factors that facilitate (or inhibit) inter-functional collaboration*" (Ellinger et al., 2006, p.2).

Until now and to our best knowledge, there is no existing research which has analysed the

functional level integration from a citizenship perspective. Furthermore, no one to the best of our knowledge has researched the integration between R&D and IP employees from the behavioural/citizenship perspective. The differences linked to different thought worlds, as well as the inter-dependent processes, require a nuanced understanding of citizenship behaviours in inter-functional work. By developing the IFCB scale and testing it in the inter-functional work between R&D and IP employees, this research aims to fill the gaps as mentioned above adequately. Likewise, no one to the best of our knowledge has examined citizenship behaviours through the organisational equilibrium (OE) lens. Inter-individual behaviours might cause tension and conflict between employees from different functions. By applying the equilibrium lens, a novel theoretical perspective to analyse citizenship behaviours between employees from different functions towards each other is proposed: *the behavioural equilibrium lens*.

### 1.3 Research questions

This research commits the people-oriented integration in cross-functional research which focuses on the behavioural perspective of integration. The behavioural characteristics of inter-functional work are still inadequately understood. Thus, this research introduces IFCBs as a fine-grained scale to characterise inter-functional work from the behavioural perspective. Further, it tests the scale in the inter-functional work between R&D and IP employees. With that, this dissertation asks the following research questions:

1. Which inter-functional citizenship behaviours characterise the inter-functional work between employees from different functions who inhabit different thought worlds?
2. Under what circumstances with regards to IFCBs is a behavioural (dis)equilibrium beneficial for the integration between R&D and IP functions and its employees?
3. How do IFCBs influence R&D employees' perceived organisational support for innovation?

### 1.4 Research objectives

In support of the behavioural perspective, multiple types of outcome variables were subjected to organisational citizenship behaviour studies. Among others, financial measures (Ahearne et al., 2010; Fisher et al., 2010; Li-Yun et al., 2007; Naumann and Bennett, 2002), customer

measures (Nishii et al., 2008), and organisational measures (Ahearne et al., 2010; Hu and Liden, 2011; Tanghe et al., 2010) show statistically significant positive correlations with OCB which indicate that Organ's definition from 1988, where he postulated that "*OCB, in the aggregate, promotes the effective functioning of the organisation*" (Organ, 1988, p.4), might be strongly supported. The positive effects of OCBs on performance variables have attracted much attention, resulting in multiple adaptations and scales aiming to research citizenship behaviours in numerous contexts. Among others, customer-citizenship behaviour (CCB) is the scale to research citizenship behaviours between customers and their engagement in co-creation process (Langner and Seidel, 2014), environmental citizenship behaviour (ECB) is the scale to research citizenship behaviours towards environmental initiatives and policies, and inter-organisational citizenship behaviour (ICB) is the scale interested in behavioural perspectives of two or more organisations who work together (Autry et al., 2008; Gerke et al., 2017).

Regardless of all adaptations to multiple organisational contexts with close links to the original OCB theory, as well as promising results, research still fails to answer questions about inter-individual and inter-functional behaviours within an organisation. This dissertation aims to fill this gap and develops the novel IFCB scale to analyse behaviours between employees from different functions who inhabit different thought worlds - thus, the following objectives are set:

- Identify inter-functional citizenship behaviours (IFCBs) apparent between employees from different functions who inhabit different thought worlds.
- Apply the *behavioural equilibrium* lens to examine the inter-functional work between R&D and IP employees using IFCBs.
- Research the influence of IFCBs on R&D employees' perceived organisational support for innovation.

Consequently, this dissertation provides three main contributions to theory and knowledge. Firstly, the novel IFCB scale advances citizenship research and aims to capture the nuances of inter-individual and inter-functional work from the behavioural perspective. Developing this scale addresses the gap in the citizenship literature with regards to a proxy scale for the inter-functional context (Podsakoff et al., 2014, 2000). The IFCB scale is closely linked to the early conceptualisation of the OCB theory. It introduces the inter-functional and inter-individual level of detail, which existing scales could not provide.

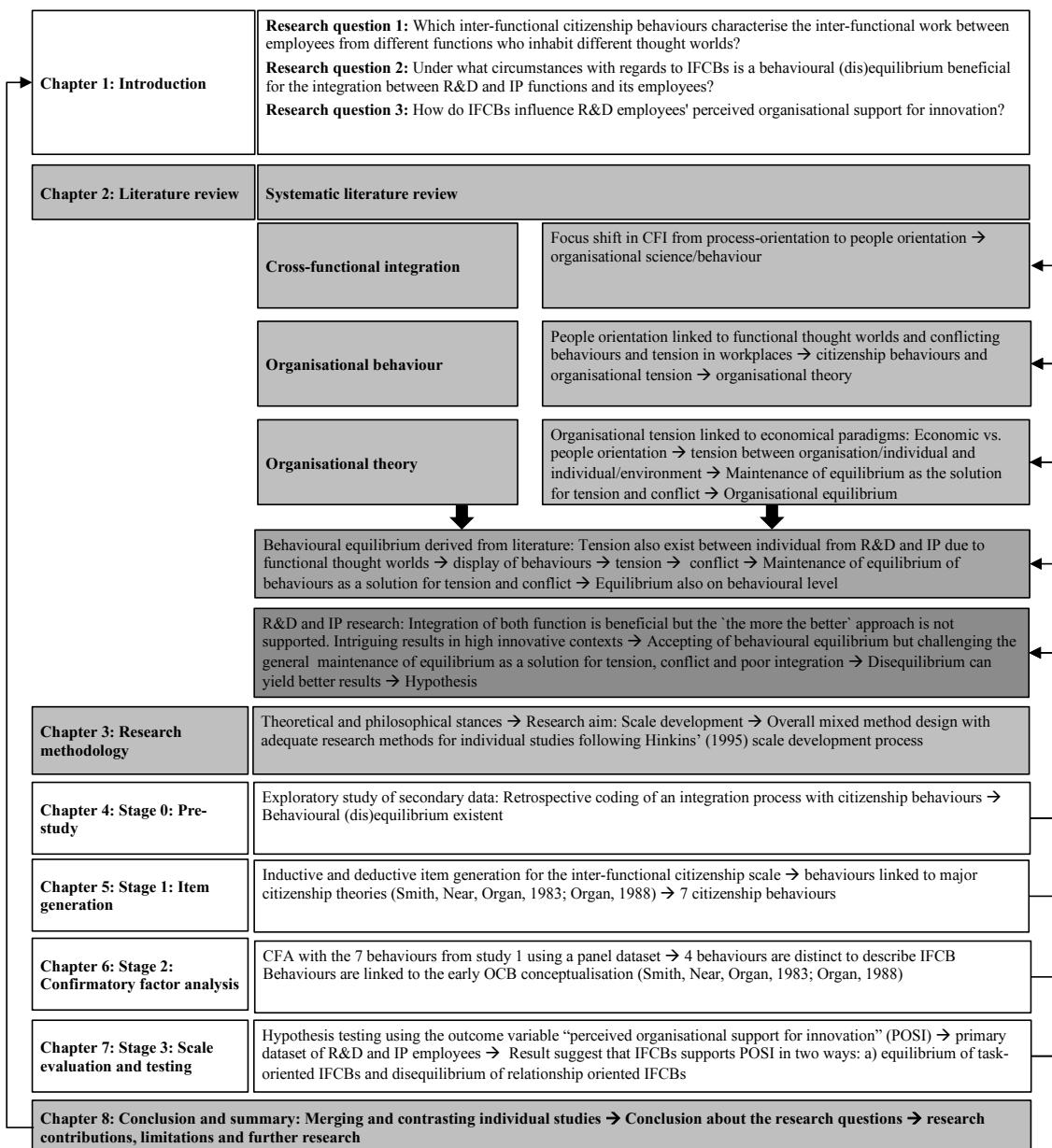
Secondly, the introduction of IFCBs opens a pathway to further study and measure integration from the behavioural perspective. By proposing the inter-functional behavioural perspective, the gap to understand behavioural factors that influence integration is addressed (Ellinger,

2000). Finally, by linking the organisational equilibrium lens with the behavioural perspective, the novel theoretical lens of *behavioural equilibrium* to analyse integration between employees from different functions is proposed. This theoretical lens aims to understand and answer fundamental questions about integration affecting many research streams, such as innovation and technology management and CFI research in general (Froese, 2017).

In addition to the contributions mentioned above, the pre-study revealed an additional contribution to citizenship research. Adhering to the latent nature of citizenship behaviours, a qualitative approach to analyse the highly quantitative citizenship research was proposed (Cengiz and Geiger, 2019). Instead of deploying large surveys, a retrospective and deductive research approach revealed compelling (preliminary) results, which researchers could utilise to support previous results or to develop new theories and propositions for further studies.

## 1.5 Thesis structure

Figure 1.1 outlines the structure of this dissertation. Following the introduction, the literature review in Chapter 2 summarises the core theoretical views of the dissertation, which guides the research to the research proposition. Chapter 3 explains the overall research methodology, as well as the philosophical and methodological implications of the chosen research methods. Chapter 4 describes an exploratory pre-study that tests if the research proposition of behavioural equilibrium, derived from the literature, is also applicable in real-world settings. The subsequent three chapters are devoted to the prescribed three-stage scale development process. Chapter 5 introduces study 1, which takes a qualitative approach to the first stage: item generation. Chapter 6 presents stage 2 of the scale development process: a quantitative research design devoted to the confirmatory factor analysis. Finally, Chapter 7 discusses the third and final stage of the scale development process: a quantitative scale evaluation approach to test the IFCB scale with a pre-defined relationship between R&D and IP employees. Chapter 8 merges and contrasts all studies, summarises the overall results, including research limitations, and remarks on further research opportunities.



# **Chapter 2**

## **Literature review**

This chapter presents a summary of three pertinent literature streams, namely cross-functional integration (CFI), organisational behaviour (OB) and organisational theory (OT)/organisational equilibrium (OE) that establish the theoretical foundation of this research. Cross-functional integration is, by definition, inter-disciplinary, and this is also reflected in the literature review: the established cross-functional integration literature sets up the basis and the context for this research. The two areas of inquiry, namely process-oriented and people-oriented tradition in CFI give a clear structure to the pathway of this research and place the focus of this research on the less researched but promising people-oriented tradition in CFI. The people-oriented tradition in CFI links directly to the organisational behaviour literature where citizenship behaviours are examined as one of the most promising theories to measure workplace behaviours. While more prominent theories, such as the social exchange (Blau, 1964) or the organisational support theory (Eisenberger et al., 1986) have been utilised more commonly in OB research, this dissertation introduces the organisational equilibrium theory as a novel theoretical lens. The OE theory has its roots in much earlier times than the social exchange and the organisational support theory. Hence, it can be interpreted to have influenced other theories. A link to the deep-rooted organisational equilibrium theory opens new opportunities for novel research inquiries and unique interpretations.

The OE theory, adapted from the behavioural perspective, provides the boundaries of this research and acts as the primary theoretical lens. It takes the people-oriented tradition in CFI, links it with citizenship behaviours from the OB theory and anchors the scale into the context of the organisational theory.

## 2.1 Systematic literature review

A multi-disciplinary literature research approach was necessary to grasp all relevant areas of research. Following Higgins et al. (2019), this dissertation reviewed several academic journals, using journal database platforms like Scimago Journal Rank, ABS Academic Journal Guide 2018, AJG Academic Journal Guide, Web of Science in research areas of R&D management, organisational psychology, cross-functional integration and applied psychology. In total, nine journals were identified, and systematic search strategies with extensive search-terms were developed (please see Appendix C for the list of journals). The aim was to explore research contributions, which commit to the people-oriented tradition in CFI and link these with behaviours in the context of R&D and IP integration. Consequently, the research aim was separated into five blocks of search terms covering topics as mentioned above. The initial strategy of searching for "Title-Abstract-Keyword" using the Web of Science database resulted in approximately 4000 articles. After a manual screening of those hits, the indication that titles were very well defined in the niche area of the research was clear and justified. Hence, the strategy to use "Title" only was implemented. The subject area within the search was limited to business, management and psychology, which adequately represent the literature streams of this dissertation (please see Appendix L for search term). The systematic literature review, illustrated with the Venn Diagram in Appendix L, figure L.1, indicated 499 potentially relevant articles based on the title. Those articles were screened manually for precise relevance taking the research aims, the abstracts and the research contributions into account. After manual screening and additional cross-reading based on cross-referencing, 136 articles were identified as relevant for this dissertation, of which nine articles were declared as key articles (please see appendix D for a list and summary of the key articles). The following sections introduce the three literature streams, illustrate their precise links with each other and guide the reader towards the research proposition.

## 2.2 Cross-functional integration

Historically, organisations segmented processes into functional areas to hold control over complexities (Child and Mansfield, 1972). This so-called diversification focused on the vertical integration of processes, where bureaucracy enables control over functional interactions (Ouchi, 1979). The first task division can be traced back to the first industrial revolution where the British economist Adam Smith introduced the division of labour in a pin factory and increased the efficiency of workers (Smith, 1776). However, the diversification was

not only a matter of fact for blue-collar professions. The novel organisational complexity required top-level diversification, introducing multiple organisational forms which are still in place in current organisational settings (including functional, matrix, divisional, network organisational structures) (Miles and Snow, 1992). This approach worked until organisations opened their value chain firstly towards downstream and then towards upstream suppliers. This complexity subsequently introduced the term integration. Mintzberg (1983) refers to this as the management of activities that take place in functional units which holistically supports task accomplishment for value creation.

Despite the ample amount of research on CFI, especially in supply chain and procurement, i.a. Churchill (1979); Kahn and McDonough (1997); Mintzberg et al. (1996), scholars in various academic disciplines have not settled on a concise definition which is widely accepted in the CFI literature. Terms like coordination, collaboration, cooperation or interaction have been in use interchangeably. Regardless of multiple suggestions for a definition, scholars pursue a binary classification of integration. Pagell (2004) and Barki and Pinsonneault (2005) propose a division of integration in *external integration* and *internal integration* which is widely used across research streams and academic disciplines.

### **2.2.1 Classification of integration**

Integration can be either external or internal. The internal or sometimes referred to as "lateral" or "horizontal" integration links several corporate functions through the integration of data, processes and people (Da Xu, 2014). Research subdivides internal integration into the strategic and operational level. Firstly, strategic level integration deals with the alignment of goals, the development of joint incentive systems, and the introduction of integrated information and communication systems (IICS) (Hayes and Wheelwright, 1984). Secondly, the operational level integration concerns with operational integration mechanisms which are commonly referred to as cross-functional integration. These are daily interactions of functions on the process level, taking the value chain, the inter-dependencies, the knowledge base, and the expertise of the specific function into account (Paiva, 2010; Song et al., 1996; Whybark, 1994). Scholars summarise horizontal integration as more efficient for dynamic and competitive environments as it reduces inefficiencies and improves functional effectiveness (Christopher, 2000; La Londe and Powers, 1993; Leuschner et al., 2013). External integration, also called vertical integration, refers to the integration of multiple organisations across formal and legal boundaries to speed up decision-making (Da Xu, 2014). It deals with the links to upstream and downstream suppliers, with customers and official stakeholders. It aims to

consolidate information and input from external stakeholders for better internal planning and customer satisfaction (Frohlich and Westbrook, 2001). External integration scholars researched the integration of information in, for example, product development (Gerke et al., 2017; Koufteros et al., 2005), marketing (Paiva, 2010) or user innovation (Nambisan et al., 1999; Nambisan and Baron, 2009). However, in general, external integration can influence operational, tactical and also strategic decision making. The strategic level integration is mostly concerned with long-term plans and collaboration benefits from the coordination and incorporation of information and inputs (Swink and Song, 2007). The tactical level integration influences medium-term activities like product development with information from co-developing partners and on the operational level, the input of external information can influence the coordination of material flow, manufacturing or development of a specific part.

## 2.2.2 Cross-functional integration research

Generally, a significant amount of CFI research focuses on the intersection of manufacturing, R&D, and marketing and supply chain, which is why Whybark (1994) describes it as the 'prerequisite for strategic integration'. However, multiple research streams, in addition to the established triangle described above, are involved in cross-functional integration scholarship. Among others, Paiva (2010) researched the integration of marketing and manufacturing; Bardhan and Patnaik (2017) the integration between Marketing and Operations; Song et al. (1996) the cross-functional integration of Marketing and R&D; and Ernst (2003); Ernst et al. (2016); Ernst and Fischer (2014); Germeraad (2010); Somaya (2012); Somaya et al. (2007) the integration of IP and R&D functions. In addition to the multiple disciplines involved in CFI research, multiple levels of analysis have been subjected to academic scholarship. Firm-unit (O'Leary-Kelly and Flores, 2002), project-unit (Montoya-Weiss et al., 2001) and individual-unit research (Podsakoff et al., 2011) all supported theory building in two main focus areas: *the exogenous variables* and the *endogenous variables* of CFI.

Researchers who are interested in the *exogenous variables* of CFI aim to research, discuss and assess the effects and influence of CFI (Montoya-Weiss et al., 2001; Pagell et al., 2004; Swink, 2000; Swink and Song, 2007; Takeuchi and Nonaka, 1986). One of the main exogenous variables in this area is performance. Researchers interested in the *endogenous variables* are concerned with the antecedents of integration and discuss drivers and conditions for successful integration. Both variables are supported by assumptions and arguments of various theoretical lenses that researchers apply to contribute to academic knowledge. Ketokivi and

Salvador (2007) summarise four main theoretical lenses which influenced theory building in most of the CFI research:

- (i) Contingency theory
- (ii) Institutional efficiency
- (iii) Institutional legitimacy
- (iv) Economic efficiency

Contingency theory: The contingency theory is building on the bounded rationality assumption of March et al. (1958) and does not treat integration as a prerequisite for organisational success. Integration is treated as a resource which can be pushed too far and cause more harm than good (Katz and Kahn, 1966). The contingency theory argues that organisations vary in their needs and requirements for integration and that integration is only effective when needs and requirements are high (Lawrence and Lorsch, 1967). The golden aim of the contingency theory is to balance and manage differentiation and integration.

Institutional efficiency: Institutional efficiency also builds on the bounded rationality argument of March et al. (1958). However, instead of managing integration and differentiation, it assumes that integration efforts always bring economic benefits and organisational success, even when the empirical data regarding benefits and costs are not known to decision-makers. According to the institutional efficiency theory, organisations should always engage in integration efforts as the theory takes the benefits of integration for granted (Ketokivi and Schroeder, 2004).

Institutional legitimacy: The main idea of the institutional legitimacy theory is that integration efforts in organisations are followed for legitimacy and social reasons rather than economic reasons (Powell and DiMaggio, 2012). Compared to the institutional efficiency theory, the institutional legitimacy theory leaves the economic reasons out of consideration. Social and legitimacy reasons are defined as benefits, which provide organisations with its requirements for organisational success (e.g. access to resources, customers and competitive advantage factors) (Hill and Alexander, 2000).

Economic efficiency: The economic efficiency theory builds on the economic rationality assumption. It treats integration efforts as an approach to achieve economic efficiency by taking the cost and benefits of integration into account. This theory assumes that the total cost and benefits of integration efforts are known and perfectly rational. By doing so, the engagement in integration is only a matter of cost and benefit where integration should be

followed only when the benefits are higher than the costs (Pagell et al., 2004).

To the greatest extent, these theoretical lenses define two main areas of inquiry: the *process side of integration* which has a direct effect on the costs and benefits of integration and the *people side of integration*, researching the social needs and requirements for a successful integration which might subsequently affect the cost, benefits and success of the organisation.

### 2.2.3 Areas of inquiry

The existence of the two areas of inquiry is neither a novel distinction nor a novel research development. This distinction can be seen as early as in post-war England. The introduction of new technological equipment and change of processes for efficiency purposes in the coal mine industry (*the process-oriented tradition*) led to a decrease in efficiency due to the ignorance of the human needs, behaviours and requirements (*people-oriented tradition*) (Pellathy, 2016). Workers felt that new technologies and processes hampered the personal interactions and created unintended behaviours in a critical industry under hazardous and dangerous mining conditions (Allcorn, 1951; Trist, 1978). Researchers pinpoint this and similar events as the first attempts to shift from the sole scientific paradigm with a focus on technologies and processes to a more holistic approach, including behaviours, task design and sustainable outcome variables into the context of the organisation (Emery and Trist, 1960, 1965; Trist, 1981).

#### 2.2.3.1 Process-oriented tradition

The process-oriented tradition of CFI is generally seen as the primary organisational design element to overcome integration challenges. It was the first attempt to deal with the complexity of organisations in which dynamic market conditions determine functional objectives and operations. These created a need for continuous adjustments, especially in the area of supply chain management. Williams et al. (2013) and Pagell (2004) summarise process integration into four key mechanisms, including (1) reporting structures, (2) information systems, (3) key performance indicators (KPI), and (4) process improvements. It is almost undeniable that those mechanisms, especially with the use of integrated information and communication systems (IICS), yield positive results in overall performance (Williams et al., 2013). Process integration is mainly affiliated with the change and optimisation of tasks and virtualisation of interactions (Flynn et al., 2010; Lambert and Michael, 2007). Further, it is supported by IICSs which facilitate access to information, verify the quality of information across boundaries

and thus speed up decision making and operations (Fawcett et al., 2007). The resulting KPIs are in favour of objectives which aim to foster process-oriented CFI and continuous improvement. However, practitioners, as well as academic researchers, continue to report process-oriented integration as a major problem and challenge to their ongoing operations (Gray et al., 2002; Jin et al., 2013; Nakata and Im, 2010). Integration is seen as a process which is challenging to manage. Managers and employees try to accommodate conflicting goals, interest, abilities and objectives into an overall strategy, process or ICCS system without reducing the perceptions of organisational fairness or the perception of unequal or restrictive collaborative work (Moorman, 1991; Moorman et al., 1993). Employees can respond to those restrictions and the perception of unequal efforts by exhibiting behaviours towards the task, the organisation or even towards members of another function (Katz and Kahn, 1978; Rice, 1958). Following this, Stank et al. (1999) argue that the focus on trust, commitment and mutual respect among members from different functions are critical to the success of integration.

### **2.2.3.2 People-oriented tradition**

An emerging stream of researchers researched the problems of CFI from the non-technical, non-process view. The aim was to give additional insights to the people-oriented factors that might influence integration. Early researchers like Trist and Bamforth (1951) and Katz and Kahn (1978) identified people-oriented factors in the workplace and the organisational environment. However, people-oriented traditions only became a major field of research when supply chain researchers accepted the people-oriented tradition as a theoretical lens (Dougherty, 1992; Ellinger et al., 2006; Oliva and Watson, 2011).

The people-oriented tradition builds on the research of organisational psychology, dominated by i.a. Organ (1988); Podsakoff et al. (2014, 2018a); Thompson (1967); Van Dyne et al. (1995) and suggests that workplace behaviours may impact the interpersonal interactions and hence the daily operations between employees from different functions. Over the last decades, researchers generally introduced people-oriented factors with roots to the organisational psychology (Dougherty, 1992; Ellinger et al., 2006; Enz and Lambert, 2015; Oliva and Watson, 2011; Thornton et al., 2013) in which an accepted distinction of workplace behaviours in three different conceptualisations are followed (Borman and Motowidlo, 1997; Brief and Weiss, 2002; Frazier and Bowler, 2015; MacKenzie and Podsakoff, 2012; Motowidlo and Van Scotter, 1994; Organ, 1988, 1997; Pellathy, 2016; Podsakoff et al., 2000, 2018a; Robinson and Bennett, 1995; Walumbwa et al., 2012):

### 1. Task behaviour (TB)

Task behaviours "*bear a direct relation to the organisation's technical core, either by executing its technical processes or by maintaining and servicing its technical requirements*" (Motowidlo and Van Scotter, 1994, p. 476). Researchers refer to task behaviours as "in-role" behaviours as these behaviours are associated with the direct execution of a given task necessary to do the job. Task behaviours can be seen as fundamentally important for integration as they represent the technical core (Katz and Kahn, 1978).

### 2. Organisational citizenship behaviour (OCB)

OCBs are also called "extra-role" behaviours and are defined as "*individual behaviours with contributions to the maintenance and enhancement of the social and psychological context that supports task performance*" (Organ, 1990b, p.95). OCBs are driven by employees' own free will, and "*lubricate the social machinery of the organisation*" (Bateman and Organ, 1983, p.588) which "*supports the social and psychological environment in which task performance takes place*" (Organ, 1997, p.91). OCBs aim at establishing interpersonal ties (affiliation-oriented OCBs) or challenging the status quo of the organisation that promotes positive change in the organisation (challenge-oriented OCBs) (Graham and Van Dyne, 2006; LePine et al., 2002; Podsakoff et al., 2000; Smith et al., 1983).

### 3. Counterproductive work behaviour (CWB)

Finally, CWBs are behaviours that are intended to harm the effective functioning of the organisations and its members (Fox et al., 2001). Contrary to OCBs, these behaviours negatively impact the members of the organisation, interpersonal relationships, as well as task performance (Dunlop and Lee, 2004; Fox and Spector, 1999; Robinson and Bennett, 1995). CWBs can be mistakenly seen as the opposite of OCBs as they both are "extra-role" behaviours and are unintended in nature. However, Dalal (2005) indicates that employees can engage with OCBs alongside with CWBs and that they are not mutually exclusive to each other.

The above-mentioned organisational psychology conceptualisations are not the only ones to research workplace behaviours or people-oriented integration. However, current research in CFI indicates that the above-described conceptualisations adequately represent the potential behaviours employees might adopt during inter-functional work. Extensive research in the area of organisational psychology supports this representation (Borman and Motowidlo, 1997; Brief and Weiss, 2002; Frazier and Bowler, 2015; MacKenzie and Podsakoff, 2012;

Motowidlo and Van Scotter, 1994; Organ, 1988, 1997; Pellathy, 2016; Podsakoff et al., 2000; Walumbwa et al., 2012).

In summary, processes need to be designed, taking more than the task and the objectives of CFI into account. The positive outcome of implementing CFI is empirically supported by, e.g. Neely et al. (2005); Prajogo and Olhager (2012) and Foerstl et al. (2013) but 'the more, the better approach' with the sole focus on processes is not enough to surpass major problems, inconveniences and costs associated with CFI (Homburg and Kuehnl, 2014).

## 2.2.4 Problem areas in cross-functional integration

Multi-disciplinary research has positively influenced the theory-building efforts of CFI researchers, who have identified three main problem areas (Baumol et al., 1964; Galbraith, 1974; March et al., 1958; Mintzberg, 1980; Thompson, 1967):

1. The problem of heterogenic goals
2. The problem of heterogenic activities
3. The problem of heterogenic knowledge

The problem of heterogenic goals: An organisation consists of multiple stakeholders who seek for the best solution for their own problems in their own function. March et al. (1958) have long identified that objectives and goals vary and academic literature suggests CFI as a mechanism to overcome the problem of heterogenic and egocentric goals (Mintzberg, 1979; Tjosvold, 1988). The alignment of multiple goals from multiple stakeholders is one of the primary concern of CFI. Collaboration among those functions is seen as an important factor for organisational success (Mintzberg, 1979; Mintzberg et al., 1996).

The problem of heterogenic activities: An organisation can be described as a system of functions that carry out activities which are inter-dependent and result in inputs for other activities (Thompson, 1967). This represents the central problem of heterogenic activities as those inter-dependencies are hard to manage and need to be aligned for successful value creation (Barki and Pinsonneault, 2005). An output from one activity is an input for another set of activities and, even though old bureaucratic rules and schedules exist to manage this problem, CFI can support the alignment with coordination and periodic reviews of activities (Thompson, 1967; Van De Ven et al., 1976).

The problem of heterogenic knowledge: Knowledge is the most fundamental resource for

value creation. However, the complexity of products, the globalisation of value creation and also the increased speciality of knowledge increased the barriers for successful creation, usage and sharing of knowledge (Ullah et al., 2016). Distributed across various functions, knowledge transfer can be disturbed. Academic literature suggests CFI as one of the mechanisms to support communication and knowledge transfer and to overcome some of the inconveniences associated with distributed knowledge (Alavi and Leidner, 2001; Hitt et al., 1993).

Current research agrees on these main problem areas, and they have been subjected to ample research enquiries over time. However, solely focusing on these problems provides neither answers to the inconsistent findings of the effects and benefits of CFI (Keller, 2001; Polzer et al., 2002; Tekleab et al., 2016; Webber and Donahue, 2001) nor to the major problems managers encounter when implementing CFI in business practice.

Focusing on people-oriented traditions in CFI research, academics have started researching people-oriented factors of integration (Choi and Sy, 2010; Dalal, 2005; Podsakoff et al., 2009). Hence, another central problem area which is associated with the people-oriented tradition has been introduced.

The problem of heterogenic behaviours: The problem of heterogenic behaviours is an underlying issue which can cause the aforementioned inconveniences, tensions and problems. Consequently, it can disrupt integration and value creation (Dougherty, 1992; Ellinger et al., 2006; Pagell, 2004). Other research streams, such as the social categorisation theory (SCT), social identity theory (SIT), and the similarity-attraction approach (SAA) (Byrne, 1971; Tajfel, 1969; Tajfel and Turner, 1979) for a long time indicated that homogeneous teams (based on skills, personality but also behaviours) should be more productive than diverse teams because of the mutual attraction shared among team members with similar attributes (Bell et al., 2011). Considering this, cross-functional integration between employees from two different functions with distinct and different thought worlds, attributes, beliefs, habits and behaviours might affect integration negatively and should be taken into consideration (Brief and Weiss, 2002; Ellinger et al., 2006; Pellathy, 2016; Podsakoff et al., 2000).

### **2.2.5 Perspectives of cross-functional integration**

Researchers treat CFI as a multi-perspective concept in research. Matching the problem areas mentioned-above, CFI is aligned in four structural perspectives (MacKenzie and Podsakoff, 2012): coordination (Eng and Ozdemir, 2014; Swink and Song, 2007), collaboration (Ernst

and Fischer, 2014; Song et al., 1996), communication (Flynn et al., 2010; Lovelace et al., 2001) and citizenship (Esper et al., 2015; Gerke et al., 2017; Podsakoff et al., 2014).

**Collaboration:** Resources and skills are distributed among different functions and locations within an organisation (Teece, 2000) but also outside the boundaries of the organisation (Chesbrough, 2003; Mortara and Minshall, 2011). Collaboration can be defined as the process whereby two or more functions develop a common vision and work towards common goals.

**Coordination:** Coordination is primarily linked to the management of activities (Cesaroni and Piccaluga, 2013). The focus is on the holistic view of the overall value creation process, as well as on the information these activities gather for decision-making, task performance and value creation.

**Communication:** The communication perspective of CFI is concerned with the information exchange and knowledge sharing (Hirunyawipada et al., 2010). Communication can be designed as a formal information-sharing activity, but research also indicates the power of informal information exchange (Cesaroni and Piccaluga, 2013). Communication is an enabler for collaboration and coordination and plays a vital role in integration.

**Citizenship:** Citizenship, in the organisational context, is the "*individual behaviour with contributions to the maintenance and enhancement of the social and psychological context that supports task performance*" Organ (1997, p.91). Citizenship behaviours can support integration from the behavioural perspective, matching the problem of heterogenic behaviours which previous CFI have neglected. Employees might adopt heterogenic behaviours and cause tension between multiple organisational stakeholders. Current research includes citizenship behaviours in the context of two or more organisations (inter-organisational citizenship behaviour) (Autry et al., 2008) or between customer and organisation (customer citizenship behaviour) (Langner and Seidel, 2014) or within a dedicated project team (project-citizenship behaviours (Braun et al., 2013).

## 2.2.6 Summary

CFI literature, on the one hand, suggests that a successful integration allows for quick and innovative response in dynamic and complex environments. It is associated with cost reductions, performance improvements and highly-innovative and high-quality products. On the other hand, however, there is more and more research which question the positive-only effect

of integration with major problems described by practitioners and academics. More research is needed to describe the effects, antecedents, boundary conditions, requirements, and other important factors of integration.

One promising area of research is the focus on the people-oriented tradition in CFI. Research suggests that workplace behaviours can play an essential role in affecting integration (Ellinger et al., 2006; Enz and Lambert, 2015; Oliva and Watson, 2011). However, research including the behavioural perspective is still scarce. Additional research is needed to characterise the inter-functional work from the behavioural perspective and examine how these behaviours influence the integration process (Ellinger, 2000; Ellinger et al., 2006; Ernst and Fischer, 2014; Fawcett et al., 2012).

OCBs are one of the most researched workplace behaviours and "*lubricate the social machinery of the organisation, ...[providing] the flexibility needed to work through many unforeseen contingencies...[and enabling] participants to cope with the otherwise awesome condition of interdependence on each other*" (Bateman and Organ, 1983, p.588). Along these lines, the focus on the process of integration is not enough to surpass major problems, inconveniences and costs associated with CFI (Homburg and Kuehnl, 2014). Organisations need to ensure that workplace behaviours are taken into consideration, especially between inter-dependent functions and employees who inhabit different thought worlds (Autry et al., 2008; Emery and Trist, 1960; Ernst and Fischer, 2014; Esper et al., 2015; Gerke et al., 2017; Somaya, 2012; Thornton et al., 2013; Trist, 1981). The next section links the people-oriented tradition in CFI to the organisational behaviour literature and introduces the theory of organisational citizenship behaviour in more detail.

#### Summary 1: CFI

- (n) CFI offers many advantages, but there are also major problems with CFI due to heterogenic goals, activities, knowledge, and behaviours.
- (n) The research focus in CFI is moving from the process-oriented tradition to the people-oriented tradition to research behavioural factors in CFI.
- (n) Among the four perspectives in CFI, citizenship behaviours specifically follow the people-oriented tradition and the problem with heterogenic behaviours.
- (n) This research follows the pathway of the people-oriented tradition in CFI and examines citizenship behaviours in inter-functional work.

## 2.3 Organisational citizenship behaviour (OCB)

### 2.3.1 The nature of citizenship behaviours

The nature of citizenship behaviours can be traced back to nearly six decades ago when Katz (1964), and Katz and Kahn (1978) postulated three kinds of behaviours which are essential for the functioning of an organisation:

1. The attraction of new employees who enter and remain in the organisational system.
2. The performance of the specific task in a reliable and trustworthy manner.
3. The support for the organisation with activities that go beyond the role prescriptions.

Katz (1964) paid particular attention to the third behaviour and noted that "*an organisation which depends solely upon its blue-prints of prescribed behaviour is a very fragile social system*" (p.132). Following this, the performance of an organisation can be seen as a function of the prescribed role description with its requirements, authority and hierarchical structures, links and technologies associated with it. However, the prescribed role is also supported by an additional factor that takes the "*day-to-day, spontaneous, (pro)-social behaviours and gestures*" of the working environment into account (Podsakoff et al., 2018a, p.653). Smith et al. (1983) refers to these behaviours as citizenship behaviours and postulates that organisational performance and success need behaviours which go beyond formal job requirements, incentive systems or forcible actions. In 1988, Organ introduced a definition which is still widely used in citizenship research. He initially defined OCB as "*individual behaviour that is discretionary, not explicitly recognised by the formal reward system, and that in the aggregate promotes the effective functioning of the organisation*" (Organ, 1988, p.4). However, the growing acceptance of OCB raised some concerns about the conceptual boundaries between behaviours resulting from formal job requirements ("in-role") and behaviours going beyond that ("extra-role"). These concerns were initiated by Morrison (1994), who published a pioneering work which shed light on the widely discussed "in-role" and "extra-role" behaviours and questioned the discretionary nature of OCBs. Her results indicate that the distinction can differ based on individuals and groups and as a consequence, some of the behaviours can be seen as "in-role" rather than "extra-role". Organ thus revised his definition to "*individual behaviours with contributions to the maintenance and enhancement of the social and psychological context that supports task performance*" (Organ, 1997, p.91). Nonetheless, organisational psychology researcher for a long time disregarded the assumption that (psychological) satisfaction can cause performance and labelled it as naive folk

wisdom (Lawler and Porter, 1967). However, citizenship behaviours nurtured research that endorsed this 'satisfaction-causes-performance proposition'. Current research, even in organisational psychology, accepts that satisfaction can influence performance and that citizenship behaviours are linked to satisfaction as they "*lubricate the social machinery of the organisation*" (Smith et al., 1983, 588).

Regardless of the redefinition, OCBs are still considered distinct from task behaviours, which makes them explicitly neither directly compoundable to the formal job requirement nor the incentive system. Failing to recognise the subtle distinction between the behaviours leads to not understanding the holistic performance nor the productivity measures used in many research settings (Campbell Pickford and Joy, 2016; Podsakoff et al., 2000; Smith et al., 1983).

### **2.3.1.1 Differentiation of citizenship behaviours**

The ample amount of OCB research confirms the acceptance of OCBs in organisational psychology. Podsakoff et al. (2018a) summarise in figure 2.1 that in 2017, around 5000 publications were in the area of OCBs or topics related to OCBs. It is also important to note that 83% of the publications occurred within the last ten years and 51% over the last five years, with major publications in the field of management and (organisational) psychology. With increasing research, scholars introduced over 30 different citizenship constructs in citizenship scholarship (Gerke et al., 2017; LePine et al., 2002; Podsakoff et al., 2014, 2018a). Recent research proposes a binary categorisation approaches to deal with the increased proliferation of citizenship constructs (Podsakoff et al., 2014):

- (i) Differentiation based on the beneficiary of the behaviour: Organisation (OCB-O) vs individual (OCB-I) (Williams and Anderson, 1991). OCB-Os benefit the organisation in general, whereas OCB-I directly affects the individual and indirectly affects the organisation. OCB-O includes, among other constructs, civic virtue, sportsmanship, conscientiousness, loyalty, and protection supporting the organisation. Common OCB-Is, on the other hand, include altruism, courtesy, and peacekeeping.
- (ii) Differentiation based on the effect of citizenship behaviours: affiliation-oriented (AOCB) vs challenge-oriented constructs (COCB). Van Dyne et al. (1995) argue that citizenship behaviours are either cooperative and aimed to strengthen interpersonal relationships (AOCB) or aimed to challenge the current state and give constructive feedback as an input for improvement (COCB). Common AOCB constructs include helping behaviour, altruism, courtesy, peacekeeping, and cheerleading, whereas the

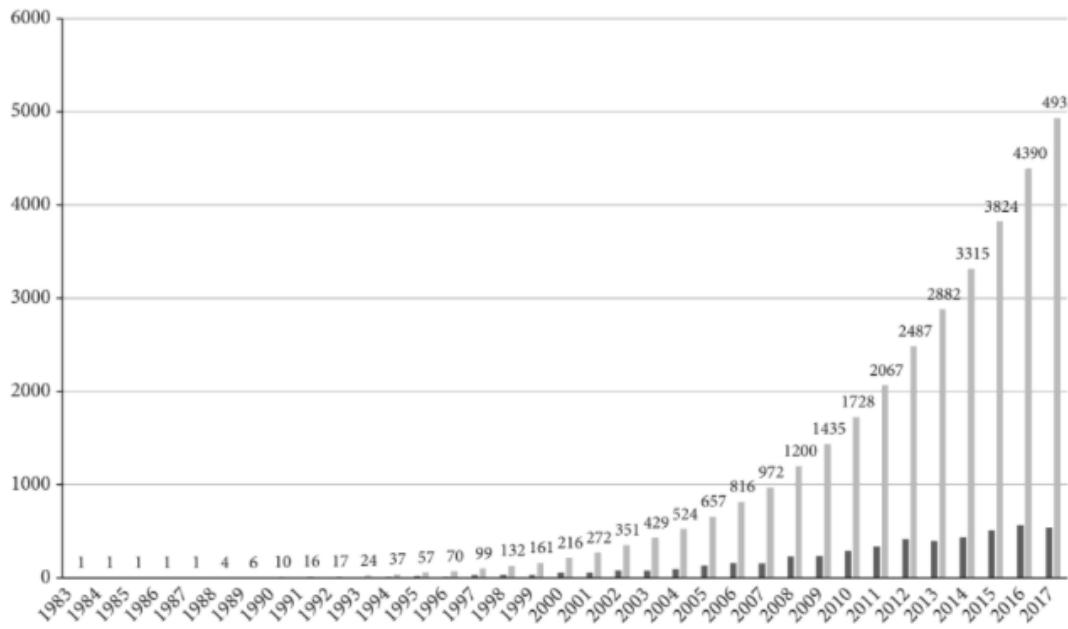


Fig. 2.1 Plot of yearly and cumulative publications on OCB and related progressions - (Podsakoff et al., 2018a)

most common COCB behaviours are employee voice behaviour, issue selling, and participation.

Podsakoff et al. (2014) admit that there is "*no consistent paradigm for the creation of composite OCB measures in the unit-level OCB literature*" (p.93). Scholars develop novel scales, utilise different clusters of behaviours or include different numbers and combinations of behaviours into their studies. Hence, undertaking comparisons among the present studies is difficult as none of the study parameters with regards to behaviours are controlled for a comprehensive comparison. LePine et al. (2002) reports 133 studies using 40 different combinations of citizenship constructs, with little overlap. This is arguably a weakness in the theorisation of the broader OCB theory. Table 2.1 summarises a thorough screening of the present citizenship literature and reports key publications and its OCB constructs. All in all, there is no consistent paradigm in OCB research. However, a meta-analysis published by Podsakoff et al. (2014) indicates that 75% of the research focuses on AOCBs. Taking table 2.1 and a more detailed analysis of Podsakoff et al. (2014, 2000) into account, seven main constructs of OCB can be summarised as follows: (1) Helping Behaviour, (2) Sportsmanship, (3) Loyalty, (4) Compliance, (5) Individual Initiative, (6) Civic Virtue, and (7) Self Development.

Table 2.1 Key OCB constructs derived from the literature

Author	OCB construct
Smith et al. (1983)	Altruism Generalised compliance
Bateman and Organ (1983)	Altruism Compliance
Organ (1988)	Altruism Courtesy Civic virtue Conscientiousness Sportsmanship
MacKenzie et al. (1991)	Altruism Courtesy Civic virtue Conscientiousness Sportsmanship
Graham (1991)	Loyalty Obedience Participation
Podsakoff and MacKenzie (1997)	Helping behaviour Sportsmanship Civic virtue
VanYperen et al. (1999)	Altruism Courtesy Civic virtue Conscientiousness Sportsmanship
Autry et al. (2008)	Helping behaviour Organisational loyalty Organisational compliance Individual initiative Civic virtue

### 2.3.1.2 Roots of citizenship behaviour

Revisiting Katz and Kahn (1978), the performance of an organisation can be seen as a function of (i) the prescribed role description including requirements, authority and hierarchical structures, as well as links to technologies and (ii) an additional factor which takes the day-to-day, spontaneous, (pro)-social behaviours and gestures which accommodates the working environment with other employees into account (Podsakoff et al., 2018a)<sup>1</sup>. This follows exactly the *person-environment (PE) fit concept* which was pioneered by the well-known psychologist Kurt Lewin in 1936 (Lewin, 1936). In his book *Principles of Topological Psychology*, Lewin postulates that the behaviour of a certain individual is a function of his personality (P) and the environmental factor (E), hence

$$B = f(P, E) \quad (2.1)$$

The fundamental idea is that an individuals' behaviour changes according to the dependent variables, P and E. Finding a good fit between an individuals' personality and the environmental conditions offers tremendous benefits, which the PE research area has introduced over the last decades. Those benefits include individual-level benefits such as the reduction of stress, increased commitment and trust (Kristof-Brown, 2005; Podsakoff et al., 2018a) and organisational-level benefits such as reduced employee turnover, deviance and team cohesion (Naus, 2007; Podsakoff et al., 2018a).

Rogelberg (2017) defines the P (personality) variable as preferences, knowledge, skills and abilities, personality traits, working styles, values, and goals. In contrast, the E (environment) variable includes vocational norms, job demands, job characteristics, organisational culture and climate and company/group goals. Research has demonstrated that both variables, P and E, can differ significantly. Scholars research the combination and the difference between both variables to give indications about the fit and associate it to an outcome variable of interest (Edwards, 1995, 2002, 2006). Podsakoff et al. (2018b) argue that the PE fit concept can be seen as an umbrella term for multiple types of fit-research which focus on important compatibility variables. Figure 2.2 shows the umbrella analogy of the PE fit-research. The top part of figure 2.2 shows multiple adaptations of the environment variable by holding the personality variable fix. Fit-research conceptualises various research approaches such as PO being personality-organisation; PJ being personality and job; PS being personality-supervisor, or PG being personality and the workgroup (Edwards, 2006). OCB followed the

<sup>1</sup>Note that the third element of attracting new employees mentioned in 2.3.1 is excluded for clarity reasons. It does not directly relate to the outcome of this dissertation

same route and researched personality and also environmental factors. The lower part of figure 2.2 illustrates the adaptations of the citizenship behaviour research where on the left side, the E variable is fixed, and scholars researched the P variable. PE-fit research gave OCB

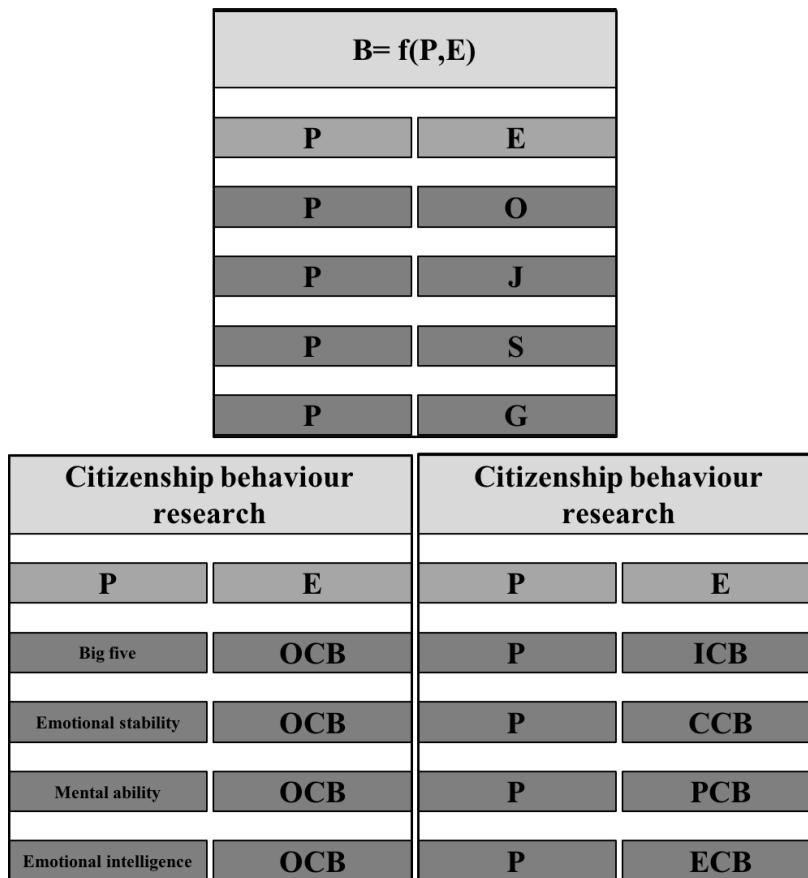


Fig. 2.2 Roots of citizenship research in PE fit-research; P= Personality, E= Environment, O= Organisation, J= Job, S= Supervisor, G= Workgroup

researchers a venue to discover new conceptualisations where several aspects of personality research shed light on the P variable in Lewin's maxim. I.a. Chiaburu et al. (2011); LePine et al. (2002); Organ and Ryan (1995) focused on the five personality traits, Hurtz (2000) on emotional stability, Gonzalez-mulé et al. (2014) on the general mental ability or (Day and Carroll, 2004) on emotional intelligence as a predictor of OCB. On the lower right side of figure 2.2, the P variable is fixed, and the E variable is altered. As a consequence, additional citizenship scales, such as the inter-organisational citizenship behaviour (ICB) (Autry et al., 2008; Gerke et al., 2017), the customer-citizenship behaviour (CCB) (Langner and Seidel, 2014), the project citizenship behaviour (PCB) (Braun et al., 2013) or the environmental citizenship behaviour (ECB) (Robertson and Barling, 2017) have been developed.

The link between the two theories is not surprising. The PE-fit and the OCB literature are both linked to the social exchange theory (Blau, 1964). Furthermore, the similarity–attraction paradigm (Byrne, 1971) gives a compelling reason why individuals are more willing to engage in OCB when they fit their environment. Perceived similarities and reciprocity norms stimulate OCBs which result in more frequent communication, team and group cohesion and better work relationships (Lincoln, 1979; Wharton and Baron, 1987).

### **2.3.1.3 Effects of OCBs on organisational performance, success, teams and employees**

The above-mentioned rooting enabled research in multiple academic streams. Although OCB research is still in search of a distinct categorisation of citizenship constructs as indicated earlier, multiple types of outcome variables have been subjected to OCB studies (Podsakoff et al., 2014). These studies use multiple theoretical lenses, apply different mediation and moderation criteria and use a combination of citizenship constructs based on the theoretical lens and purpose:

1. Financial measures
  - (a) Profitability: (Ahearne et al., 2010; Chuang and Liao, 2010; Naumann and Bennett, 2002)
  - (b) Revenue: (Fisher III and Oberholzer-gee, 2013; Li-Yun et al., 2007)
2. Customer measures
  - (a) Customer satisfaction: (Nishii et al., 2008)
  - (b) Service quality: (Hyatt and Ruddy, 1997; Park and Yoon, 2009)
3. Process measures
  - (a) Product quality: (Ahearne et al., 2010)
  - (b) Corporate innovation: (Hyatt and Ruddy, 1997; Zhang et al., 2008)
  - (c) Task completion: (Bachrach et al., 2006)
4. Organisational measures
  - (a) Performance: (Hu and Liden, 2011; Tanghe et al., 2010)
  - (b) Revenue: (Fisher III and Oberholzer-gee, 2013; Podsakoff, 1994)

However, screening the early publications of Organ (1988); Organ and Konovsky (1989); Smith et al. (1983) and Podsakoff (1994), the influence of OCBs on organisational outcome variables were only qualitative and conceptual in nature (George and Bettenhausen, 1990; MacKenzie et al., 1991; Organ and Konovsky, 1989; Organ and Ryan, 1995; Podsakoff, 1997; Podsakoff et al., 2000).

At the beginning of the OCB theory, Karambayya (1989) summarised several conceptual reasons why citizenship behaviours might influence organisational effectiveness and performance: (1) enhancing co-worker and managerial productivity; (2) freeing up and helping to reallocate limited resources for value-adding, value-creating and key processes; (3) helping to reduce conflicts and hence enhance team spirit and cohesiveness; (4) attract and maintain talents due to the influenced organisational culture where OCB contributes; (5) reduce employee turnover and variability; and (6) enhance the dynamic capabilities of the organisation to internal and external factors. Those conceptual factors have been examined extensively during the last ten years, and many of these results empirically support the positive effect of OCB on organisational, team and individual level performance as well as success. A meta-analysis published by Podsakoff et al. (2009) report remarkable correlations between OCBs at the unit, organisational and individual level. They compared 168 independent research studies and show that the correlation between, e.g. OCB and performance evaluations is .60, between OCB and reward recommendation, is .77 or between OCB and turnover intention is at -.22. Furthermore, several studies indicate the effect of OCB during the hiring process. Podsakoff et al. (2011) demonstrated in lab settings that voice and helping behaviour, as well as loyalty, are positively correlated with hiring evaluation. Whiting and Maynes (2016) replicated these lab-based results in real-world settings and researched the influence of OCB and counterproductive work behaviours of college football players on National Football League (NFL) decision makers' evaluations of drafting (hiring), the performance of the players in their first year in the NFL, as well as the monetary compensation. Results hint that OCB-like behaviours, which they indicate with helping behaviour and conscientiousness, influenced drafting, monetary compensation, and on-field performance.

There is also evidence that OCB influences career success. Promotability was researched by Shore et al. (1995) and Hui (2000) in which they conclude that OCB in the form of altruism, compliance, initiative, and conscientiousness is positively correlated with the evaluation of promotion. These results were supported with a meta-analysis by Ng (2005) in which the number of promotions within a single organisation was impacted by contextual performance indicators, after controlling for demographic variables (age, education, marital status, race,

and tenure). All these indicate that Organ's definition from 1988, where he postulated that "*OCB in the aggregate promotes the effective functioning of the organisation*" might be strongly supported (Organ, 1988, p.4). It is imperative to note that the magnitude of the correlations in a given relationship varies due to different sets of items and constructs which influence the comparability of studies and the demonstrated effects. Besides the research design bias, Devlieger and Rosseel (2017) indicate that regression methods also influence the magnitude of correlations and can cause biases which need to be mentioned when discussing the positive effects of OCBs.

Despite the ample research about the positive effects of OCBs, empirically and conceptually, a small research stream devoted intellectual resources into the dark-side of OCB (Van Dyne et al., 2004). Scholars questioned the 'always beneficial' assumption of OCBs and challenged existing research with conceptual publication to highlight that OCB can also have negative effects on personal and professional outcomes (Bolino et al., 2013). Empirical research from Bolino (2005) and Halbesleben et al. (2009) indicate that OCB is positively correlated to stress and work-family conflict, Barnes et al. (2008) indicate negative effects on task performance and Mueller and Kamdar (2011) demonstrated a negative effect of OCB on creative behaviour. Furthermore, Posdakoff and MacKenzie (1994) attest a negative relationship of OCB with direct performance variable, namely unit performance in insurance sales.

A more balanced view on OCB, not necessarily only from the dark-side, a perspective paradigm shift from the helper towards the recipient and an uncoupling from 'the more, the better' assumption might give a more comprehensive view on the effects, boundary conditions and the antecedents of the citizenship theory (Podsakoff et al., 2018a). This balanced view is a central point in the organisational equilibrium research theory, which the next subsection introduces.

#### **2.3.1.4 Citizenship in the organisational theory and context**

Smith et al. (1983) himself implied on the relationship between the citizenship theory and the organisational theory by linking OCB to organisational theory research (Barnard, 1938; Katz, 1964; Roethlisberger and Dickson, 1939; Weber, 1947). These theories and researchers can be seen as heavyweight in the area of organisational theory and play a crucial role in anchoring the proposed IFCB scale to the citizenship theory and its origins. As defined earlier, the citizenship theory can be summarised as a theory that deals with behaviours that can not be, regardless of the job specifications, descriptions, requirements or interpretations, explicitly linked to the job itself. Katz (1964) had already postulated this distinction on the behavioural level. He described three types of behaviours and concluded that an organisation

needs more than the prescribed behaviours from its employees to be successful (please see 2.3.1). Nonetheless, nearly three decades prior to Katz (1964), Organ (1988) and Smith et al. (1983), Weber (1947) gave this thought a place to nurture. In his most influential work, he described the bureaucratic organisation with its characteristics, hierarchies, strengths and weaknesses (Podsakoff et al., 2018a). However, he also described the informal organisation, which indicates the existence of informal ties, relationships and behaviours within the formal organisation. Acknowledging the contributions of Organ (1988); Smith et al. (1983); Weber (1947) and Katz (1964), this dissertation argues for a much deeper-rooted link of OCB in Roethlisberger and Dickson (1939) and Barnard (1938). Roethlisberger and Dickson (1939), in their influential work *Management and the Worker*, advocated for a distinction between productivity and cooperation (Roethlisberger and Dickson, 1939). Productivity was regarded as the authority and hierarchical structure, job specifications and technology, whereas cooperation referred to acts that served more of a maintenance purpose - to maintain internal equilibrium. The maintenance of internal equilibrium was, as a matter of fact, the key contribution of Barnard (1938). He popularised the distinction between effectiveness and efficiency. He referred to effectiveness as the duties to successfully operate key functions of the formal organisation to create value and fulfil its goals. Efficiency was the satisfaction of individual motives in exchange for a contribution to the organisational goals. Barnard postulates that the survival of the organisation depends on the maintenance of the equilibrium between effectiveness and efficiency. He indicates that efficiency is closely linked to the willingness of the employee to engage with "*something different from effectiveness (...) the depersonalisation of personal action (...) without this there can be no sustained personal effort as a contribution to cooperation*" (Barnard, 1938, p.84).

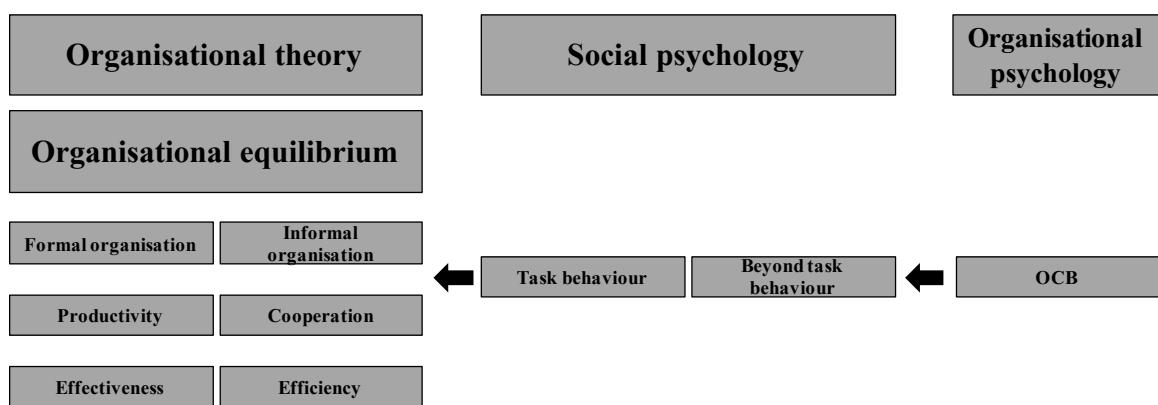


Fig. 2.3 Pathway of the OCB theory towards the equilibrium theory

Figure 2.3 illustrates the pathway of citizenship behaviours. As indicated before, the organi-

sational theory, as well as the equilibrium theory indicated very early the difference between effectiveness and efficiency, formal and informal organisations, as well as productivity and cooperation (Barnard, 1938; Fayol, 1930; Roethlisberger and Dickson, 1939; Weber, 1947). This dissertation argues that these thoughts might have influenced social psychology research in which task and beyond task behaviours were taken into consideration (Katz, 1964). Finally, the current stream of OCB summarises these thoughts in organisational psychology and pinpoints to OCB when it comes to "extra-role" behaviours (Organ, 1997; Smith et al., 1983). The equilibrium theory, as postulated by Barnard (1938) shows immediate relevance to this dissertation and will be further discussed in section 2.4.

### 2.3.2 Summary

Citizenship behaviours are among the most popular theories in the organisational behaviour research stream. Researchers from multiple disciplines, such as organisational psychology, organisational behaviour, management, marketing, supply chain and finance utilised citizenship behaviours to contribute to academic knowledge and enhance research from the people-oriented tradition. With that, empirical research confirmed the theorised benefits of citizenship behaviours over the last decade, although the negative effects of those behaviours in organisational settings have also been indicated.

Citizenship behaviours are "*individual behaviours with contributions to the maintenance and enhancement of the social and psychological context that supports task performance*" (Organ, 1997, p.91). This definition of Organ (1997) can be traced back to scholars such as Katz (1964) and Katz and Kahn (1978) who thoroughly described individual behaviours that go beyond the role prescriptions. This distinction between citizenship ("extra-role") and task behaviours ("in-role") is fundamental to OB research and helps to understand the nuances of people-oriented integration.

This dissertation anchors the citizenship behaviour in organisational/equilibrium theory (Barnard, 1938; Roethlisberger and Dickson, 1939) and introduces a novel theoretical lens to develop the proposed IFCB scale. The next section focuses on the organisational theory literature and introduces major equilibrium theories.

**Summary 2: Organisational behaviour**

- (i) Organisational behaviour supports the people-oriented tradition CFI and proposes an influence on performance and success.
- (ii) Citizenship behaviours are "extra-role" behaviours and support the functioning of the organisation, including task-performance (and "in-role" behaviours).
- (iii) Citizenship behaviours are not 'beneficial-only' and can cause tension and negatively influence individual and organisational performance.
- (iv) The earliest link to citizenship behaviours can be found in the organisational/equilibrium theory in which the IFCB scale is anchored.

## 2.4 Organisational Theory

The formalisation of organisational theories follows major societal changes. The industrial revolution changed the way individuals were living, moving and earning money (O'Shaughnessy, 2013). The development of formal organisations started the intellectual challenge of understanding why organisations exist, how they exist and succeed or fail (Elverson, 1994). New theories on how to design new organisational formations and structures emerged. Some of them supporting the old ones and some of them changing the existing paradigm and shifting the focus. Some agreed on shared principles, and others fundamentally disagreed and outright rejected them. Intentions to group organisational theories in different research streams or even associate theories with different societal changes and times deteriorated and are not established enough to follow. Nonetheless, more immediately relevant to the purpose of this dissertation is not the grouping of theories to research streams. Rather, it is the distinction of the paradigm shift within organisational theory research, which is subsequently described further.

### 2.4.1 Classical paradigm

The classical organisational theory came in response to the efforts of mass production and the division of labour. Given the new operational and technical advancements of the time, the values of the classical paradigm prioritised advancements and new possibilities (Elverson, 1994). The organisational view of the classical paradigm was goal-oriented, rational, technical and mechanical, which can also be seen in the main areas of discussion. Organisational theorists were primarily concerned with a) hierarchy vs. authority (Blau and Scott, 1962); b) span of control (O'Shaughnessy, 2013); c) centralisation vs. decentralisation (Ross, 1961) and d) specialisation vs. generalisation (Benson, 1973).

One of the most cited critiques of the classical paradigm is the assumption of the 'impersonal system', which prioritised the goal orientation of the organisation. The focus and optimisation of rational elements were the key drivers of the classical paradigm. Job specifications, incentive systems and structures were designed for achieving the technical objectives without paying attention to the people variables such as stress, satisfaction or motivation (Bhambri and Sonnenfeld, 1984).

Scholars argue that the classical organisational theory is very simplistic in nature (Mintzberg, 1973) and also very inflexible in its propositions (Dale, 1952). Key characteristics of the classical school are summarised as:

- (a) Clear organisational goals and aims.

- (b) Job descriptions, specifications and definitions are detailed.
- (c) Detailed delegation of authority, control and functions.
- (d) Standardisation of workflows, processes and hierarchies.
- (e) Authoritative leadership styles with predominantly (top-down).
- (f) Formal and prescribed relationship among employees.

Some of the key drawbacks of the classical theory are:

- (a) Inflexibility of the hierarchical structure.
- (b) Slow adaptation due to the standardisation.
- (c) Detailed delegation of authority, control and functions with no space for creativity and freedom.
- (d) Inadequate consideration of human needs and motivations.

The last item was the main driver for the neoclassical paradigm, where human needs within new organisational systems were examined. This can be seen as the first pathway to organisational behaviour and also to modern organisational theories.

#### 2.4.2 Neoclassical paradigm

As described above, the classical paradigm focused on productivity, authority and the technical core of the business just as the neoclassical paradigm favoured the neglected parts of the organisation: the affective and socio-psychological aspects of human behaviour in organisations (Sapru, 2008). The neoclassical paradigm put the individual in the centre of the organisation and treated the highly developed technological core as a mean to reach an aim (Elverson, 1994).

Roethlisberger and Dickson (1939), together with Elton Mayo (Mayo, 1937), influenced the neoclassical paradigm with the prestigious Hawthorne study in which they observed the Hawthorne plant of the Western Electric Company between 1927 and 1932. Even though the study had its methodological flaws, it is treated as the paradigm shift from the qualitative, conceptual and classical research to the more quantitative, empirical neoclassical research (Elverson, 1994). Through multiple experiments, the Hawthorne study indicated that sociological, behavioural and relationship factors affected the productivity more than factors

regarding the working conditions or comfort. Additionally, the importance of intangible motivators for work has been observed and indicated that financial incentives, which were the primary incentive mechanism in the given time, were not sufficient enough to extract an individual's maximal contribution. Social and psychological needs alongside with the economic needs of an individual were subjected to research and opened up new pathways. Khandwalla (1977) described three main attention areas of the neoclassical paradigm: a) group dynamics (the intra-group behaviour, structure and functioning); b) non-formal organisation behaviours, norms, relationships, communication within the organisation; and c) style of supervision (leadership, employee-supervisor relationship). These areas are indeed seen as integral parts of the organisation and attracted a wide range of research (Barnard, 1938; Likert, 1961; March et al., 1958; Smith et al., 1983).

One of the main criticisms of the neoclassical theory is the shifted attention to empirical results. The increased research complexity introduced drawbacks and biases, which researchers neglected at the time. The most-mentioned drawback is the Hawthorne effect. Investigators might have unintentionally changed the behaviours of participants with their presence and observance. Thus, some argue that the Hawthorne study results are non-compliant because of the extra care workers put during the research process. Nonetheless, the key characteristics of the neoclassical paradigm shifted the focus and can be summarised as:

- (a) Correlation of non-rational factors (morale, satisfaction) with productivity.
- (b) Workers do satisfy not only economic needs but also social needs.
- (c) Leadership style does affect morale and productivity.
- (d) Decentralisation of authority as an organisational structure.

Compared to the classical paradigm, the key characteristics of the neoclassical paradigm appear to be more appealing to the working environment of today's world. Nonetheless, there are some criticisms of the neoclassical paradigm, which led to new organisational developments like the contingency paradigm. Some of the key drawbacks of the neoclassical theory are (Khandwalla, 1977):

- (a) Overemphasis of social needs.
- (b) Questionable and non-researched assumptions.
- (c) Increased complexity in research with low applicability.

There is not much that both paradigms have in common except for the fact that the benefits and drawbacks are in tension. The classical paradigm ignored the people-tradition in and focused on the technical core and the process-oriented tradition. Contrary, the neoclassical paradigm overemphasised the people-oriented tradition and pushed the process, the technical core and the economic thinking aside. Researchers hint to the organisational equilibrium (OE) theory within the context of organisational theory to advocate for constructive intercourse (Müller-Christ, 2014).

The next paragraph gives an introduction about the equilibrium theory and introduces two of the major equilibrium theories.

### **2.4.3 Organisational equilibrium theories**

The organisational equilibrium (OE) theory (Barnard, 1938; Fayol, 1930) postulates that maintaining an equilibrium state is key for organisational success and survival. A more balanced organisation can maintain the tension between economic, social and ethical goals by being more efficient and dynamic in change. Many scholars argue that in the long run, an organisation that can neither reach nor maintain an equilibrium state between the areas of tension will risk their existence (Barnard, 1938; Cohen et al., 2002; Fayol, 1930; March et al., 1958).

The tension between the individual and the organisation is called internal equilibrium. It is dependent on individual factors and on the organisational structures and functions. On the other hand, external equilibrium tries to balance the tension between the organisation and its environment, taking the organisational structures and functions but also environmental factors - like the complexity of the environment or the intensity of competition - into account. The following two equilibrium theories are among the most significant theories in the OE literature and are of immediate relevance for this dissertation.

#### **2.4.3.1 Fayol's management theory**

The organisational equilibrium theory has been primarily concerned with the tension of the newly created organisation and the individual worker. Fayol (1930) and also Barnard (1938) defined organisation as a social unit, which follows a structure and is assigned to a function to pursue a common goal (Barnard, 1938; Fayol, 1930). The structures and functions are managed by an entity which has the power and authority to decide about the tasks to accomplish, as well as the goals to pursue.

Fayol (1930) was the first scholar and thought leader in introducing the concept of equilibrium

to his principles of management. By doing so, he acknowledged that an equilibrium is a dynamic process in which the equilibrium state can get disturbed. The managerial entity, therefore, pursues the maintenance and restoration of equilibrium. Fayol gave an essential explanation to the phenomena of equilibrium by stating that "*social order demands precise knowledge of the human requirements and resources of the concern*" (Fayol, 1930, p.37) and also indicated that maintaining equilibrium is difficult to achieve in bigger businesses with a larger base of individuals.

Gazendam (1997) summarises multiple aspects of Fayol's equilibrium concept in three aspects: a) the equilibrium between authority and responsibility; b) the equilibrium between individual interest and tension and c) the micro-level equilibrium between productive time and learning time. Each of the proposed equilibrium aspects supports Foyal's 14 management principles and also his distinction between the 'organisme social' (social organisation) and 'organisme matériel' (material organisation)<sup>2</sup> It is aligned with the focus of the non-relational (social) and also relational (material) factors of the organisation (Wood and Wood, 2002).

#### **2.4.3.2 Barnard and Simons's theory of equilibrium**

Following Fayol (1930), Barnard's control and authority framework is a pioneering piece of work dated back to 1939, in which Barnard contributes to the literature of management with his book *Functions of the Executive* (Barnard, 1938; Stewart, 1989). His system approach to equilibrium consists of the tension between the organisation and its environment, from which the organisation can benefit with resources to pursue its organisational goals. Furthermore, it incorporates the tension between the organisation and the individual. Barnard proposes the *inducement-contribution theorem* which, in its essence, is a motivational theory and a supervisor-subordinate framework. It describes the "*zone of indifference*" where the subordinate accepts authority and its actions without question (Barnard, 1938).

According to Barnard, the zone of an employees' indifference is wider or narrower according to "*the adhesion of the individual to the organisation*" (Barnard, 1938). This adhesion is linked to continuous motivation where Barnard postulates that the continuous motivation of an employee is key for survival. March et al. (1958) examined Barnards' continuous motivation proposition and introduced the theory of organisational equilibrium which refers to the organisation's ability to attract sufficient contributions from individuals to ensure organisational survival (Mitchell and Scott, 1988). These contributions can be part of the formal agreement between the organisation and the employee (task behaviours). However, as Organ suggested, not all contributions are linked to the formal agreement. Hence, contributions

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<sup>2</sup>Literal translation from French.

can be informal, which Organ labels as citizenship behaviours. March, Simon and Barnard link contributions to inducements. An individual contributes and participates in the given task as long as inducements are higher than their contributions (Barnard, 1938; March et al., 1958; Stewart, 1989). Inducements are material and non-material rewards which an employee values and takes as an incentive to participate in an organisational context. Consequently, the *inducement-contribution theorem* can happen on a formal level (e.g. monetary) but also on the informal, social level (e.g. behaviours). In this regard, the equilibrium theory of Barnard takes care of the internal equilibrium tension by introducing the inducement-contribution theorem but also of the external equilibrium which is concerned with external resources and its effect on the organisational success.

This dissertation adapts the organisational equilibrium, as well as the *inducement-contribution theorem* from the behavioural perspective and argues, that tension can also be manifested in inter-individual behaviours. Hence the equilibrium from the behavioural perspective might support organisational success in which behaviours can be seen as inducements and thus trigger a behavioural contribution. This adaption will be discussed further in section 2.5.

#### 2.4.4 Summary

The organisational theory research followed the societal changes and shifted its focus over time. Whereas the first organisational theories clearly focused on productivity and the technical core, the shift towards the people-side of an organisation opened up new theories which put the individual and its needs into attention. Scholars in organisational theory indicated tension between multiple stakeholders within the organisation. The tension between the individual and the organisation, as well as between the organisation and its environment were discussed by established scholars in the early 20th century. The maintenance of equilibrium between tensions was the initial answer in organisational theory where early scholars indicated that equilibrium of tension is key for the survival of an organisation. Even though equilibrium research has drifted to the sustainability research in modern times, recent scholarship work advocates for more research on how organisations in different fields can maintain equilibrium (König et al., 2013; Rhoten et al., 2009).

This dissertation supports this call and commences the challenge to research the tension between employees from different functions who inhabit different thought worlds but need to work together. It researches the tension from the behavioural perspective and adapts the equilibrium theory on the behavioural level. The next section explains the adaption of the equilibrium theory from the behavioural perspective and introduces the research proposition

for the chosen functions and its employees.

**Summary 3: Organisational theory**

- (I) Organisational theories followed the major societal change of the 20th century and shifted from purely focusing on the technical core to putting the individual into the centre of the organisation.
- (I) Tension can occur between the organisation and the individual as well between the organisation and its environment. However, this dissertation focuses on the tension between employees from different functions who inhabit different thought worlds.
- (I) Equilibrium theories exist to support the maintenance of equilibrium in organisational tension areas.
- (I) The maintenance of equilibrium is dependant on structural/functional factors as well as individual factors.

## 2.5 Setting the scene - Research proposition

This dissertation responds to the call in the CFI literature to "*understand behavioural factors that facilitate (or inhibit) inter-functional collaboration*" (Ellinger et al., 2006; Pagell et al., 2004, p.2), the recent call in OCB literature to examine the inter-level effects of OCB (Podsakoff et al., 2014, 2000), and the call in organisational theory to research on how organisations in different fields can maintain equilibrium in organisational tension (Müller-Christ, 2014). As argued earlier, a shift from the process-oriented research towards understanding the individual factors - the people-oriented research - is apparent. This dissertation supports the people-oriented research by introducing the IFCB scale to investigate inter-individual citizenship behaviours of employees from different functions who inhabit different thought worlds. Further, this research utilises the theoretical lens of organisational equilibrium and adapts it from the behavioural perspective. Up until now and to the best of our knowledge, the equilibrium lens has not been operationalised from the behavioural perspective. The proposed *behavioural equilibrium lens* allows this research to investigate the influence of IFCBs on an outcome variable from the equilibrium, as well as the behavioural perspective. The next subsection aims to justify the adaptation of the equilibrium theory from the behavioural perspective. It shows the rooted tension areas in organisational theory, citizenship behaviour and CFI and places the origin of tension at individual behaviours. Furthermore, it links the equilibrium, citizenship and integration "language" with each other and explains the IFCB scale and its measurement approach. Finally, a separate subsection introduces the chosen inter-functional work between R&D and IP employees and develops a proposition based on the R&D and IP integration literature. This proposition will be further developed and tested in chapter 7.

### 2.5.1 Behavioural equilibrium lens

#### 2.5.1.1 The roots of the behavioural equilibrium lens

Different functions inhabit different thought worlds (Dougherty, 1992), resulting from different cultures, languages, structures, and routines, as well as from goals, performance metrics, and linked incentive systems (Dougherty, 1992; Ernst and Fischer, 2014). These differences might influence the behaviour of individuals and could increase the tension and conflict potential during CFI (Song et al., 1996). The tension might arise due to differences in fundamental inclinations. For example, R&D employees are technically-oriented, and they appear to be more risk affine, whereas IP employees are legally-oriented and tend to

be more risk-averse. Both functions also adhere to seemingly different "languages": R&D employees use technical language to explain a phenomenon, while IP employees might use legal language to describe the same phenomenon (Ernst and Fischer, 2014), introducing communication difficulties between both functions.

Researchers acknowledge citizenship behaviours as multi-level constructs that vary within individuals but also between individuals (Binnewies et al., 2009). Hence, given this, an investigation in the area of *between-people behaviours* could help to develop a more fine-grained understanding of inter-individual citizenship behaviours between employees from different functions who inhabit different thought worlds. The concept of inter-functional citizenship behaviour adapts the organisational equilibrium view (Barnard, 1938; Fayol, 1930; March et al., 1958) to introduce the importance of behaviours within a system of interrelated social behaviours such as organisations and functional integration. Figure 2.4 shows the theoretical

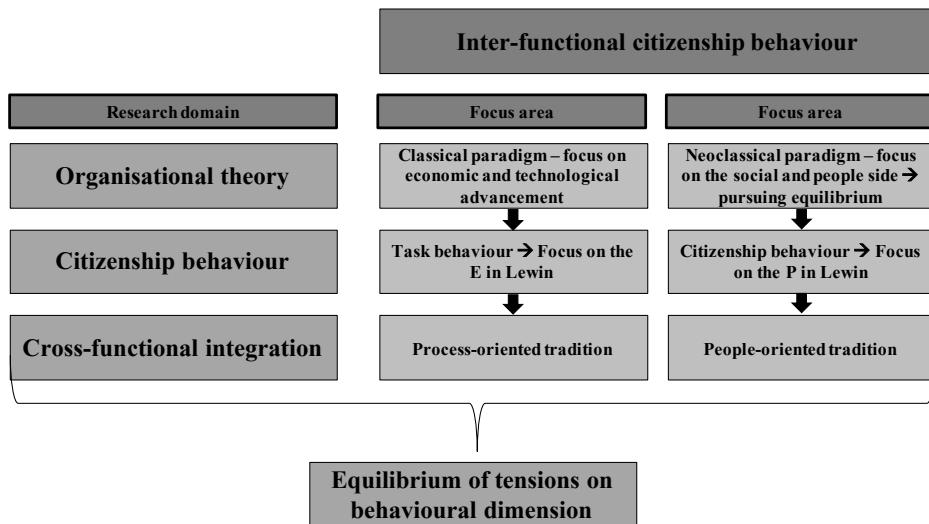


Fig. 2.4 Theoretical conceptualisation of the behavioural equilibrium lens; P=Personality, E=Environment

conceptualisation of behavioural equilibrium. The main body of the figure summarises the rooted tension between the focus on the economic versus the social factors in organisational theory research and links this rooted tension area to the citizenship and also the CFI research stream.

The behavioural equilibrium lens has its roots in the organisational theory, which aims to balance the classical and neoclassical paradigms between economic and social focus, as well as contribution and inducement (please see subsection 2.4.3.2). The same line of enquiry is followed in citizenship behaviour research. OCB followed the fit-research as described in 2.3.1.2. The early focus was on environmental factors (E) which competed against personality

factors (P). Finally, linking it to this dissertation, the change of focus from the process to the people tradition was followed in the integration literature (please see section 2.2.3), allowing to formulate the tension and the maintenance of equilibrium in cross-functional integration between employees from different functions from the fundamental, behavioural perspective. As indicated in the introduction of this chapter and also illustrated with Figure 2.4, the equilibrium theory appears to be a fundamental theory with roots in the early conceptualisations of organisations. Hence, researching IFCBs with the equilibrium lens gives the scale a theoretical grounding which other relevant theoretical lenses could not achieve.

### **2.5.1.2 Behavioural equilibrium and citizenship behaviours**

High complexity in current technological developments demands CFI between functions which increased the interactions between employees from different functions. The resulting organisational structures and inter-dependent processes might have initiated the tension between an employee in one function and an employee in another function. The tension is further supported by the premise that perceptions of organisational fairness or unequal/restrictive collaborative work could influence individual behaviours (Moorman, 1991; Moorman et al., 1993). Consequently, this could also increase the conflict potential and thereby influence the inter-functional work (Song et al., 1996).

As discussed earlier in section 2.4.3, the maintenance of equilibrium of tension between organisational stakeholders is key for organisational survival. This is the case for the tension and conflict between the organisation and the individual, as well as the organisation and its environment. Taking the citizenship research into account, the behavioural response to these tensions has been researched utilising the concept of organisational citizenship behaviour (mainly the tension among individual and organisation) and also with new progressions and adaptations of the citizenship behaviour towards the environment (e.g. inter-organisational-, environmental-, customer- citizenship behaviour). However, a scale to measure inter-functional work between employees is still lacking.

### **2.5.1.3 Behavioural equilibrium on inter-functional and inter-individual level**

This dissertation aims to fill this gap and develops the IFCB scale and tests it in an inter-functional context. The R&D and IP functions and its employees are chosen as an appropriate interaction to test the IFCB scale from the behavioural equilibrium lens. Both functions are inter-dependent (Ernst and Fischer, 2014; Reitzig and Puranam, 2009; Somaya et al., 2007), possess different thought worlds (Dougherty, 1992; Ernst, 2001; Ernst and Fischer, 2014)

and the integration became strategically important in recent times (Ernst, 2017). Following Barnard (1938), this dissertation formulates the *behavioural equilibrium in which the maintenance equilibrium of the tensions between functional employees from the behavioural perspective is key for survival*. Thus, the contribution-inducement theorem, as discussed in 2.4.3.2 is applicable from the behavioural perspective.

If behaviours are understood as *inducements*, they could trigger a behavioural contribution. R&D employees might perceive IP employees' IFCBs towards them as an inducement which might increase their motivation to engage in integration efforts. A behavioural contribution is triggered and could be manifested in reciprocal IFCBs towards their IP colleagues. The derived behavioural equilibrium assumes that two dependent functions and employees with different thought worlds, who are required to work together by organisational structures and processes (Dougherty, 1992), need to maintain a behavioural equilibrium for organisational survival. This dissertation aims to measure this with the proposed IFCB scale and links it to perceived organisational support for innovation (POSI) - an organisational culture variable which proxies the innovation culture in the R&D function.

In general terms, if an individual in function A is working with an individual in function B in the same organisation, the influence on an outcome Z will be the higher when the individual A's perceived IFCB1 from individual B (perceived IFCB) is "*in agreement*" with his/her displayed IFCB1 towards individual B (displayed IFCB) than when both IFCBs are *discrepant*. A state of "*in agreement*" applies when both perceived and displayed IFCB have been answered without response discrepancy. Individual A displays as much IFCB towards individual B as (s)he perceives from individual B. Following the same logic, a discrepancy in behaviours applies when both perceived and displayed IFCB have been answered with a response discrepancy. Individual A displays more/less IFCB towards individual B than (s)he perceives from individual B. Adhering to the equilibrium view, it is assumed that the maintenance of equilibrium of conflicting tensions will benefit the organisation and the work environment where task performance takes place.

#### **2.5.1.4 Behavioural equilibrium - collaboration vs contribution**

The link between behavioural equilibrium and integration is essential. But, how are "*in agreement*" and discrepancy of IFCBs linked to integration? Scholars use a binary approach to distinguish two forms of integration. First, *collaboration* is understood as "*the affective, volitional, mutual, or shared nature of working together [...] integration encompasses aspects like joint goals, open and cooperative work atmosphere, teamwork, and harmony in the working relationship of two or more different functions*" Ernst and Fischer (2014,

p.120-121). Second, "*the specific contributions of a corporate function*" is referred to as contribution (Ernst and Fischer, 2014, p.120) and describes the specific task activities without the underlying and implicit relationship during inter-functional work. This might mimic the service design of integration in which an internal function acts as a service provider and advises other employees on specific issues reactively.

This research adheres to this distinction and links *collaboration* to "in agreement" IFCBs. Perceived IFCB and displayed IFCB were answered without response discrepancy, indicating IFCBs to harmonise the relationship, a willingness to teamwork, tolerance and support the atmosphere (Ernst and Fischer, 2014; Organ, 1988; Smith et al., 1983; Song et al., 2018). Contrary, a discrepancy is linked to the *contribution* where a response discrepancy is apparent. Behaviours are asymmetric, meaning that one employee perceives more than (s)he displays or vice versa. No teamwork, shared vision or joint goals appear to be important. Instead, the specific activity and task performance are more relevant (please see figure 2.5).

### **Contribution**

Discrepancy between  
perceived and  
displayed IFCB  
(asymmetry/non-  
reciprocal)

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### **Collaboration**

Agreement between  
perceived and  
displayed IFCB  
(symmetric/reciprocal)

Fig. 2.5 Behavioural equilibrium lens

By linking "in agreement" to collaboration and discrepancy to contribution, this research encapsulates citizenship behaviour into the existing inter-functional process where IFCBs are manifested. The proposed scale measures the response discrepancy between perceived and displayed IFCBs and indicates the association with POSI.

## 2.5.2 Behavioural disequilibrium: Proposition for R&D and IP integration

This dissertation commits to the people-orientated research in CFI and tests the IFCB scale in the inter-functional integration between R&D and IP employees from the behavioural equilibrium lens. Prior research shows that inter-functional integration becomes more important when functions are highly inter-dependent (Ernst et al., 2010; Mohsen and Eng, 2016; Pfeffer and Salancik, 1978). Employees hold specific sets of skills and expertise which are necessary to accomplish organisational aims (Hillman et al., 2009). However, the integration between inter-dependent functions and employees not only involves sharing skills and a specific set of expertise. It also involves citizenship behaviours (Katz, 1964; Katz and Kahn, 1966; Organ, 1988; Smith et al., 1983). These behaviours could affect the outcome of inter-functional work, they could influence the future involvement of employees in one function with employees in another function (Ernst and Fischer, 2014), and they could also increase the tension and conflict potential during inter-functional work when different thought worlds "clash" (Ernst and Fischer, 2014; Song et al., 1996).

The cross-functional integration literature very recently started looking into the integration of the R&D and IP functions. Ernst (1998, 2001); Ernst et al. (2004) and Ernst (2003) were among the first scholars to investigate the integration between IP and R&D functions and conclude mixed results for individual, team and organisational level variables. One of the most influential publications dates back to Somaya et al. (2007). They studied the complementary effect of R&D spending and patent law expertise. Unlike their hypothesis that high levels of both R&D spending and patent law expertise have a positive interactive effect on patenting performance, a (weak) negative interaction effect of the variables was found. Ernst and Fischer (2014) published another key article in which they propose a distinction for integration. They refer to the *behavioural perspective* as the specific contribution of an IP employee towards the R&D colleague in a project setting. This is similar to contribution as defined in 2.5.1.4. Unlike, they define *attitudinal perspective* as the collaborative work between two functions. The attitudinal perspective includes more than the task behaviour and involves "*the affective, volitional, mutual, or shared nature of working together*" (Ernst and Fischer, 2014, p.120-121). This follows the collaboration definition in section 2.5.1.4. Adding on Somaya's work (Somaya et al., 2007), Ernst and Fischer (2014) included the level of innovativeness as a moderator variable in their analysis. Their results support previous research and conclude that in highly innovative contexts, specific contributions from IP employees towards their R&D colleagues matter more than collaboration. The

specific contribution rather than collaboration is associated with higher new product success (Ernst and Fischer, 2014). However, none of these studies were from the behavioural perspective. None of the studies used "actual" behaviours to study the link between R&D and IP employees. Though called behavioural, Ernst and Fischer (2014) did not utilise behaviours to measure integration. By applying inter-functional citizenship behaviours, this dissertation aims to shed light on previous results from the behavioural perspective. Hence, the main research setting of this dissertation is the integration between R&D and IP employees.

Taking the above mentioned key contributions of Somaya et al. (2007) and Ernst and Fischer (2014) into account, the chosen context of R&D and IP functions offers the opportunity to study and understand the integration of employees from different functions who inhabit different thought worlds. By introducing the IFCB scale, this research aims to introduce a nuanced view about the effects of their integration on perceived organisational support for innovation (POSI) - an organisational culture variable which proxies the innovation culture in the R&D function. Following the assumptions of the behavioural equilibrium theory, the maintenance of equilibrium of IFCBs could be critical for organisational survival. However, as presented with the results in the integration of R&D and IP functions, collaboration does not always yield the best results (in terms of patent count and new product performance) - especially in high R&D settings. This dissertation researches R&D and IP integration in highly innovative industries. Therefore, a behavioural equilibrium, indicated by the agreement in IFCBs and collaboration between R&D and IP employees, might not be beneficial. Different thought worlds, previous research results, formal inter-functional processes and the inter-dependencies between the R&D and IP functions signal that a disequilibrium of IFCBs might yield better results than the equilibrium of IFCBs. Tension can be introduced by collaborative processes and might affect the inter-functional work negatively. Organisations which ignore the behavioural needs, patterns and preferences of employees in respective functions might increase the conflict potential and consequently affect the outcome of the integration. Furthermore, a behavioural disequilibrium might also mimic the service-oriented integration as argued by scholars like Fisher III and Oberholzer-gee (2013); Gassmann and Bader (2011); Süzeroğlu-Melchiors (2017). The IP function is a dedicated support function and aims to help inventors to secure IP rights. A reciprocally displayed behaviour from R&D employees towards IP colleagues might not be expected. Following this, an asymmetric integration in which the IP function operates as an internal service provider, guaranteeing full and high-quality IP support and contribution when needed (Gassmann and Bader, 2011) might be more adequate for the context of this dissertation.

All in all, R&D employees are working under enormous competitive and time pressure. Adopting IFCBs towards employees from different thought worlds might increase their stress level and decrease the perceived organisational support for innovation.

In summary, the proposed association of agreement (equilibrium - collaboration-based integration) and discrepancy (disequilibrium - contribution-based integration) with POSI will be researched in chapter 7. Hypotheses, including IFCBs, are developed following the R&D and IP integration literature and tested by using polynomial regressions with surface graph analysis as proposed by Edwards (1995, 2002, 2006); Shanock et al. (2010).



# **Chapter 3**

## **Research methodology**

This chapter focuses on the research methodology of this dissertation and justifies it based on the given boundaries of the research aim, the research questions, the philosophical position of the researcher and the state-of-the-art designs of the research areas. It puts the research design into a broader philosophical context and reveals the fundamental ontological and epistemological assumptions of the researcher. These assumptions come with several commitments which the researcher needs to evaluate carefully as these predispositions influence the research design, the results, as well as the interpretations of the results.

### **3.1 Philosophical foundation**

*"Whether we are considering the physical sciences, the life sciences or the social sciences, the research process begins with an interesting thought about the world around us. Without this, there is no research."* (Remenyi, 2002, p.39). Discussing the philosophical foundation is an important part of research to understand the effects of inherent predispositions and assumptions on the chosen methodologies, data collection procedures, as well as protocols and results. These assumptions are fundamentally inherent and conveyed by the research stream and its scholars. For a long time, researchers in social sciences, as well as in management science, have adapted and replicated the methods of natural science researchers. The beauty of prediction in natural science, in which researchers believed that facts could be separated from value, and objective reality could exist beyond the human mind, gave quantitative research methods the dominance in social sciences (Flick, 2009; Weber, 2004). Although the fundamental philosophical discussions in research remain widely hidden, the discussions about the phenotypical operationalisations (such as qualitative vs quantitative research) are eminent in most of the research areas (Robson and McCartan, 2016). However,

the argumentation about the fundamental differences between qualitative and quantitative research does not start right before every research intention. It starts much earlier with the question about the nature of society and the fundamental inquiry - why research? (Burrell, 1979). This research adopts the nomenclature and definitions proposed by Burrell (1979); Creswell (2014); Easterby-Smith et al. (2015); Van de Ven (2007), which is widely established in management research. By doing that, the tree analogy proposed by Easterby-Smith et al. (2015) illustrated in figure 3.1, is followed and explains the theoretical foundation of this dissertation.

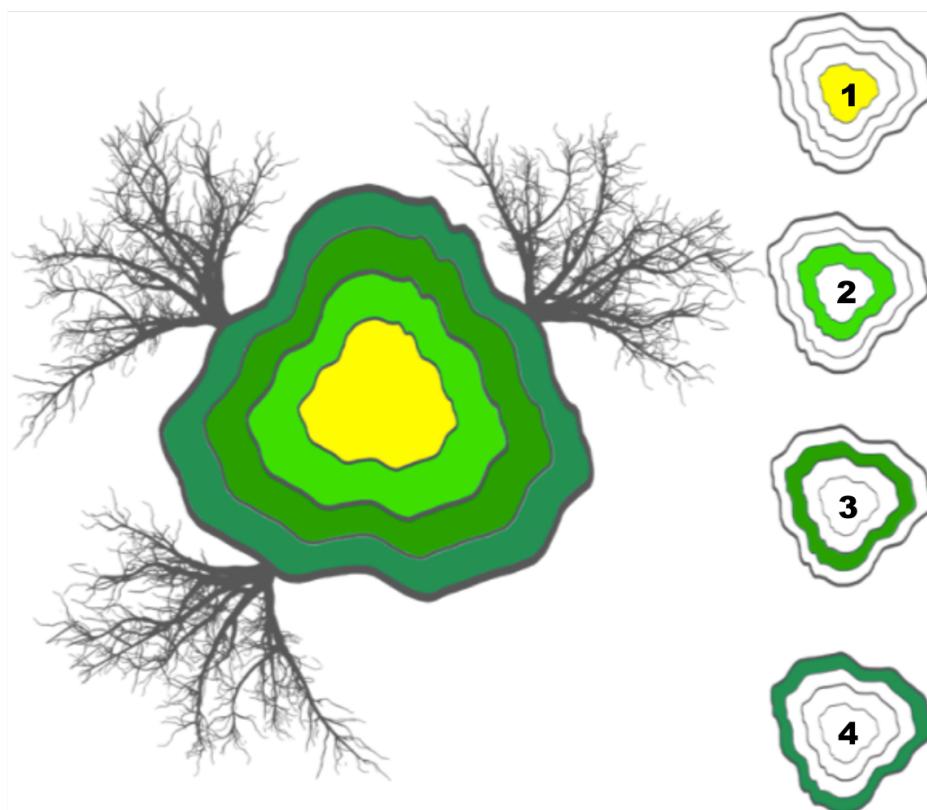


Fig. 3.1 Philosophy of science tree analogy - (Easterby-Smith et al., 2015)

The tree analogy is, in essence, very similar to the research onion proposed by Saunders and Lewis (2012), but flips the core and the outer layers around. The (1) *ontology* and (2) *epistemology* create the core of the research with the fundamental assumptions and the nature of society and beliefs. The (3) *methodology* and (4) *methods* are in contrast, the "visible" part of research, presented by the two outer-layer of the tree. As indicated earlier and also by Robson and McCartan (2016), the philosophical position remains widely hidden. The tree analogy indicates this by placing the (1) *ontology* and (2) *epistemology* into the inner core of the tree, indicating the rooting of all outer layers on the philosophical position - invisible but

underpinning. The outer layers represent the methodologies and methods of research, which is the phenotypical operationalisation of the fundamental philosophical positioning.

### 3.1.1 Definition of ontology and epistemology

According to Lincoln and Guba (1985), "*ontology is defined as the nature of reality*" (p.37). But individuals' perception of the nature of reality can differ. Crotty (1998) introduced his definition of ontology by stating that "*ontology is the study of being*" (p.10). However, the question of existence is also a diverting point, which must be taken into consideration. There is neither an accepted definition nor a standardised nomenclature for ontology. This dissertation screens numerous definitions from i.a. Burrell (1979); Creswell (2014); Easterby-Smith et al. (2015); Guba (1987); Guba and Lincoln (1981); Lincoln (1979); Lincoln and Guba (1987, 1985); Van de Ven (2007) and defines ontology as "*individuals' unique view of the world, the system of beliefs in what exists and what constitutes as fact, taking into account their historical, philosophical and cultural background*".

There are two important, opposing and elementary ontological ideologies, which are aligned with the definition stated previously (Easterby-Smith et al., 2015). The realism ideology treats the world as being an independent entity with a single and objective reality by neglecting and denying personal beliefs, experiences and perspectives (Hudson and Ozanne, 1988). On the contrary, the nominalism ideology, which views the world as an entity, sees reality as co-created by individuals who socially and contextually interact (Bracken, 2010) (please see figure 3.2 for the ontological spectrum). Linked to ontology, epistemology is defined as the "nature of knowledge". It concerns how we gain knowledge about the things we observe. Following the nomenclature of Easterby-Smith et al. (2015), the epistemological opposition spans a spectrum which has a strong positivism on one end and a strong constructionism on the other end (please see figure 3.3 for the epistemological spectrum). The strong positivist view assumes that the reality exists without the influence of the researcher and is also independent of the observer. The strong constructionist view denies the pre-existing reality and aims to find out the reality which is constructed by the people in the researched environment (Easterby-Smith et al., 2015).

Creswell and Creswell (2017) argue that the entire process of developing research questions and hypotheses, as well as choosing the appropriate research method is triggered by the initial acceptance of fundamental philosophical principles. Bracken (2010) compares the acceptance of an ontological and epistemological position with the signature of an unwritten contract. Committing to an ontological and epistemological position gives the researcher a coherent

and consistent strategy in his/her research design. It helps the researcher to understand his/her own assumptions towards the research and its effect on the decision making process with regards to methodological choices (Creswell and Creswell, 2017). Being consistent with one's ontology and epistemology strengthens the arguments towards criticism and creates a foundation for findings and implications. However, the unwritten philosophical contract comes with commitments, such as adhering to a common language and research methods. There are indeed research methods which are aligned with ontological and epistemological positions. To neglect these is regarded as unreliable and invalid (Creswell and Creswell, 2017; Van de Ven, 2007).

### **3.1.1.1 Ontological position of this research**

Figure 3.2 serves as the main source for setting the ontological position of this research. It shows the opposing views of the ontological spectrum described in section 3.1.1.1. It also gives the researcher two indications to position him/herself and the research along the ontological spectrum: The 'nature of truth' and the 'nature of facts'. Until now, debates about the "nature of truth" could not be solved in the seemingly more scientific domain of natural sciences. It appears to be more difficult to engage in discussions about ontology and distinguish among the different ontological positions in the area of social sciences and management (Easterby-Smith et al., 2015). Facts and the truth are vague by nature, and it is difficult to agree on how to measure nature and truth adequately.

This research is interested in the behavioural perspective of individuals and the effect of these behaviours on organisational and individual (performance) variables. By this aim, it is clear that the data this research collects are not directly attainable. Behavioural data is, by nature, very complicated and its measurement needs to be treated only as a psychometric proxy (Easterby-Smith et al., 2015; Smith et al., 1983). Hence, committing to the realism position is not appropriate as the realism position assumes that facts can be revealed directly. The literature review indicated that behavioural differences might exist and their consequences on the individual and organisational level can be treated as real phenomena (Blaikie, 2007). Furthermore, the psychometric proxy to measure behaviours exists as well. As indicated in chapter 2, numerous scholars developed new scales to proxy the behavioural perspective in complex organisational settings. Hence, committing to the nominalism position does neither reflect the literature nor the researchers philosophical positioning. Easterby-Smith et al. (2015) hint to the internal realist ideology which accepts the existence of truth but also acknowledges that data is not directly measurable. It is the middle point between the realism and the nominalism positions with closer links to the realism than to the relativism position

(please see figure 3.2 for the placement in the ontological spectrum).

This ontological positioning is in line with the principles and beliefs of the researcher and is also aligned with the ontological commitments of the research stream. Consequently, this dissertation adheres to the internal realist ideology.

Ontology	Realism	Internal Realism	Relativism	Nominalism
Truth	Single Truth	Truth exists, hidden	There are many 'truths'	There is no truth
Facts	Facts exist and can be revealed directly	Facts are concrete, but cannot be researched directly	Facts depend on viewpoint of observer	Facts are all human creations

Fig. 3.2 The ontological position of this dissertation - (Easterby-Smith et al., 2015)

### 3.1.1.2 Epistemological position of this research

The epistemological position is an important translator between the ontology and the research design. Epistemology is the "nature of knowledge", and it is concerned with the question of "how we know what we know" (Creswell and Creswell, 2017). As with the ontological debate, the epistemological discussion gives a spectrum of views. One the one end, a strong positivist view, which is very data-driven and aims to verify or falsify theories and concepts. On the other end, a strong constructionist view, which is driven by the aim of creating theories with data from multiple sources and research designs where the researcher is purposefully embedded into the research setting (Easterby-Smith et al., 2015). It rejects the predeterminedness of methodologies, reality or truth and aims to increase understanding by theoretical abstraction and inductive reasoning (please see figure 3.3 for the epistemological spectrum, which is linked to the ontological spectrum). Both ends of the spectrum oppose one other, which has led to intermediate epistemological positions which have become more popular among social scientists and management researchers (Easterby-Smith et al., 2015). By combining the ontological with the epistemological view, researchers can appropriately identify, understand, and mitigate the effects of the research design and its biases. As a consequence, research aims, questions and outcomes are evaluated, and common pitfalls are eliminated. As indicated earlier, the ontological and the epistemological spectrum consists of more than the two extreme ends. Referring to figure 3.3 and combining the ontological and epistemological views, it is clear that the *Realism-Strong positivism* and *Nominalism-Strong constructionism* are linked.

As indicated earlier, this dissertation commits to the *internal realist* perspective as the ontological view, which is supported by the positivist epistemological view. By not committing

to the extreme ends of both positions, the research aims, questions, outcomes, and the chosen research design benefit from triangulation of data, which helps to reduce bias (Van de Ven, 2007). This intermediate epistemological solution is commonly linked to the mixed-method approach (this will be described in section 3.3.1 in more detail) and tries to combine the benefits of both ends of the spectra. This approach might sound like the perfect solution for any research and also an end to the discussion about the philosophical foundation in research. However, combining two different worldviews is not straightforward and has common pitfalls, the researcher needs to be aware of (Creswell, 2014).

	Realism	Internal realism	Relativism	Nominalism
Ontological Assumptions	Single reality exists independent from the observer	Single social reality exists but it can not be directly assessed	No pre-determined reality. Nature of truth dependent to viewpoint of observer	No pre-determined reality. Facts, knowledge and nature of truth is based on human creation
Epistemology	Strong positivism	Positivism	Constructionism	Strong Constructionism
Methodology				
Aims Starting points	Discovery Hypotheses	Exposure Propositions Large surveys, multiple case studies	Convergence Questions	Invention Critiques
Designs	Experiments	Mainly numbers with some words Correlation and regression	Cases and surveys	Engagement and reflexivity
Data types	Numbers and facts	Mainly words with some numbers Triangulation and comparison		Discourse and experiences Sense-making; understanding
Analysis / Interpretation	Verification / falsification	Theory-testing and generation		New insights and action
Outcomes	Confirmation of theories			

Fig. 3.3 The epistemological position of this dissertation - (Easterby-Smith et al., 2015)

## 3.2 Research methodology and questions

The research methodology is a combination of techniques which translates the philosophical foundation into a practical guide (Easterby-Smith et al., 2015). This research aims to examine the influence of behavioural factors in cross-functional integration from an equilibrium perspective. This is supported by a strategic research plan, which takes multiple methodological approaches with regards to theory, reasoning and enquiry into account.

### 3.2.1 Research methodology

The addressed research gaps and the intended outcomes of this research require multiple complementary research methods (Blaikie, 2007; Easterby-Smith et al., 2015). Creswell (2003) summarises three fundamental methodological approaches to create a research plan: theory, reasoning and enquiry. These approaches need to be evaluated according to the research questions, the aims, and the ontological/epistemological positions. Figure 3.4 shows the three methodological approaches which are supported by a general sequential or cyclical research iteration.

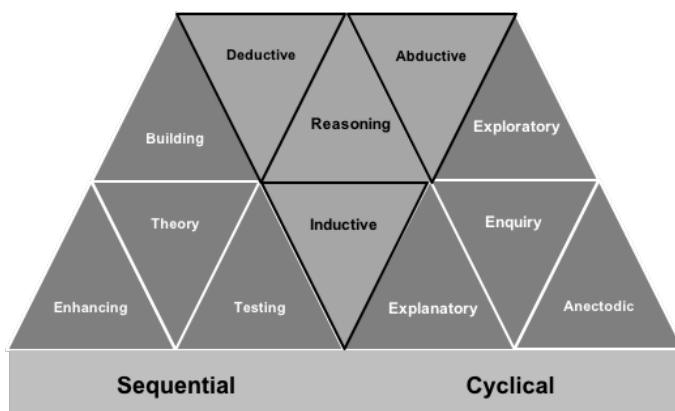


Fig. 3.4 Summary of main research enquiries - (Blaikie and Priest, 2019)

The first approach to create a research plan for an intended research is the fundamental question about theory. Generally, research can (1) *enhance* an established theory, it can (2) *test* an existing theory or it aims to (3) *build* a theory (Blaikie and Priest, 2019). The decision to engage with any of the three intentions is linked to the overall aim and the research questions.

This dissertation is divided into four studies. Each study has a theoretical focus, in accordance with its aim, philosophical position and contribution to the bigger research objective. As shown in figure 3.5, the pre-study aims to build theory by deriving the research proposition

and exploring it in a real-world case. Study 1 and 2 aim to enhance the existing citizenship research and study 3 tests the theory in an empirical context.

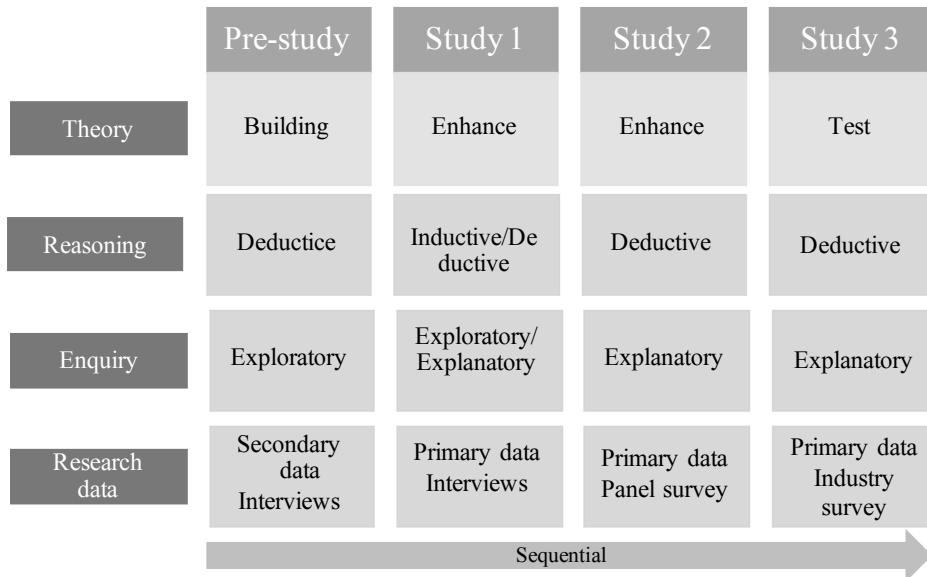


Fig. 3.5 Research enquiry of this dissertation

Secondly, reasoning is defined as the logic of how to approach the research area. Blaikie and Priest (2019); Creswell and Creswell (2017); Easterby-Smith et al. (2015) and Van de Ven (2007) argue in favour of three main forms of reasoning: The (1) *inductive reasoning* is a bottom-up approach where data is analysed without prior theoretical foundation nor hypotheses (Creswell, 2003). By contrast, the (2) *deductive reasoning* aims to generate hypotheses and theories by screening the literature. It is a top-down approach which aims to test theory (Mounce et al., 1997). Finally, (3) *abductive reasoning* is a cyclic approach which creates, tests and generates a new theory which is exposed to further testing (Mounce et al., 1997). Across the four studies, this research used (mainly) deductive reasoning for the pre-study, a mix of inductive and deductive for study 1 and purely deductive reasoning for study 2 and 3. Lastly, research enquiry is concerned with the aims and outcomes of the research and advocates for three types of enquiry. The (1) *exploratory enquiry* starts by gathering data in any form by using a pre-defined theoretical lens or without any prior theoretical foundation to describe the phenomena under observation (Van de Ven, 2007). The (2) *anecdotic enquiry* builds on the exploratory enquiry by collecting more data in a specific research stream and aims to create hypotheses and propositions for further testing

(Easterby-Smith et al., 2015). The (3) *explanatory enquiry* builds on existing or created knowledge and aims to give explanations about the observed phenomenon (Blaikie and Priest, 2019). This research follows an exploratory enquiry for the pre-study, a mix of exploratory and explanatory in study 1 and a purely explanatory enquiry in study 2 and 3.

All aforementioned methodological approaches are supported by an iteration strategy. There are two main iteration strategies which can be applied separately or in combination. The *sequential iteration* combines different reasoning and enquiries sequentially and tries to introduce controlled changes after a defined sequence to then compare the effect of the change in a divergent or even contrasting context (Blaikie and Priest, 2019). The *cyclical iteration* defines reasoning or enquiry and adapts it during the process to come up with an outcome which has been adapted multiple times in the same context (Van de Ven, 2007).

This research follows a sequential iteration. Subsequent studies follow previous results and build on the knowledge created in an antecedent fashion (please see figure 3.5).

### 3.2.2 Research question

This research aims to characterise the inter-functional integration from a behavioural perspective and introduce a fine-grained understanding of the integration between employees from two different functions who inhabit different thought worlds. Hence three research questions are developed and aim to support the research proposition of this dissertation. These questions will be analysed using the theoretical lens of the organisational equilibrium theory.

1. Which inter-functional citizenship behaviours characterise the inter-functional work between employees from different functions who inhabit different thought worlds?
2. Under what circumstances with regards to IFCBs is a behavioural (dis)equilibrium beneficial for the integration between R&D and IP functions and its employees?
3. How do IFCBs influence R&D employees' perceived organisational support for innovation?

The pre-study enables the formulation of the research proposition and is qualitative in nature. The results of the pre-study indicate the need for a novel scale, which is jointly developed in study 1 and 2 following the prescribed scale development method by Hinkin (1995); Likert (1961); Schwab (1980) and DeVellis (2011). Scale development is a step by step method, following the sequential exploratory approach to answer research question 1 (RQ1). Study 3

aims to answer research question 2 and 3 (RQ2 and RQ3) by testing the proposed behavioural (dis)equilibrium theory in the context of R&D and IP integration.

### 3.3 Research method and design

This section describes the research method and explains the assumptions of the chosen research design. The chosen mixed-method approach will be evaluated in detail by taking the benefits, the mixed-method design possibilities, as well as the evaluation criteria for trustworthiness into account. The outcome is a coherent research plan for gathering and analysing data that is used to answer the research questions and comply with all the aspects of trustworthiness (Campbell and Stanley, 1963).

#### 3.3.1 Mixed-method approach

Onwuegbuzie and Leech (2006) state that "*research questions in mixed-methods studies are vitally important because they, in large part, dictate the type of research design used, the sample size and sampling scheme employed, and the type of instruments administered as well as the data analysis techniques*" (p.475). This research commits to the internal realist ontology and acknowledges the obscurity of the data and the research domain. Easterby-Smith et al. (2015) indicate that "*added data and more perspectives will enable them [internal realist - positivist researcher] to get closer to the intangible objects*" (p.65). The indicated mixed-method strategy should not be treated as "*universally applicable or as a panacea*" (Bryman and Bell, 2003, p.658), the benefits and risks concerning this dissertation were judged carefully and attested to the appropriateness. The aims and the assumptions are aligned with the mixed-method approach described in figure 3.6.

The mixed-method approach has its roots in the belief of imperfection of the current results on both ends of the philosophical spectrum (Bryman, 2006). It is a methodological development in the field of social science and management research, dating back to the 1980's (Creswell, 2014). Incorporating different research methodologies, methods, and philosophical positions have been controversially discussed by influential researchers like Creswell (2003); Tashakkori and Teddlie (2003, 2010). These discussions even formed a special journal, dedicated to mixed-method research approaches (Easterby-Smith et al., 2015). Opponents have argued against mixed-methods by expressing scepticism about the potential lack of appropriate skills of the researcher in conducting different methods, including skills in gathering and analysing data or putting the results into the context of the underlying

paradigm (Bryman, 2006; Bryman and Becker, 2012; Easterby-Smith et al., 2015). Taking the views on qualitative and quantitative methods as an example, the disregard of each of the method is very likely to be very high. Not only based on the aims and philosophical positions but also due to the extreme difference in the operationalisation of both methods. Whereas quantitative researchers aim to minimise the effect of outliers (extreme data values), qualitative researchers aim to create insights by explaining outliers (Flick, 2018). Furthermore, quantitative researchers aim to study macro-sociological questions, using a high number of data points - qualitative researcher study micro-sociological questions, using verbal and textual data (Flick, 2009). Guba (1987) went even further with his apathy and compared the efforts of combining the opposing views to the acceptance of the paradigm which "*precludes the other just as surely as belief in a round world precludes belief in a flat one*" (Guba, 1987, p.31). But the combination of qualitative and quantitative, deductive and inductive as well as the links between Realism-Strong positivism or Nominalism-Strong constructionism (or any other link illustrated in figure 3.3) are not incompatible (Tashakkori and Teddlie, 2003). Starting quantitative research with a qualitative research approach to strengthen the quality of propositions and hypotheses is well established in research (Robson and McCartan, 2016). Hence, scholars advocating for the mix-method approach counter with the triangulation effects. Triangulation, by definition, adds another perspective and data source to the context which results in increased validity and generalisability of the research (Flick, 2009). Furthermore, by adding qualitative data to the overall research purpose, quantitative model biases can be cancelled out (Mathison, 1988). Finally, the prospect of obtaining contradicting results by using opponent philosophical views and methods have been highly criticised by the opponents of the mixed-method approach. However, contradicting results can indicate more appropriate modelling of the complexity of real-world problems and hence should be seen as a strength of the approach (Flick, 2009). Table 3.1 summarises the benefits of the mixed-method approach. This dissertation advocates for adequate use in complex research settings where a mix of methods supports the validity and generalisability of the results and its interpretations (Bryman, 2006; Van de Ven, 2007).

Table 3.1 Benefits of mixed-method approach, adopted from Creswell and Creswell (2017); Robson and McCartan (2016)

Nomenclatur	Benefit
Triangulation	Combining multiple sources and data formats enhances validity by adding depth to the researched field.

*Continued on next page*

<b>Terminology</b>	<b>Benefit</b>
<b>Completeness</b>	Conducting studies with multiple methodologies is decreasing alternative explanations and increasing the number of different perspectives.
<b>Balance weaknesses</b>	Identification and mitigation of weaknesses which is addressed by using alternative methods.
<b>Increased research scope</b>	Increasing the possibility of answering more research questions with a broader scope.
<b>Explaining findings</b>	Research findings, even contradictory, are explained by different philosophical positions and can contribute to knowledge more coherently.
<b>Data representation</b>	Qualitative and quantitative data enhance and even amplify each other to strengthen the results and findings.
<b>Research program development</b>	By supporting qualitative data with quantitative or vice versa, the researcher immerses him/herself to the domain generates better theory, propositions, hypotheses, interpretations and conclusions.
<b>Inter-disciplinarity</b>	Some established methods in quantitative research use qualitative research at the beginning to generate some useful data to confirm in a later stage.

### 3.3.1.1 Mixed-method approach - methodological factors

These benefits are linked back to figure 3.3 and are in line with the methodological factors of the epistemological, as well as the ontological view. The mix-method supports this dissertation in:

- (a) Aim: The mix-method approach increases the scope of the research and allows formulating qualitative and quantitative research questions. This research applies this principle and formulates a qualitative "which" question and a quantitative "how" question and follows the prescribed scale development approach by (Hinkin, 1995; Schwab, 1980), which naturally builds on the mixed-method.
- (b) Starting point: Using multiple methods (sequentially or cyclical) builds a coherent storyline. The pre-study of this research starts with the question and conveys the research proposition. The complementary literature review helps to develop the scale (study 1 and 2), which is the starting point for study 3 in which the scale and the hypotheses are developed and subsequently tested.

- (c) Design: Complementing the aims and the starting points, different research questions require adequate research designs from the relevant area of the philosophical spectrum to increase the validity by methodological triangulation. This research applies the interview design for the pre-study and study 1, as well as survey design for study 2 and 3.
- (d) Data types: Aligned with the benefit of methodological triangulation, multiple data types complement each other in research. Associated with the research methods, pre-study and study 1 utilises textual data, whereas study 2 and 3 examine results with Likert (numerical) data.
- (e) Analysis: The analysis of data using multiple theoretical lenses and tools increase the quality of results and provide a platform to interpret findings in a more immersed practice. This research uses inductive and deductive analysis for the qualitative data, as well as confirmatory factor analysis and polynomial regression for the quantitative data types.
- (f) Outcomes: The mixed-method approach allows to increase the scope of research. With this dissertation, the pre-study is aimed to build theory, study 1 and 2 enhances the theory, and with study 3, this dissertation tests the theory. Each study has a different outcome and contributes to academic and practical knowledge.

In general, these benefits can be summarised into three major benefits:

1. The benefit of triangulation
2. The benefit of increased scope
3. The benefit of offsetting methodological weaknesses

### **3.3.1.2 Mixed-method approach - timing and order designs**

Combinations of different methods have been previously used in social science and management science research (Bryman, 2006). However, there is no guaranteed mix of methods for impactful research which complies with all validity and credibility criteria. The timing and order of the research methods are crucial in supporting the research design where research objectives and aims dictate timing and order.

Creswell (2014) and Robson and McCartan (2016) introduce six different timing and order designs which need to be adjusted to the relevant research aims. Table 3.2 summarises these and gives indications about their characteristics and benefits.

Table 3.2 Mixed-method timing and order designs, summarised from (Creswell, 2014; Robson and McCartan, 2016).

Design	Characteristics
<b>Concurrent (parallel)</b>	Single-phase research design where qualitative and quantitative studies are investigated at the same time and converge to one interpretation in the end. Similarities and differences are compared to create knowledge.
<b>Explanatory sequential</b>	A two-phase design starting with quantitative data collection and analysis followed by a qualitative research approach to triangulate and interpret data.
<b>Exploratory sequential</b>	A classical two-phase research design. A qualitative study frames the scope of the research domain and helps to develop hypotheses, propositions and theory. A quantitative approach follows to test and generalise the findings.
<b>Embedded</b>	Qualitative and quantitative data is collected and analysed together. However, one research approach is prioritised, and the other one is adding data in intriguing, contradicting or interesting cases. Can happen concurrently or in a two-phase setting.
<b>Transformative</b>	A two-phase design following a pre-determined transformative and theoretical framework as a guideline to answer the research questions. The use of qualitative and quantitative methods can be concurrent or sequential depending on the previous results of the committed framework.
<b>Multi-phase</b>	A multi-phase design uses a mix of qualitative and quantitative methods sequentially or concurrently across the defined research plan. Individual studies are ordered and timed according to the overall research objective and build upon each other to explain previous results or explore new areas of the defined objectives.

Following Creswells' terminology, this dissertation employs a multi-phase research design, embedding the exploratory-sequential design into the overall research program as presented in figure 3.6. The benefits, critiques and risks of the mixed-method approach were evaluated carefully. The decision to commit to the mixed-method design was influenced by mainly two criteria. Firstly, citizenship behaviour research adheres to the mixed-method approach for scale development following the recommendation of DeVellis (2011); Hinkin (1995); Likert

(1961); Schwab (1980). This method is by nature mixed and employs multiple research designs within the three-step procedure (please see section 3.3.4 for a methodological description). Secondly, the aim of introducing a new theory needs thoroughly designed research. The benefits of the mixed-method concerning triangulation, the extended scope and the offsetting of methodological weaknesses in the complex research environment justifies the use of the mix-method approach. Each study is explained in more detail in the respective chapters, including research design, data types, analytical techniques results and discussions.

	Pre-study	Study 1	Study 2	Study 3
Theory	Building	Enhance	Enhance	Test
Reasoning	Deductive	Inductive/Deductive	Deductive	Deductive
Enquiry	Exploratory	Exploratory/Explanatory	Explanatory	Explanatory
Multiphase, explorative-sequential approach				
Aims	Convergence	Convergence	Exposure	Exposure
Starting point	Question	Proposition	Proposition	Proposition
Designs	Multiple case studies	Multiple case studies	Psychometric survey	Psychometric survey
Data types	Textual data	Textual data	Quantitative data	Quantitative data
Analysis	Deductive understanding	Deductive triangulation	Corelation, CFA	Polynomial regression
Outcomes	Proposition generation	Scale development	Scale development	Theory testing + generation

Fig. 3.6 Research design of this dissertation

The next section will briefly outline the aspect of trustworthiness (Campbell and Stanley, 1963), which can be summarised in two broad assessment of research quality: Validity

and reliability. A detailed evaluation of the validity and reliability criteria will be further discussed in the adequate study chapter.

### 3.3.2 Aspects of trustworthiness

Campbell and Stanley (1963) were among the first researchers to introduce the aspects of trustworthiness: validity and reliability. Research validity is concerned with the adequacy of measures deployed in the chosen research setting - including the research stream, the questions, the research design and the research methodology (Robson and McCartan, 2016). There are many different validity criteria which are used to evaluate the adequacy of measures. The American Psychological Association provides a guideline on what measures should be demonstrated. Among others, content validity, criterion-related validity, construct validity, and internal consistency are included in the evaluation process (DeVellis, 2011; Hinkin and Tracey, 1999). In fact, validity is often distinguished in two main aspects: *Truth value* and *Applicability* (Guba and Lincoln, 1981). These main aspects are called *internal validity* and *external validity* in the ontological position of this research.

Internal validity: Internal validity aims to increase the adequacy of the measures for the research enquiry and thus reduce the influence of external factors (Campbell and Stanley, 1963). In quantitative research, internal validity deals with the abstraction of measures and examines how accurate the chosen and developed measures assess the underlying attributes (Lee et al., 2009). In qualitative research, the influence of bias is the primary worry. Qualitative researchers are judged with regards to the potential bias they are exposed to when trying to understand a novel research area and create theory from the chosen ontological position (Flick, 2009).

External validity: External validity refers to the degree to which findings or models can be applied to different research settings (Yin, 2017). Research findings with good external validity reveal robust results by changing research parameters like the source or geographical location of the research sample. By doing that, external validity aims to lower the abstraction level, which increases adequacy between the research context and the underlying reality, which increases the chance of generalisability.

This dissertation applies multiple steps to comply with the highest level of research validity. Firstly, participants of the pre-study, as well as study 1 both gave feedback to the underlying problem described during the interview stage. Interviewees commented on the applicability in the inter-functional context, which strengthens the research proposition, as well as internal validity. Moreover, the pre-study used non-expert coding principles where data was

deductively coded by researchers who are neither embedded in this research nor into the research stream. For study 2 and 3, adequate statistical techniques are deployed to ensure the comparability of findings with other domain results.

All techniques to strengthen research validity are accompanied by data and methodological triangulation principles. Several data sources and types are combined with multiple research methods which increase research quality (Flick, 2007).

Research reliability: Research reliability refers to the consistency of the research study with its measures (Robson and McCartan, 2016). It aims to give consistent results over time, across the abstract measure or even across different research contexts. There are multiple guidelines on how research can be reliable. Hinkin and Tracey (1999) indicate that the most important reliability criteria research should take care about is *internal reliability*: the consistency across items (please note that items are the questions respondents answer in survey research). The most common internal reliability assessment criterion is Cronbach's alpha which measures the stability of a scale and its items (Price and Mueller, 1986). Researchers eliminate items, add new items to the scale or simplify the wording to increase internal reliability (Nunnally, 1978).

This research integrates multiple techniques to increase research reliability (see figure 3.7). For the qualitative part of the research, the blind coding of cases, as well as integration of non-expert coders increased consistency and hence reliability. Interviews were conducted using a standardised interview guideline. The same applies to the coding process. Furthermore, the pre-study served as a pilot study to define and also refine the items used in study 1, 2 and 3. For the quantitative part of this dissertation, reliability techniques follow established research procedures: Cronbach alpha, composite reliability and factor loading cut off values are well documented and used for comparison purposes (it is worth mentioning that the well-documented and also accepted cut off values and statistical indices are not consistent in research. Numerous scholars suggest multiple cut off values for the same measure and a mix of different statistical indices).

This dissertation acknowledges that the proxy of using a psychometric survey can never fully describe reality (Van de Ven, 2007). By using data and methodological triangulation principles, as well as the mixed-method approach, methodological issues are mitigated to increase reliability and validity. More importantly, the continuous engagement with domain scholars, as well as research stakeholders from the practical domain established a constant feedback loop to ensure reliability. This research commits to the most established techniques

and statistical indices to establish validity and reliability (please see figure 3.7 for a summary). These will be described in more detail in appropriate chapters and sections.

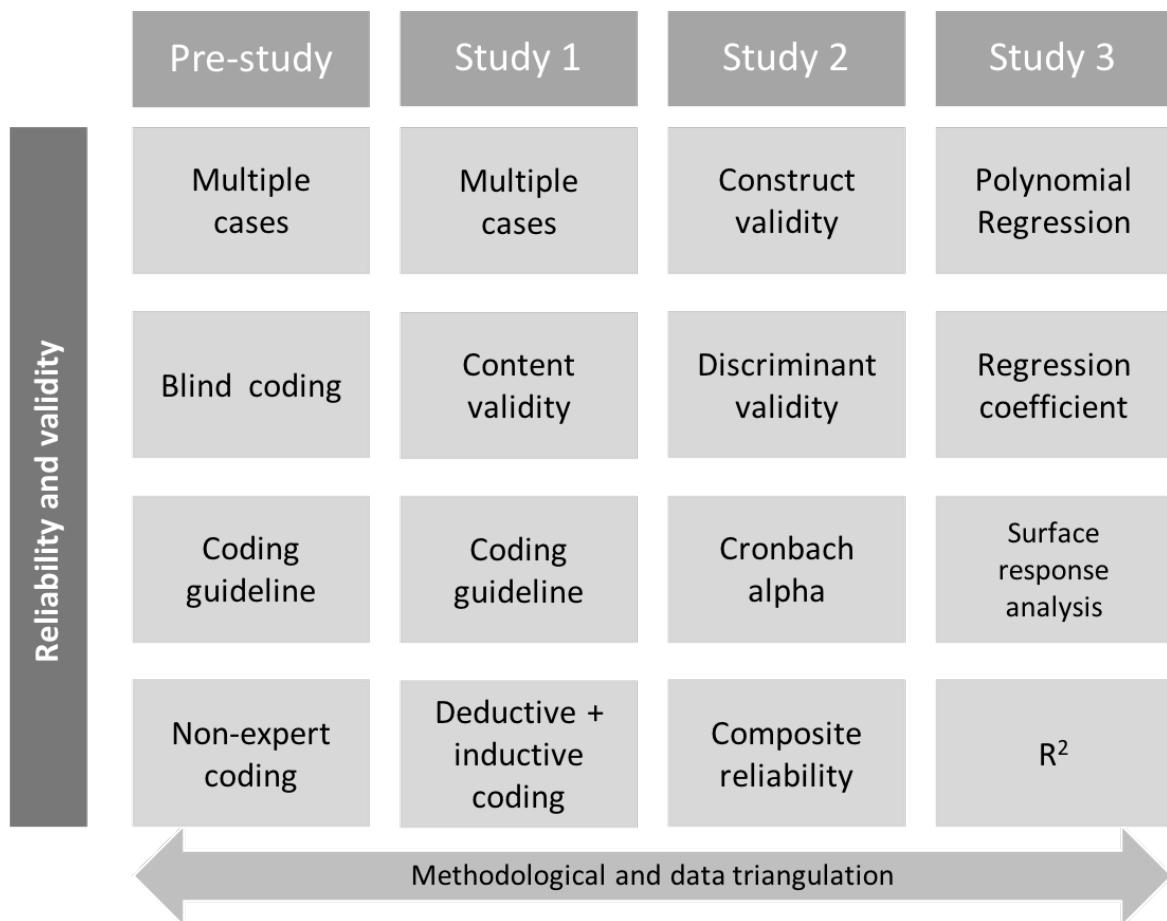


Fig. 3.7 Deployed aspects of trustworthiness of this dissertation

### 3.3.3 Aspects of quantitative measurement scales

Before using quantitative measures for research and data gathering, scholars carefully evaluate measurement scales based on the nature of the measurement variable (Robson and McCartan, 2016). Measurement scales differ in their power to adequately capture, describe and measure the intended variable and are differentiated in "interval", "ratio", "nominal" and "ordinal" scales (Stevens, 1946). The first two are numerical, and the latter two are categorical. The differentiation is based on the nature of the measurement variable which the researcher intends to measure. Some cannot describe or measure variables with the same scale when neither the algebraic order nor the algebraic distance between the variables complies. Table 3.3 summarises the characteristics of each scale and gives common examples

in the respective category. As shown, the Likert-scale appears in all scales. Scholars did not settle for the exact categorisation of the Likert-scale, and it is used as interval, nominal, ordinal and ratio scale depending on the research area and the philosophical position of the researcher (DeVellis, 2011; Devlieger and Rosseel, 2017; Edwards, 1995; Likert, 1961; Rosseel, 2012; Rosseel and Devlieger, 2018). Arguments about the distance between the scales and the logic about algebraic operations are among the most discussed topics. Does it make sense to label the Likert scale from "strongly disagree" to "strongly agree" with numbers and treat it as ordinal (numerical) data where a 5-point Likert scale becomes (1= "strongly disagree" and 5= "strongly agree"), and algebraic operations such as addition, mean or median are performed? And if so, is the distance between a response 4= "agree" vs 2= "disagree" actually exactly double the algebraic distance (DeVellis, 2011)?

This research does not engage in the discussion about the categorisation of the Likert-scale. However, study 2 and study 3 use the ratio (numerical) scale where algebraic operations are performed. The acceptance of the Likert-scale as a ratio scale in the psychology, organisational science and management literature is established (DeVellis, 2011; Hinkin, 1995; Likert, 1961; Schwab, 1980). Hence, this dissertation adheres to the established categorisation and treats the Likert-scale as numerical, ratio scale, performs regression and algebraic operations and reports  $\mu$ ,  $\sigma$  and median.

Table 3.3 Quantitative measurement scales, based on Stevens (1946) and Rosseel (2012)

Scale	Characteristic	Example
Interval	Numerical, ordered scale, known algebraic distances	Likert-scale, dates, temperature
Ratio	Numerical, ordered scale, known algebraic distances, algebraic zero accepted	Rational numbers, prices, weight, Likert scale
Nominal	Named and, categorical scale, no order, no algebraic zero accepted	London, Cambridge, Likert-scale
Ordinal	Named, categorical variable scale, implicit order	High, medium, low, grades, Likert-scale

### 3.3.4 Scale development process

As stated previously, this dissertation aims to develop a novel scale for the inter-functional work between employee from different functions who inhabit different thought worlds. The scale development process is a well-established process which requires the researcher to follow a step-by-step procedure of research guidelines (DeVellis, 2011). It requires the commitment to multiple research methods and the execution of the steps under the highest validity and reliability criteria. There are multiple-scale development procedures in the academic literature (DeVellis, 2011; Hinkin and Tracey, 1999; Likert, 1961; Schwab, 1980), but the differences between the procedures are marginal. Differences exist in the requirements for the sample size, which increased over time due to more sophisticated statistical techniques. Furthermore, researchers try to urge for certain methods along the scale development process (e.g. inductive vs deductive reasoning). These are, however, mainly individual preferences rather than established guidelines.

Hinkin (1995) introduces a comprehensive meta-analysis of the scale development literature, closely following all the research of Likert (1961) and Schwab (1980) who are among the most cited researchers in the field of psychometric scale development. Hinkin (1995) proposed a three-stage procedure to develop a novel measurement scale under the highest reliability and validity criteria. DeVellis (2011) recently updated the procedure in the assessment part of the scale development with up to date cut off values and novel statistical methods. Hence, this research follows the three-stage procedure summarised by DeVellis (2011); Hinkin (1995); Likert (1961); Schwab (1980):

1. Item generation: The primary concern of this stage is content validity. This can be done inductively as done in Butler (1991) or in a deductive manner MacKenzie et al. (1991). The aim of stage 1 is to develop items for the scale and ensure content validity by using independent panels to review, add, eliminate and classify items.
2. Scale development: The primary concern of stage two is internal consistency and reliability. In this stage, the researcher has identified, defined and clustered potential items and needs to test how well these items confirm latent and structural expectations. Multiple tests are used to justify the items: Among others, principal component analysis (PCA), exploratory factor analysis (EFA), confirmatory factor analysis (CFA) and Cronbach's alpha values support the internal consistency and reliability.

3. Scale evaluation: The scale evaluation stage is concerned with construct validity. Hinkin (1995) recommends to test and establish a nomological network with a different sample to avoid common source/method bias and increase generalisability.

This is a brief summary of the prescribed scale development process this dissertation follows. Each stage is supported by a study where item generation is linked to study 1 (chapter 5), scale development to study 2 (chapter 6) and scale evaluation to study 3 (chapter 7). The detailed methodology is described in the adequate chapter, including the nuances of the methodology and the assessment criteria for each stage.

### 3.4 Summary

The methodology chapter indicated that none of the research methods are perfect and bear some weaknesses. To be able to develop an appropriate research design which holds to the validity and reliability criteria, the ontological and epistemological principles need to be discussed. A commitment to an ontological and epistemological position comes with several benefits but also restrictions. This research commits to the *internal realist* ontology which is linked to the *positivist* epistemology. By doing that, the acceptance of a single truth which is not directly observable is acknowledged. A sole focus on the quantitative method does not capture the full complexity of the research setting. Consequently, a mixed-method approach, combining the proximate philosophical foundations, is deployed. The mixed-method approach equips the researcher with adequate tools to reach all validity and reliability criteria and contribute to academic and practical knowledge. A multi-phase research design, embedding the exploratory-sequential design into the overall research program, is followed. This research design enabled data and methodological triangulation and paired with the continuous feedback loop with domain researchers and practitioners, validity and reliability criteria are met, and potential biases are mitigated.

**Summary 4:** Research methodology

- (d) A mixed-method approach enables capturing the complexity of the research objectives and equips the researcher with adequate tools to meet validity and reliability criteria.
- (d) The mixed-method approach complies with the ontological and epistemological views, and commitments of this research and the researcher.
- (d) A multi-phase research design, embedding the exploratory-sequential design is chosen where the pre-study and study 1 utilise qualitative and study 2 and 3 quantitative methods.
- (d) Adequate validity and reliability criteria are chosen for the appropriate research methods and will be explained in each chapter separately.

# **Chapter 4**

## **Pre-study - Retrospective coding of behavioural equilibrium**

### **4.1 Chapter introduction**

The pre-study acts as a pilot for this dissertation and aims to answer the fundamental question about the influence of behaviours between employees from different functions who inhabit different thought worlds. The diversification and functional specialisation created the need for integration in which employees from different functions must work together and share knowledge, processes and resources to create organisational value. As introduced in chapter 2, including the people-oriented tradition and behaviours into the equation of integration is a recent trend in research in which workplace behaviours have been examined frequently (Borman and Motowidlo, 1997; Brief and Weiss, 2002; Frazier and Bowler, 2015; MacKenzie and Podsakoff, 2012; Motowidlo and Van Scotter, 1994; Organ, 1988, 1997; Pellathy, 2016; Podsakoff et al., 2000, 2018a; Walumbwa et al., 2012). OCB, as one of the most researched workplace theory, attracted researchers who embedded OCBs into their theoretical lens and linked citizenship behaviours to fundamental organisational and behavioural paradigms.

This exploratory pre-study aims to introduce a novel theoretical lens into the research stream: the behavioural equilibrium lens. Previous equilibrium research has examined tensions between individuals and the organisation, as well as tensions between the organisation and its environment. However, tensions between individuals within an organisation (inter-functional) have been largely ignored - *a fortiori* from the behavioural perspective.

This research aims to fill this gap and investigates tensions between employees from different functions who inhabit different thought worlds. The pre-study helps to analyse the proposed tension between employees through the behavioural equilibrium lens, an adaptation of the

equilibrium theory from the behavioural perspective. It is the hope that the results might present unique indications to the persistent issues in CFI and start discussions about the people-oriented factor from the (behavioural) equilibrium perspective.<sup>1</sup>

## 4.2 Methodology and research design

The pre-study follows a deductive, exploratory case study design and tests a fixed set of behaviours on a secondary, empirical dataset. The pre-study aims to examine inter-individual relationships in a corporate environment where a) distinct thought worlds are inherited b) interactions happen frequently and c) some kind of inter-dependency is present. Citizenship research predominantly uses quantitative datasets where either a psychometric scale is established (as for OCB - (Bateman and Organ, 1983; Podsakoff et al., 2000)) or new scale development is pursued for the given research context (please see inter-organisational citizenship (ICB) (Autry et al., 2008; Gerke et al., 2017), the customer-citizenship behaviour (CCB) Langner and Seidel (2014), project citizenship behaviour (PCB) (Braun et al., 2013) or environmental citizenship behaviour (ECB) (Robertson and Barling, 2017). These adaptations are closely grounded in the OCB theory. However, the distinction of the research context and the fundamental differences in the theoretical lens required a new scale, which is traditionally pursued by following the deep-rooted scale development procedures of Schwab (1980), Hinkin (1995) and Likert (1961).

This dissertation follows the established norms of the research stream and develops a novel scale for the inter-functional work between employees from different functions (studies 1, 2 and 3). However, to test the proposed tension through the behavioural equilibrium lens prior to scale development, a research design, which is unusual for the research stream of citizenship behaviour, has been implemented. The reason for implementing the pre-study in a qualitative approach is primarily driven by the theoretical conceptualisation of the citizenship theory. Organ (1988), even after the re-definition in 1997 (Organ, 1997) still considered OCBs distinct from task performance, which makes it explicitly neither directly compoundable to the formal job requirement nor the incentive system. Committing to this utterly accepted conceptualisation, a research question solely for the pre-study has been developed accordingly. If there are distinct behaviours alongside task behaviours, which "*contributions to the maintenance and enhancement of the social and psychological context that supports task performance*" (Organ, 1997, p.88), *can those behaviours be deductively*

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<sup>1</sup>Please note that the pre-study was presented together with the co-author and owner of the dataset, Martha Geiger, mcag3@cam.ac.uk, at the Academy of Management conference 2019 in Boston, USA.

*and retrospectively coded in textual, empirical data, using non-expert coders who are neither familiar with the research context nor the citizenship theory?* The answer to this question increases the research validity by investigating the proposed tension between employees and by testing the applicability of the behavioural equilibrium lens in an integrative context. However, it can also be interpreted to qualitatively testify Organs' citizenship theory by indicating the existence of those behaviours in an empirical, textual dataset, which was collected for a different purpose and did not explicitly ask for citizenship behaviours. Furthermore, the pre-study has methodological contributions, which attracted the interest of researchers during the Academy of Management conference 2019 in Boston (Cengiz and Geiger, 2019). The deployment of large surveys is established in the predominantly quantitatively-oriented research of OCB. The novel methodology could enable the research of citizenship behaviours without using large psychometric surveys. The effect of citizenship behaviours can be inferred from qualitative data, which could provide new insights to understand some of the undiscovered factors and thus might generate new knowledge, theories and propositions. These new insights can be further researched quantitatively. In addition to the theoretical and methodological implications for implementing a qualitative pre-study, the time factors played a crucial role. The availability of a secondary, qualitative empirical dataset in the area of interest introduced a quick and novel way to examine if the proposed tension between employees is grounded in a real-world phenomenon and a commitment to a novel scale is justified.

### 4.3 Data and sample description

The indicated differences in the purpose, the contrasting values, norms and beliefs, as well as the practical problems between the functions were a valuable and valid point to engage with the intended pre-study. The empirical interview data was collected using eight automotive corporate innovation subsidiaries. The data was solely collected to analyse the knowledge transfer process from employees in innovation subsidiaries of automotive companies towards employees in their headquarters (HQ)<sup>2</sup>. Innovation subsidiaries are distant from their company HQs both in terms of location and in terms of purpose (ideation, innovation, and knowledge creation, often in conjunction with a network of external partners in the subsidiary's location) (Zhang et al., 2008). The initial coding by the owner of the dataset

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<sup>2</sup>Note that the author is aware of the fact that both functions belong to the same R&D function and hence can not be declared as inter-functional. Nonetheless, the owner of the dataset, multiple academics, as well as interview partners indicated that the relationship is more inter-functional than intra-functional.

indicated contrasting values, norms, and beliefs between employees in the subsidiaries and their HQs. Besides, it also indicated that knowledge sourced from the subsidiaries' ecosystems cannot always be successfully transferred back to their company HQs (Geiger, 2019).<sup>3</sup> The empirical dataset consists of interviews conducted by a scholar who has no connection to this dissertation nor any prior expertise in citizenship research. Interview partners include employees of eight automotive corporate innovation subsidiaries located in innovation ecosystems, as well as relevant employees at the subsidiaries' respective company HQs. In total, 43 interviews with eight automotive manufacturers were analysed, 28 of those interviewees being employees in innovation subsidiaries, and 15 being employees at respective company HQs. Of the 28 interviewees at the subsidiaries, 18 used to work at their respective company HQs (expatriates on rotation at the subsidiary) and therefore provide valuable understanding and insight into both parties. The interviews were conducted for the sole purpose of researching the knowledge transfer process between the corporate innovation subsidiaries and company HQs, rather than for investigating any (citizenship) behaviours. Thus, it is unlikely that interviewees would have specifically been aware of certain labelled behaviours, let alone be inclined to discuss them in an interview. Instead, interviewees discussed their relationship with colleagues from the subsidiary or the respective HQs concerning any knowledge transfer process. An overview of the eight case companies is provided in table 4.1. The methodology of the pre-study was able to greatly reduce bias inherently present in most

Table 4.1 Sample description of the pre-study

<b>Case</b>	<b>Subsid.</b>	<b># employees</b>	<b>Subsid. age (years)</b>	<b>Overall company # employees</b>
A		50	20	130,000
B		300	23	280,000
C		200	23	650,000
D		40	17	370,000
E		3	11	180,000
F		200	6	200,000
G		70	7	470,000
H		30	11	220,000

qualitative case studies. The researcher was, since the dataset is secondary, not linked to the interviewee and was hence not able to influence the interview process. Interviewees were not pushed towards admitting to, or highlighting certain (citizenship) behaviours. The pre-study avoided the observer effect/Hawthorne effect in which the interviewee might react or behave

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<sup>3</sup>Note that, when referring to "company HQs", this pre-study is referring to the R&D function at HQs as this is the main partner for the subsidiaries, who are also organisationally part of the company's R&D function.

differently while being studied. Instead, specified behaviours were identified and analysed retrospectively by the primary, as well as independent and non-expert coders. The pre-study used graduate students, researchers, and other academics working in various research streams (i.e. non-experts in the field of innovation management and organisational psychology). In total, alongside with the researcher and the dataset-owner, five non-experts provided external coding of the data.

## 4.4 Measures

OCB research discovered over 30 different behavioural constructs (Gerke et al., 2017; LePine et al., 2002; Podsakoff et al., 2014, 2018a). There are different sub-scales within the theory of OCB, using different clusters of constructs (Autry et al., 2008; Braun et al., 2013; Ferreira et al., 2013) or including different combinations of constructs. Undertaking comparisons among the present studies are very difficult. LePine et al. (2002) reports 133 studies using 40 different combinations of behavioural constructs, with little overlap. None of the existing citizenship scales characterised the research area between two functions adequately. This pre-study concerns corporate innovation subsidiaries and their respective HQs and acknowledges that both entities, the subsidiary and the HQ function belong to the same corporate function, namely the R&D function. Nonetheless, research in technology and knowledge transfer, as well as in the field of institutional logic indicates that the differences between both functions are considerable high (Kostova and Roth, 2002; Kostova et al., 2008). Reay and Hinings (2009) speak about *rivalry* when they describe mechanism to manage the interaction, Kostova and Roth (2002) indicate the *maintenance of legitimacy* when explaining the role of the subsidiary and Kotosaka and Sako (2017) even indicate a distinct logic for the respective entities, the corporate logic vs. venture logic. Furthermore, interviewees supported the view that HQs focuses more on stability because the "*the company has been around for one hundred years and what every manager, every worker, every academic learned in these hundred years is: do not make a mistake. Make sure this car is running. Because, ultimately, we do not want our customers to get hurt*" (C1). On the other hand, an innovation subsidiary supports the view that "*when you fail, it is nothing bad as long as you learn from it*" (C1), thereby prioritising entrepreneurial activities and risk-taking over stability and certainty. Battilana and Dorado (2010) indicate the perfect fit to the proposed tension as they indicate the potential tension of the entities by stating that managing these competing institutional logics "*is challenging for organisations because it is likely to trigger internal tensions that may generate conflicts among organisation members, who are ultimately the ones who enact*

*institutional logics*" (Battilana and Dorado, 2010, p.1420). Given that employees in subsidiaries exhibit a distinct institutional logic to that of their respective employees in their company HQs (venture vs corporate logic), this pre-study considers corporate innovation subsidiaries as separate organisations to analyse citizenship behaviour. By doing that, the theory and scale of inter-organisational citizenship behaviour (ICB) (Autry et al., 2008) are explored in more detail.

The ICB theory has been developed from OCB research mainly due to the extensive work on cross-functional integration in the area of supply chain (Autry et al., 2008). Prior to the advent of the ICB theory, academic research has indicated that relationships between organisations are based on power and the ability to direct this power towards other organisations (Montoya-Weiss et al., 2001; Song et al., 2018). Further work argued that inter-organisational relationships are instead based on trust, commitment, and information sharing (Stank et al., 1999, 2001). Taking these developments into account, Autry et al. (2008) established the theory of ICB to describe the behavioural perspectives between two or more organisation working towards a mutual aim (please see table 4.2 for the ICB scale with its seven constructs). <sup>4</sup> The lack of an appropriate scale for the pre-study has been compensated by utilising a citizenship scale, which proxies the chosen integration between the subsidiary and HQ employees. This gap is one of the main reasons and the main justification for committing to the scale development process in subsequent studies. A scale which captures the nuances of inter-functional work might help to understand "*the behavioural factors that facilitate (or inhibit) inter-functional collaboration*" (Ellinger et al., 2006, p.2).

Table 4.2 Definition of inter-organisational citizenship behaviours, summarised from Autry et al. (2008)

<b>ICB</b>	<b>Definition (slightly adapted to the context of innovation subsidiaries and respective company HQs)</b>
<b>Advancement</b>	Steps taken to improve relationships, knowledge bases, and integrated processes linking one or more partner organisations.
<b>Altruism</b>	Behavior directed at helping a partner organisation solve problems or acquire needed skills/knowledge.
<b>Conscientiousness</b>	Performing cross-organisational tasks with higher than normal levels of forethought and effort.

*Continued on next page*

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<sup>4</sup>In table 4.2, "partner" refers to either the corporate innovation subsidiary or the respective company HQs. With this, this dissertation deviates slightly from the supply chain language of Autry et al. (2008).

<b>ICB</b>	<b>Definition (slightly adapted to the context of innovation subsidiaries and respective company HQs)</b>
<b>Constructiveness</b>	Interest and activity in inter-organisational affairs affecting the relationships between exchange partner organisations.
<b>Compliance</b>	Orientation towards the rules, policies, and processes of partner forms as well as the focal form in the course of inter-organisational exchange; compliance with partner organisation's behavioural norms.
<b>Loyalty</b>	Allegiance to the partner organisation, sometimes sacrificing the interests of the business unit for the greater good.
<b>Tolerance</b>	Identification and tolerance of the inevitable delays/impositions/inconveniences associated with inter-organizational exchange without retribution.

We made use of most commonly cited ICB constructs (see table 4.2), as defined by Autry et al. (2008) and started the deductive coding approach proposed by Miles and Huberman (1994).

## 4.5 Data analysis

Following Miles and Huberman (1994), deductive and inductive data analysis approaches are combined for the pre-study. Table 4.2 was the provisional start and illustrated the seven most cited ICB constructs and definitions. The construct definitions were adapted from the original supply chain context to the context of technology/knowledge transfer. Once transcribed and imported to the qualitative data coding software, MAXQDA (MAXQDA 2018, Release 18.1.1), the primary researcher coded the interview data independently, using the constructs defined in table 4.2. Subsequently, the owner of the dataset was briefed in the citizenship theory and the ICB constructs and coded the data independently as well. Both coding results were cross-checked and agreed on which interview segments indicate which ICBs. This coding method is the deductive way of analysing textual data, which yielded excellent results. However, the data was also examined and coded inductively by free coding of new constructs, which are not included yet in the existing literature of ICB or the constructs defined in table 4.2. After the primary coding round, the second round of coding was performed using graduate students, researchers, and other academics working in various research streams (i.e. non-experts in the field of innovation management and organisational psychology). In total, five non-experts provided external coding of the data. Face-to-face workshop with the external coders about the general topic of OCB and ICB were conducted, making sure that

the adapted version of the ICB constructs was well-understood. The researcher then supplied a random selection (20%) of interviews to the coders and tasked them with independently identifying the pre-defined ICBs in the interviews. Again, results were cross-checked with the primary coding outcome of the researcher and the dataset owner. In each case, the coding outcomes from the external coders matched very well. While not every coded interview segment was identical to that of the primary researcher, further discussion, and the domain expertise of the primary researcher of the pre-study resulted in an accord. When asked about the overall trend of which behaviours dominate in the direction of subsidiary towards HQs and which behaviours dominate in the direction of HQs towards subsidiary, each external coder expressed conclusions matching those of the researcher. Including non-experts in the coding process thus reduced the bias in the data analysis phase of this pre-study.

## 4.6 Results and Discussion

The collected data, as well as individual, inter-organisational behaviours, are directional by definition. Results are therefore displayed by direction - which behaviours were exhibited by the subsidiary towards HQs and vice versa. Figure 4.1 presents a summary of the results of the pre-study. At the right side of the figure, the innovation subsidiary is illustrated with the globe symbol, and on the left side, the HQs is illustrated with the home symbol.

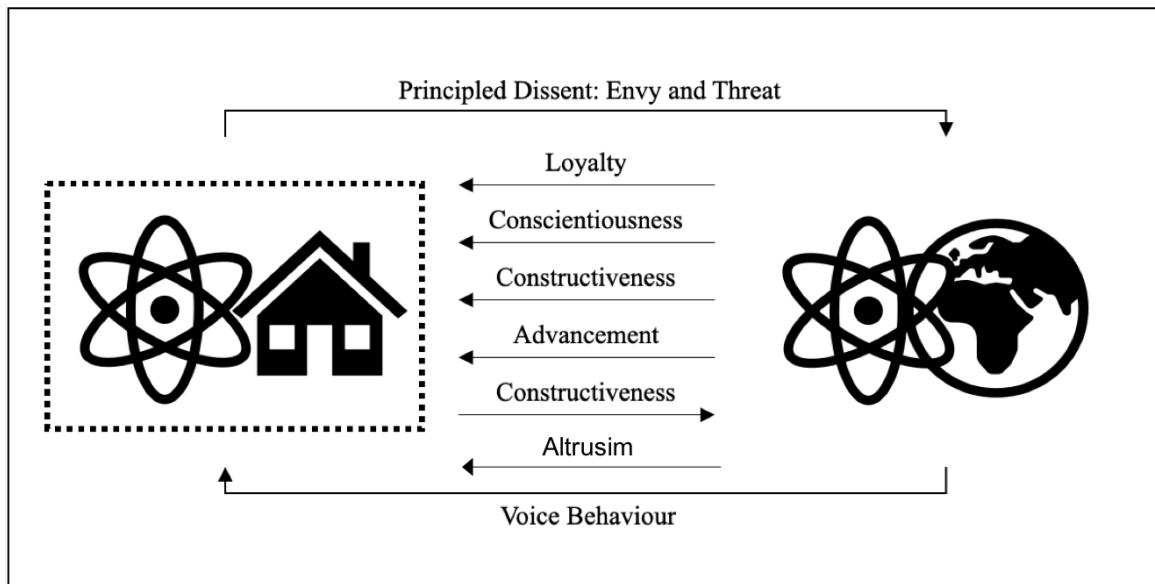


Fig. 4.1 Graphical results of the pre-study

### **Innovation Subsidiary Towards HQs**

The data indicate the presence of five inter-organisational citizenship behaviours from the interviewed innovation subsidiaries towards their HQs as indicated by the arrows from the globe towards the house. Unlike, only one ICB (constructiveness) is displayed from the HQs to the innovation subsidiary (please note that tolerance and compliance were indicated by neither the researchers nor the independent coders). The additional inductive coding indicated two behaviours, which were not part of the ICB scale proposed by Autry et al. (2008): voice behaviour from the innovation subsidiary towards the HQs and principled dissent behaviour from the HQs towards the innovation subsidiary. Both behaviours are part of the bigger conceptualisation of OCB but not part of the ICB scale and will be discussed further. By applying the categorisation of OCBs proposed by Van Dyne et al. (1995) (discussed in more detail in chapter 2.3.1.1), the ICBs are subdivided into four affiliation-oriented ICBs (AICBs) (*loyalty, conscientiousness, constructiveness, and advancement*), and one challenge-oriented ICB (CICB) (*voice behavior*). Where AICBs are cooperative and aimed to strengthen the relationship between partners, CICBs aim to challenge the current status quo and give constructive feedback as an input for improvement.

#### **Affiliation-Oriented ICB: Loyalty**

Loyalty as an AICB is defined as "*allegiance to [partner organisations], sometimes sacrificing the interests of the firm or business unit for the greater good*" (Autry et al., 2008, p.56). This behaviour is indicated at the innovation subsidiaries, for instance, in budget-related issues. As discussed by an interviewee, "*the aim of the [subsidiary] is to be fast. Suppose the business unit [at HQs] has no more available budget for a particular year, but the [subsidiary] wants to be fast. In that case, the [subsidiary] might consider doing a POC [Proof of Concept] with their own budget*" (A6). This statement indicates that the subsidiary is willing to sacrifice its own budget for the good of transferring potentially disruptive knowledge to HQ business units.

#### **Affiliation-Oriented ICB: Conscientiousness**

Conscientiousness is defined as "*performing cross-organisational tasks with higher than normal levels of forethought and effort*" (Autry et al., 2008, p.56). In other words, employees going above and beyond what is expected from them. The main role of employees in innovation subsidiaries is to scout and develop new technologies that might be relevant to their industry and to find a business unit at their respective company HQs, which is interested in implementing that technology into a marketable product. Employees in the investigated

innovation subsidiaries go above and beyond this requirement by sometimes pitching ideas to HQ employees more than once, sometimes "five or ten times" (A2), to find the most relevant recipient unit at HQs.

The following excerpt further demonstrates conscientiousness:

*We [the subsidiary] kind of figured out that we wanted to get into working with earlier stage companies. We realised that this was a gap. We would frequently find early-stage companies and have people [at HQs] say that "the technology sounds exciting, have them come back to me in two years when they're "automotive ready". And I think that's the wrong answer. So, it was like: "How do we work better with early-stage companies, knowing that early-stage companies are very different from later-stage companies?" We said: "Well, one of the things about early-stage companies is that it's a lottery, so we need to work with someone who is familiar with early-stage, who knows how to pick potential winners." And so, we went around looking for different accelerator partners. (E1)*

Subsidiary employees thus saw the gap in HQs' ability to work with early-stage companies and went above and beyond its regular duties to set up a collaboration with a local accelerator. Conscientiousness is also dominant in other areas of support. Multiple interviewees at different subsidiaries mention a regular (customised) newsletter which is sent to HQ employees to increase awareness about projects in innovation subsidiaries. Furthermore, almost all interviewees describe travelling to HQs to demonstrate proofs of concepts (POCs) and prototypes, and the importance of developing functioning prototypes rather than presenting slide decks to truly demonstrate the value, and thereby increase the likelihood of transfer, of a technology.

### Affiliation-Oriented ICB: Constructiveness

Constructiveness as an AICB is defined as the "*interest and activity in inter-organisational affairs affecting the relationships between exchange [partner organisations]*" (Autry et al., 2008, p.56). While certain aspects of the relationship between the subsidiary and HQ employees are facilitated with structural measures (such as regular phone and email contact), employees in the innovation subsidiaries nonetheless show specific constructive behaviours beyond the structural perspective. For example, subsidiary employees frequently travel to HQs "eight to ten times a year" (B1) (often located in other continents), to increase their visibility throughout the organisation. Furthermore, some employees actively learn the

language of their organisation's home country to be more integrated into the company's day-to-day activities:

*We actually have optional [HQs' home country language] classes here in this office. [...] it is not mandatory; it is just something that the company offers. I definitely see the benefit because, even though the common language is English, I think that getting engaged in the culture and the language, such that you can interact on the native language of the folks in [HQs] probably has some advantages because they are just more comfortable communicating in their native language(A3).*

Other interviewed employees in subsidiaries mention similar behaviours, including hosting employees from HQs for temporary project work for up to six months.

### Affiliation-Oriented ICB: Advancement

Advancement as an AICB focuses on the integration of processes between two partners: "*taking steps to improve relationships, knowledge bases, and integrated processes linking one or more [partner organisations]*" (Autry et al., 2008, p.56). The subsidiaries' desire for integration into the rest of the organisation, which is often inhibited by geographical distance, is the most fundamental AICB revealed by the data. This is demonstrated by the following excerpt: "*There are these events or workshops at [HQs] to showcase what they have worked on, but oftentimes we don't participate in those because we are very far away. [...] This is the first time we are participating, so it kind of shows that we are becoming more involved and aligned*" (A3). Furthermore, data analysis revealed that subsidiary employees engage in advancing behaviour to improve the likelihood of transferring projects into a HQs business unit. One example is the idea of gaining buy-in from a business unit at an early stage of the project to ensure that the project will eventually find a home. The following interview excerpt illustrates this:

*We try to involve the team [HQs] in a very early stage. We fly them over, even with all the restrictions from budget and staff, we actually bring them here. The best thing is that they work three months with this team on-site [at the subsidiary], and then they can work as an ambassador back at home and then bring [the project] back. You cannot bring back technology with a slide deck. You need people to implement it (C1).*

This behaviour on the part of the subsidiary advances the process integration between the subsidiary and HQs.

### **Challenge-Oriented ICB: Voice behaviour**

Despite the numerous examples of affiliation-oriented ICB's, the most common citizenship behaviour observed at the innovation subsidiaries towards their respective HQs is a challenge-oriented ICB (CICB), which the literature calls "employee voice behaviour". It is defined as "*promotive behaviour that emphasises the expression of constructive challenge intended to improve rather than merely criticise*" (Van Dyne and LePine, 1998, p.109). One of the biggest issues faced by innovation subsidiaries is missed opportunities, i.e. employees at HQs do not make the most of having an innovation subsidiary in an innovation ecosystem. In the words of an interviewee: "*Maybe they [HQs] don't see the value of us, of this office [the subsidiary]. Maybe they are not utilising as much value as what we could provide to them*" (A3). This excerpt demonstrates the core, underlying problem at hand. The subsidiary employees feel excluded from their HQs R&D activities, as HQs employees are not making enough use of the intellectual capabilities of the subsidiary. This, in turn, results in obstruction of the knowledge transfer process, which should be a subsidiary's key value-adding activity. Moreover, some subsidiary employees voiced concerns about the high dependence of subsidiaries on HQs. Among others, interviewees (A3), (B9), (C4), and (D1) describe budget and a lack of autonomy as the main problem. For example, "*The budget mechanism is not yet fixed [because the subsidiary is relatively new] but at the moment HQs wants everything to be budgeted according to the value chain. This doesn't make sense because software innovation is hard to value like parts for an engine*" (B9).

### **HQs Towards Innovation Subsidiary**

From HQs towards the subsidiaries, the data indicate the presence of just one affiliation-oriented ICB (AICB), namely constructiveness. Furthermore, data indicates principled dissent, expressed as envy and threat.

### **Affiliation-Oriented ICB: Constructiveness**

The analysed data revealed constructiveness as the only affiliation-oriented ICB from HQs employees towards their colleagues in the innovation subsidiary. Interviewees at the subsidiaries' respective HQs indicated this behaviour by describing frequent visits by top-management from HQs to the innovation subsidiaries (e.g. A4, A5, B3, F2, G3, G4). These visits are usually positively received by the subsidiary because they are "*very conducive to our relationship*" (G3). However, in some instances, the visits are perceived as fruitless towards enhancing the transfer process. For example, "*we have many visitors from HQs, but just visitors. They don't make any decisions*" (D1) and "*We get a lot of visits [from HQs], but*

*we have to work very hard for them not to be tourists. [...] The standard thing was, they would come here, then we would go to Napa, you know, to see the wine country, and that has nothing to do with any of this innovation in any of these places at all" (D2).* Furthermore, constructiveness on the side of HQs employees includes setting up a designated unit at HQs in charge of "receiving" knowledge from the subsidiary. For example, interviewee B3 discusses the role of a "mirror link" at HQs who is responsible for supporting the subsidiary in transferring projects to relevant business units. Similarly, interviewee C4 discusses an "*innovation circle*" at HQs – a roundtable of employees from various functions across the organisation that come together to decide the future path of projects from the subsidiary. Other interviewees mention similar structures at HQs that provide support for the subsidiary in networking and knowledge transfer (e.g. A4 and D5).

### **Challenge-Oriented ICB: Principled Dissent**

The predominant CICB from HQs towards the innovation subsidiaries shown in our data is *principled dissent* (Graham, 1986; Podsakoff et al., 2014). Principled dissent is defined by Graham (1986) as "*the effort by individuals in the workplace to protest and/or to change the organisational status quo because of their conscientious objection to current policy or practice*" (Graham, 1986, p.2). The literature argues that principled dissent can be expressed in a variety of ways, for example, through whistleblowing (Hamid and Othman, 2015). Results suggest that principled dissent is expressed by employees from HQs towards their innovation subsidiary colleagues in two very distinct ways that this dissertation labels *envy* and *threat*. These expressions result in a lack of inclusiveness, therefore preventing high-potential innovative input from the subsidiaries being implemented at HQs. HQs employees dismissal of the innovation subsidiary is demonstrated by the following interview excerpt: "*We [at the subsidiary] are very easily dismissed. People in [HQs] just think of us as this strange group in California doing their own thing. That makes us very easily ignored*" (F3). **Envy:** Envy is displayed by HQs employees with regards to the mere existence and location of the subsidiaries. For example, interviewees mentioned the concern that "*everybody [at HQs] sees you [at the subsidiary] as a bunch of surfers in the California sun*" (F1) and that *subsidiary employees sometimes don't get taken seriously by HQs because they "work where other people go on holiday"* (A1). The following interview excerpt further demonstrates the feeling of envy:

*You can imagine, coming from a small town [at HQs], how people think when your colleague leaves to San Francisco and is doing cool stuff. What would you think? "Ah this guy, such a nice life. He is doing cool [stuff]. So much freedom."*

*And then six months later, you call him and say: "Hey, I have a perfect idea, and actually, your boss liked it, so now please take it back and do it." How do you give the feeling to the people at home who are doing a great job every day, and it is just not as sexy as our job, how do you give them the feeling that they are not the team from the bench when it comes to IT innovation? (C1).*

**Threat:** The principled dissent of HQs also manifests as a feeling of being threatened. For example, an interviewee states "*Silicon Valley is very fast-moving and technologically advanced. Everyone there is comfortable with buzzwords like AI, connectivity, cloud, robotics, VR etc. In [HQs], people are more worried about these buzzwords being a threat to their existence. They are afraid it will take away their significance*" (H3). Furthermore, an interviewee provides an example of a successful knowledge transfer from the subsidiary to HQs, which ended up causing trouble with the recipient HQs team:

*It is interesting. When we built this [new infotainment unit] and showed this to our infotainment development team [at HQs]. The head of that team he came here, and we showed them that demo. He was so mad at us. It is a total threat to that department. It's a matter of job security, so he was really upset, and he said to me: "I don't think this is your job. Your job is to find or create a new idea, something that smartphones cannot do, and only cars can do." I was kind of scratching my head and said: "Well, I think that's your job. My job is to show how other technologies from outside are going to disrupt and change the way we do business. (H1)*

As demonstrated, the results are organised by direction from the subsidiary towards HQs and vice versa. In the direction of subsidiary towards HQs, there are four affiliation-oriented ICBs (loyalty, conscientiousness, constructiveness, and advancement), and one challenge-oriented ICB (voice behaviour). In the direction of HQs towards the subsidiary, the only AICB is constructiveness. Data also showed principled dissent - expressed as envy and threat. All results are displayed in figure 4.1 and indicate the dichotomy (disequilibrium) between the individuals in the innovation subsidiary and the individuals in the respective HQs. Moreover, one very important lesson learned from the pre-study is about altruism, which is discussed separately.

### Affiliation-Oriented ICB: Altruism

While the ICB scale includes *altruism* (Autry et al., 2008), the pre-study revealed that the citizenship behaviour of altruism might be misleading in the context of the innovation subsidiaries. In chapter 2, this research indicated that the conceptual boundaries of the distinction between task behaviour and the behaviour, which goes beyond task behaviour are not very settled. Morrison (1994) 's pioneering work shed light on the widely cited "in-role" and "extra-role" behaviours and questioned the discretionary nature of the OCB construct. Her results indicate that the distinction differs based on individuals and groups and that some of the behaviours can be seen as "in-role" rather than "extra-role". Given that "*OCB, as measured, contains elements that observers (even the respondents themselves) would consider part of the job*" (Organ, 1997, p.88), the pre-study revisited the definition of altruism in ICB (Autry et al., 2008). While the definition "*behaviour directed in solving problems or acquiring needed skills/knowledge*" (Autry et al., 2008, p.56) does not indicate the "in-role" behaviours only, it seems that altruism has been coded much more than any other behaviour, showing a disproportionate coding of altruism from the innovation subsidiary towards the HQ. Hence the coding from external coders who coded a secondary dataset according to the definition of altruism might have introduced a bias towards "in-role" behaviours only. As a consequence, the effect of altruism in the context of this study is interpreted with caution and introduces an invaluable lesson for further studies.

As argued in chapter 2 and also derived from the rich literature of organisational psychology, management and organisational behaviour, OCB is still considered distinct from task performance, which makes it explicitly neither directly compoundable to the formal job requirement nor the incentive system. Whereas this study might have introduced a bias towards "in-role" rather than "extra-role" for altruism, all other behaviours were coded without any bias or "one-directional" only. The subtle distinction between task and citizenship behaviours is very important. Failing to recognise the distinction leads to not understanding the holistic performance or the productivity measures used in many research settings (Autry et al., 2008; Campbell Pickford and Joy, 2016; Podsakoff et al., 2000, 2018a; Smith et al., 1983).

## 4.7 Summary

The pre-study aimed to examine inter-individual relationships in a corporate environment where a) distinct thought worlds are inherited b) interactions happen frequently and c) some kind of inter-dependency is present.

From the data analysis, the proposed tension between individuals from different functions who inhabit different thought worlds is observed. Examining the tension through an equilibrium lens, it is evident that individuals from the subsidiary show more affiliation oriented behaviours towards individuals in the HQ function rather than vice versa. The integration between employees in both functions is in disequilibrium. Moorman (1991) and Moorman et al. (1993) warn about the perception of fairness in integrative processes and its influence on organisational objectives. The pre-study indicates some feeling of unfairness from individuals who are not receiving as many affiliation-oriented behaviours as they are displaying. This increases the tension between the individuals and consequently, exacerbates the technology transfer. Furthermore, literature also suggests that unequal and restrictive collaboration work increases the tension between individuals. The restrictive nature of the collaboration is indicated by the individuals of the HQ and the perception of unequal contribution between both functions. There is a clear mismatch of behaviours, which needs to be addressed accordingly. As argued earlier, behaviours can either get to an equilibrium stage as proposed by the equilibrium theory or a redesign of the process from the behavioural perspective can to be taken into consideration. The tension between the innovation subsidiary and its HQs was generally researched from the process-view where optimal technology transfer processes, policies and systems were introduced. This is in line with the general tendency to intervene in the process from the process perspective described throughout the literature streams in chapter 2. However, recent research shifted to the people-side the process and indicated the existence of "*gaps between symbolically adopted policies and actual organisational behaviour*" (Pache and Santos, 2013, p.974). As indicated with the results and discussion, the pre-test of the research proposition appears to be valid. Controlling for a set of pre-defined behaviours and including both functions into the analysis, the results signal a disequilibrium on the behavioural (citizenship) level.

## 4.8 Limitation and lessons learned

Despite promising results, there are limitations of the pre-study, which further research should take up accordingly. One of the main limitations was the spatial distance of both functions. Whereas subsidiaries are located in innovation ecosystems like Silicon Valley, Beijing, Tokyo or Tel Aviv, respective functions in the HQ are located in (mostly) greater spatial distances. Some might argue that the spatial distance makes it difficult to connect and collaborate and also open to develop envy. However, regardless of the spatial distances, the distinction of thought worlds, expressed in contrasting values, norms, beliefs and especially

in terms of purpose between the subsidiaries and their HQs are apparent in the data and the literature (Battilana and Dorado, 2010; Zhang et al., 2008). This research acknowledges the spatial distance factor of the pre-study and implements a rigorous control of this factor during subsequent studies. Another limitation concerns the definition of functions. As mentioned previously, this research adapts the ICB scale, which has close links to the OCB scale and theory. Some might argue that it would have been more appropriate to use the established OCB scale for the research purpose. However, all indications about the differences between the functions indicated that OCB is not appropriate for the research purpose of studying two functions, who inhabit different thought worlds. Neither the ICB nor the OCB scales capture the examined area of inter-functional integration between employees who inhabit different thought worlds. However, the ICB scale encapsulates all early constructs of the OCB theory, and hence, the adaptation of the ICB scale is only adding a "between function" contextual insight. All items were adapted towards the research context accordingly. Thus the justification of using ICB is given. Nonetheless, the lack of an appropriate scale to capture the nuances of the inter-functional integration triggered the aim to develop an appropriate scale for the respective area even more. The last limitation of the study is with regards to fundamental problems of the boundaries of the citizenship theory. By researching somehow inter-dependent functions, the distinction between "in-role" and "extra-role" seems to be more present. While the clear distinction between task and citizenship behaviours have been resolved, and researchers acknowledge the presence of a distinct behaviour alongside task behaviours (Podsakoff et al., 2018a), results of this study point to the issue of altruism in the given context. The given context of the innovation subsidiary, the fact of using a secondary, qualitative dataset and the engagement of non-expert coders might have introduced a coding bias in which altruism from the innovation subsidiary employees towards HQ employees has been coded more often than any other behaviour. Some might even argue that this is the case for other behaviours discovered in the pre-study. The researcher agrees that altruism might be misleading in this case and hence needs to be defined exceptionally well in the given context. However, linking the presence of other behaviours to the given context and the inter-dependency only does neither reflect the nature of the citizenship behaviour nor the data analysis of the pre-study. Definitions, as well as the nature of other behaviours, indicate the "extra-mile". Besides, none of the other behaviours showed one-directional coding tendencies from external coders. Furthermore, if the argument was to be continued further, the absence of behaviours, which were not coded (compliance and tolerance), could not be explained. If the context suggests one-directional citizenship behaviours by default, why were the above-mentioned behaviours never externally coded? The extensive research en-

gagement and the confirmation of the citizenship theory clarified the clear distinction over the last three decades. Nonetheless, the caution about the boundary conditions in the given inter-functional context is one of the biggest lesson learned from the pre-study, which will be very important in the scale development context for defining the items for the proposed IFCB scale.

**Summary 5: Pre-study**

- (a) The proposed tension between individuals from two different functions who inhabit different thought worlds but need to work together is confirmed in the pre-study.
- (b) Controlling for the same behaviours, employees in one function display more behaviours than employees in the other function, creating a behavioural disequilibrium.
- (c) The indication that behaviours play a bigger role in integration is suggested. Processes, rules and policies but might not be sufficient to overcome the challenges and inconvenience in integration.
- (d) The proposed behavioural equilibrium lens seems to be a promising avenue and can be researched by developing an adequate scale.

# **Chapter 5**

## **Scale development - Item generation - Study 1**

This chapter starts with the introduction to measurement scales and explains the methodological development for measurements over time. The increased interest in measuring latent factors and true values of observed phenomena introduced the psychometric scale measurement and established it as a separate methodological paradigm in research. It is a prescribed three-stage procedure and starts with stage 1, item generation, followed by stage 2 which aims to confirm the underlying latent structure using statistical modelling techniques and finalises with stage 3, scale evaluation and testing in which the novel scale is tested in a pre-defined context.

This dissertation devotes one study for each of the stages in which this chapter describes the first stage, item generation in detail and generates an initial pool of items for further analysis.

### **5.1 The art of measurement**

Measurement is a vital element and an ongoing concern in many areas of research. Humans have always been interested in using numbers to research specific phenomena or problems. Early attempts of measurements can be traced back to prehistoric times. Some researchers indicate measurement attempts as early as 2200 B.C. in China where some kind of measurements were taken in civil service assessment (Dubois, 1965). Further, Wright (1999) indicates the use of the weight of seven as a measurement in the antique history, which made up the first taxation approach of the Muslim world. The interest in measurements came with the drawback of obtaining varying values. In early times, a variance of values, which we would currently label as errors - random or systematic - was linked to the scientist and his

skills directly (Buchwald, 2006). In fact, varying values were used in early fields of astronomy, physics and biology but never appropriately documented which would have questioned the adequate skills and as a consequence, the validity and reputation of the scientist. The history of science domain attests those principles to famous scientists like Newton or Graunt who used some kind of an average (different to what we define average now) to capture to the true value of the observed phenomena but never documented the initial, varying values (Buchwald, 2006). But in all fairness to these early scientists, other limitations rather than the skills of the scientist in question might have played a major role in varying values.

The early 18th century treated errors in a more scientific way than the scientist of the earlier times. Mathematical statistics with, such as Daniel Bernoulli emerged but still did not theorise the distinction between systematic and random error. Only Karl Pearson, who is regarded as the "*founder of modern statistics*" (Allen and Yen, 1979, p.3) made the distinction possible and opened up the pathway for other research streams to start measuring latent variables and get the true meaning of errors (DeVellis, 2011). Concerning the statistics used for this dissertation, Stanley Smith Stevens and Louis Leon Thurstone created the domain of modern managerial, social and psychological measurement (Nunnally, 1994). Stevens (1946) introduced the differentiation of measurement scales (nominal, ordinal, interval, and ratio scales) and Thurnstone applied those methods in psychology and introduced the technique of factor analysis which is a fundamental element of psychometric measurement techniques (DeVellis, 2011; Nunnally, 1978).

### 5.1.1 Psychometric measurement scales

Scholars treat modern psychometric measurement techniques as a separate methodological paradigm, which supports measurement in many areas of management, social science, psychology, as well as parts of engineering (Duncan, 1984). Phenomena are mostly theory-driven in which measuring the indicators of the phenomenon contains errors which could tamper the actual relationship. Lord and Novick (2008) suggest this as the main "*motivation [for] the development of methods of adjusting correlations for error-induced attenuation and stimulated the development of measurement theory as a distinct area of concentration*" (Lord and Novick, 2008, p.69).

The established technique to account for errors in the actual relationship is called psychometric measurement. Researchers are constantly developing new psychometric scales, but they are not interested in developing a new measurement scale for each phenomenon per se. The reason for a new measure is the lack of off-the-shelf measurements tools and scales

which are either inappropriate or unavailable (DeVellis, 2011). Adopting a measure, which somehow fits the theorised phenomena, yields the risk of inaccurate measurement and correlations. New scale development is the only remaining solution to equip the researcher with an appropriate tool for the intended research approach. The abstract relationship between hypothetical constructs, as well as the nature of the measure, which cannot be obtained directly, makes measurement scale essential for researching complex psychometric and behavioural phenomena. However, developing a new measurement scale requires a deep understanding of the nuances of the theory and domain, which is fundamental for a successful scale development (DeVellis, 2011).

### 5.1.2 Measurement scale

A *measurement scale* is a proxy of the actual phenomenon of interest. It contains a collection of *items* combined to a composite scale which aims to reveal the theoretically developed relationship that cannot be measured directly. An item in the measurement scale language is the operationalised question a researcher asks in surveys to measure the variable of interest. There are cases in which a single item can assess the underlying phenomenon very well. However, in most of the cases, the phenomenon is complex and requires an assessment of multiple factors, which is labelled *latent variable*, *latent factor* or *latent construct*. A latent construct is a "*collection of items whose values are caused by an underlying construct*" (DeVellis, 2011, p.17). Hence, a scale is (mostly) measured by multiple latent constructs, which consist of multiple items. A very well-defined illustration is the mental ability test scale by the HolzingerSwineford dataset (Holzinger and Swineford, 1939). Figure 5.1 shows a simplified snapshot of the scale with its latent constructs and respective items. Three latent constructs (visual, textual and speed) with three items per construct form the mental ability measurement scale. Using multiple items for a latent construct and multiple latent constructs to measure the essence of the phenomenon gives a scale the degree of precision that neither a single latent construct nor a single item could attain (Schwab, 1980). Latent constructs, as well as items, are grounded in the nuances of the literature and proxy the practical phenomenon.

As indicated earlier, the development of psychometric measurement scales follow a prescribed and well-established procedure. Through multiple steps, data triangulation and methodologies, (1) items are generated which (2) statistically constitute a scale and (3) can be evaluated and tested in a pre-defined context. Following DeVellis (2011); Hinkin (1995); Likert (1961); Schwab (1980), this study is devoted to the stage 1, item generation.

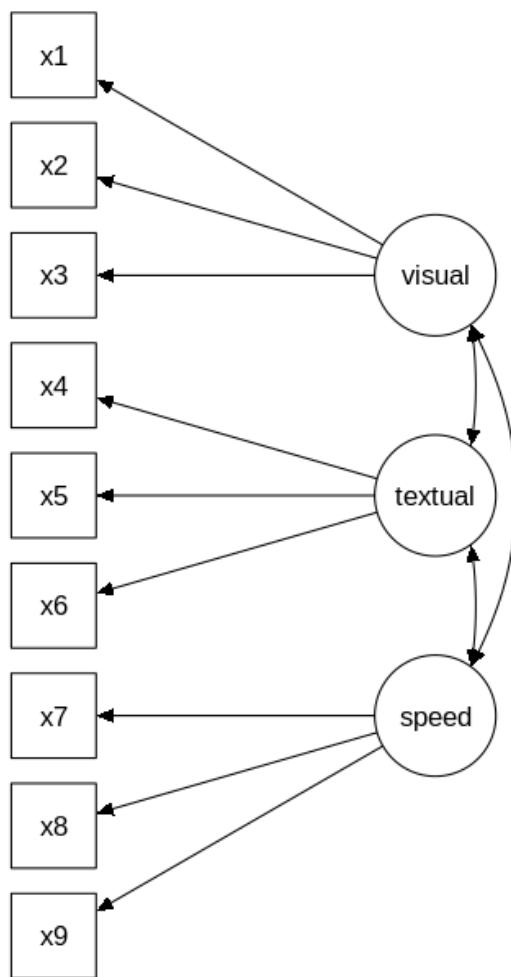


Fig. 5.1 Exemplary latent structure illustration for mental ability - (Holzinger and Swineford, 1939)

## 5.2 Stage 1 - Item generation

The primary concern of this stage is content validity. The aim of stage 1 is to develop items for the theorised scale and ensure the objectivity of latent constructs, items, as well as an items' classification to its latent construct. This stage is the minimum psychometric requirement for measurement adequacy (Schriesheim et al., 1993). Items must adequately capture the theorised constructs, the theory which it tries to establish and the phenomenon it tries to proxy. However, the highly quantitative procedure of scale development starts with a process where neither an accepted quantitative method nor indicator seems to exist (DeVellis, 2011; Stone, 1978). Items are developed with the help of methodological and data triangulation. In this sense, the better the domain of interest is defined, specifying boundaries and related construct, the easier the process of item generation will be (Boateng et al., 2018). Broadly, there are two basic and established methods for item generation: deductive and inductive item generation (DeVellis, 2011; Hinkin and Tracey, 1999).

### 5.2.1 Methodology and research design

There are multiple publications which commit to the inductive (Butler, 1991) and the deductive method for item generation (MacKenzie et al., 1991). This research introduced both methods in Chapter 3, where the *inductive method* was defined as a bottom-up approach where data is analysed without prior theoretical foundation nor a hypothesis (Creswell, 2003). For the process of item generation, qualitative research methods, such as interviews, focus group research or observations, are appropriate. By contrast, the *deductive method* aims to generate hypotheses and theories by screening the literature. Hinkin (1995), in his meta-study, indicated that 83% of the studies used deductive, 11 % the inductive and 6% a mix of both methods. However, his study is by this time three decades old, and it is considered best practice to combine both deductive and inductive methods in recent times (DeVellis, 2011). The deductive method offers the benefit of knowledge accumulation. The base theory is the citizenship behaviour, and recent progressions and adaptations, such as inter-organisational citizenship (ICB) (Autry et al., 2008; Gerke et al., 2017), the customer-citizenship behaviour (CCB) (Langner and Seidel, 2014), project citizenship behaviour (PCB) (Braun et al., 2013) and environmental citizenship behaviour (ECB) (Robertson and Barling, 2017) share the proxy to it. The development of items from theory increases the construct validity of research as existing research and items have already passed all of the required steps of holistic validity and reliability (Hinkin and Tracey, 1999). However, scholars also argue that the theoretical view of any researcher should not be limited to the domain of interest. The inductive method

allows the researcher to be open to any other theoretical underpinning, behaviours and subsequently items from, for example, expert interviews (DeVellis, 2011).

Including both methods introduce redundancy in the initial pool of items which is, de facto, beneficial in the first stage of the scale development process (DeVellis, 2011). Including more items, as well as items from proxy constructs, which are seemingly unrelated, benefits the process as successive evaluation takes care of the undesirable items. There is no agreed degree of redundancy. Some argue that redundancy in the pool of initial items can be four or five times as the final version, some argue for twofold and some others for at least half of the final score (DeVellis, 2011; Schwab, 1980). In general, 'the more, the better' approach can be followed for the initial item pool. However, the administration of the initial pool gets more difficult with a higher number of items, especially if a deductive approach is chosen and items are discussed with a team of domain experts (DeVellis, 2011). In this case, the principal researcher should eliminate undesirable items progressively. To get satisfactory results by stimulating the mind of the respondents, the wording of items need to be comprehensive, simple and unambiguously. The aim is to avoid the mental laziness which may lead to the misunderstanding of the true intention of a question, search and integration of information in a less comprehensive way, or select a less precise response (DeVellis, 2011; Hinkin and Tracey, 1999; Likert, 1961).

In order to meet all requirements and follow best practises, this research adopts, in line with the overall research design, a mixed-method approach for item generation (please see figure 5.2 for an illustrative summary of the item generation).

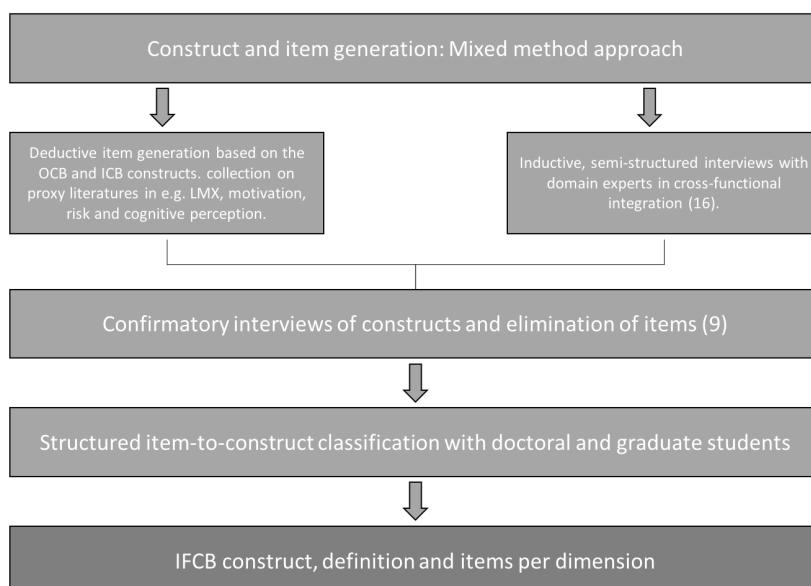


Fig. 5.2 Research design for item generation

### 5.2.1.1 Deductive item generation

The first collection of items started with the research in the OCB stream in which the proposed IFCB scale is linked. Several items from Graham (1991, 1986); Organ (1988); Smith et al. (1983) are still used in multiple recent publications, and thus, this study includes these to the initial pool of items (Gerke et al., 2017; Mackenzie, 2015; Podsakoff et al., 2009, 2011). Scholars refer to these constructs as the early conceptualisation of OCB. The meta-study by Podsakoff et al. (2014) conclude that these are still among the most used constructs in citizenship research. Podsakoff et al. (2014) indeed gives another key route to follow. Their meta-analysis summarises major publications in different areas of OCB research, lists commonly used OCBs and hints to important theoretical lenses. Through cross-readings of the leader-exchange, the motivation, perception and risk literature, items were added to the initial pool. Furthermore, recent citizenship scale adaptations nurtured thoughts and contributed with items (Autry et al., 2008; Braun et al., 2013, 2012).

### 5.2.1.2 Inductive item generation

The deductive item generation was supported by semi-structured interviews. 16 interviewees represented a range of different industries including the automotive, automation, chemical, electrical and wind energy as well as the elevator, heating and cooling technologies (please see table 5.1 for the sample description). These industries are classified as high innovative industries, according to the ZEW – Leibniz Centre for European Economic Research ([www.zew.de](http://www.zew.de)). ZEW classifies industries by a high R&D to sales ratio (Cohen et al., 2000; Duguet and Kabla, 1998; Research, 2011), which helped to design a sample which fits the context of inter-functional integration. By including several industries, this study follows the approach of "*diverse theoretical sampling*" to explore a pattern across industries and to increase the scope of items (Eisenhardt, 1989, p.537). Furthermore, based on the high R&D to sales ratio, the chosen industries are likely to generate more interactions and likely to have established integration processes in place.

During the semi-structured interviews with domain experts, several questions about the cross-functional settings in engineering, technology and innovation management, strategy, IP and manufacturing were asked. For the triangulation of the results, data were collected from all functions separately. Firm and interviewee names were anonymised to fulfil ethical considerations, and interviews took approximately 45 minutes each. The data collection stopped after the 25th interview as a theoretical saturation in the data output was perceived (Fusch and Ness, 2015). Additionally, two workshops were conducted to gather more in-depth data.

One workshop was conducted virtually utilising the online workshop software Stormboard ([www.stormboard.com](http://www.stormboard.com)). The other workshop was conducted at the firm's HQ.

All interviewees gave insights to citizenship behaviours in the cross-functional setting. In the additional part of the semi-structured interviews, interviewees confirmed the items which this study have had generated deductively from the literature.<sup>1</sup>

### 5.2.1.3 Item confirmation and classification

In the next step, an additional sample of 9 domain experts supported this study by confirming all remaining items during confirmatory interviews. The aim was to eliminate items and naturally reduce the number of items for further testing. Interviewees were asked about the items, the item-latent construct classification and the applicability of the item in cross-functional settings. In a final step, doctoral and graduate students supported the interactive item-construct classification in which this research followed the method of MacKenzie et al. (1991) in using the cutoff of 80% for a successful mapping (please see figure 5.2 for an illustrative summary of the item generation)

Table 5.1 Sample description of study 1: item generation

Case	Subsid. # employees	Industry	Interviewee
A	> 10,000	Chemical	IP manager
B	> 20,000	Automation	Head of IP; Head of R&D
C	> 40,000	Electrical	Vice president; Innovation scout
D	> 70,000	Automotive	Sales; Innovation manager
E	> 90,000	Automotive tech	Head R&D business unit
F	> 3,000	Wind & Energy	IP manager
G1	> 20,000	Manufacturing	Strategy&Manufacturing manager
G2	> 40,000	Elevator tech	Strategy manager&IP manager
G3	> 4,000	Automotive	Strategy manager&service manager
H	> 10,000	Heating tech	Director R&D; product manager
I	> 10,000	Heating tech	Requirements engineer; CTO
J	> 5000	Explosives chemicals	R&D (2x); Technology manager (3x)

<sup>1</sup>Note that the process focus of this study was presented together with the Master student Lilian Hardorp, l.hardorp@gmail.com at the R&D Management Conference 2019 in Paris, France.

### 5.2.2 Data analysis

This study used multiple methods for data analysis. Firstly, a classical snowball method in the deductive part of item generation was followed. By starting with the key publications of Graham (1991, 1986); Organ (1988); Smith et al. (1983), additional publications were examined. The meta-analysis of Podsakoff et al. (2014) introduced a valuable asset to expand the theoretical view, which suggested additional major publications.

For the inductive part of the research, the thematic network analysis by Attriade-Stirling (2001) helped to arrange the data in multiple themes of activities and behaviours. This approach is very similar to the coding principles of Easterby-Smith et al. (2015); Miles and Huberman (1994); Yin (2009) but instead of order codes, thematic network maps textual data into organising and basic themes which are linked to the general theme of the research (see figure 5.3). The thematic network analysis approach shares common features with many approaches in qualitative research. Scholars link the conceptual foundations of this approach to, e.g. grounded theory (Glaser, 1978; Strauss and Corbin, 1990) and many other qualitative analysis approaches of, e.g. Creswell and Creswell (2017); Miles and Huberman (1994) or Lincoln and Guba (1985). However, Easterby-Smith et al. (1994) clearly pinpoints thematic network analysis to the argumentation theory proposed by Toulmin (1958) in which a structured analysis is done to "*unearth the themes salient in a text at different levels*" (Easterby-Smith et al., 1994, p.387). Similar to order codes, a systematised approach on different abstraction levels is essential. Basic themes are the lowest-order themes found in the textual data which are mapped to organising themes. Organising themes are thus middle-order clusters made of basic themes which indicate similar textual patterns in the data. All organising themes are mapped to a global theme which is the super-ordinate topic of the data. The result is a web-like (network) illustration of the textual data on multiple abstraction levels.

## 5.3 Results and discussion

### 5.3.1 Results and discussions from the deductive item generation

The deductive item generation pointed out to the early conceptualisation of OCB and suggested 12 different constructs which are highly used in OCB scholarship (please see table 5.2 for the list and definition of the constructs). By further reading the item definitions and descriptions, a high overlap among the latent constructs has been observed.

Table 5.2 Common OCB constructs

OCB	Definition
<b>Altruism</b>	Helping behaviour that involves voluntarily helping others with, or preventing the occurrence of, work-related problems.
<b>Courtesy</b>	Discretionary behaviour of an individual aimed to prevent work-related problems with others from occurring.
<b>Peacemaking</b>	Behaviour that helps to solve conflicts between employees and between employees and organisation.
<b>Cheer-leading</b>	Behaviours and gestures of encouragement and reinforcement of coworkers' accomplishments and professional development.
<b>Sportsmanship</b>	A citizen-like posture of tolerating the inevitable impositions and inconveniences of work without complaining.
<b>Loyalty</b>	Identification with and allegiance to organisational leaders and the firm as a whole.
<b>Compliance</b>	A more impersonal form of conscientiousness that is indirectly helpful to others: doing what a good employee ought to do.
<b>Individual Initiative</b>	Conscientiously performing tasks by voluntarily going above the minimum required level.
<b>Self Development</b>	Taking steps to improve knowledge, skills, abilities to be better able to contribute to organisational goals.
<b>Civic virtue</b>	Responsible, constructive behaviour. Involvement in organisational governance processes.
<b>Voice behaviour</b>	Promotive behaviour that emphasises the expression of constructive challenge intended to improve rather than merely criticize”.

Podsakoff et al. (2000), in their critical review, acknowledge the rapid growth of the citizenship behaviour landscape but criticise the misuse and the continuous addition of constructs which cause overlaps and dilute the citizenship literature. In their review, they aim to summarise constructs and suggests 7 constructs which include most of the 12 constructs described in table 5.2:

**Altruism**: Altruism is one of the most important constructs in OCB research (Organ, 1988, 1990b). Podsakoff et al. (2000) postulates that altruism "*has been identified as an important construct by virtually everyone who has worked in OCB*" (Podsakoff et al., 2000, p.517). Indeed, the literature screening indicated that altruism, sometimes referred to as *helping behaviour*, plays a significant role in OCB research. Podsakoff et al. (2000) suggests that the definition of altruism can be interpreted as helping per se and behaviours to prevent the creation of problems for coworkers. They bundle *courtesy, peacemaking and cheer-leading* and suggest altruism as a multi-dimensional construct, which has been empirically confirmed in many occasions (Graham, 1986; MacKenzie et al., 1991; Podsakoff et al., 2000; Van Scot-

ter and Motowidlo, 1996). As indicated in chapter 2, integration is challenging to manage as problems and inconveniences arise due to the heterogeneity of knowledge, activities and goals. In the cross-functional setting of this dissertation, altruism can be an adequate linker between the process-oriented and the people-oriented tradition and mechanisms.

Cheer-leading: Cheer-leading is about encouragement. The closeness to altruism as indicated above cannot be denied; the encouragement part of cheer-leading is a phenomenon, which could be potentially very important in CFI. Although Podsakoff et al. (2000) suggestion to bundle this construct with altruism is well-established in organisational settings, this dissertation, taking the definition of cheer-leading into account, disregards the inclusion of that construct into the bundle of altruism and aims to examine its sole existence in the inter-functional context during the inductive part of stage 1.

Sportsmanship: Sportsmanship is another construct which belongs to the early conceptualisation of Organ (1988, 1990b) and research has shown a high level of distinctness over time (Podsakoff et al., 2000). Showing sportsmanship in inter-functional work can play a significant role in maintaining a good relationship when processes are integrated, and deliverables are inter-dependent.

Loyalty: Loyalty includes boosterism, a behaviour, which is not very well-established in OCB research (Podsakoff et al., 2000). Loyalty, including boosterism, entails the promotion of the organisation to external stakeholders and the identification with organisational aims and its leaders under uncertain times (George and Brief, 1992; George and Jones, 1997). Construct definition is aimed at external stakeholders and should not play a role in the inter-functional context. However, loyalty also aims to maintain the relationship under uncertain times, which can be important in cross-functional work, especially when working under deadlines and constant competitive pressure. Thereby, loyalty and its items are included in the analysis to increase potential redundancy.

Compliance: Podsakoff et al. (2000) suggests a further construct, the construct of compliance. Compliance is another multi-dimensional construct, which involves obedience, goodwill, job dedication, loyalty (including boosterism) as well as an element of cheer-leading (Borman and Motowidlo, 1997; Graham, 1991). Compliance can be traced back to Smith et al. (1983) and shows high redundancy with other constructs as described above. Nonetheless, the link to the early conceptualisation of OCB, its potential effect in inter-functional work and the multi-dimensional aspect makes compliance an adequate construct for the aim of this dissertation. Items are included and could also serve the aim of redundancy.

Individual initiative: Individual initiative is the fifth construct suggested by Podsakoff et al. (2000) and includes conscientiousness and personal industry, two constructs aimed to per-

form above and beyond expectation (George and Brief, 1992; Graham, 1989; Moorman et al., 1993). This multi-dimensional construct might be highly relevant in the context of infer-functional work, as it involves overperformance in task-related matters. Furthermore, voluntary creativity and commitment to innovation are associated with it, and therefore, it is included for further testing.

Civic virtue: The forelast construct is civic virtue, a behaviour, which involves organisational participation, job dedication, and making suggestions (Graham, 1989; Organ, 1988; Podsakoff et al., 2000). This multi-dimensional construct might be highly relevant in integrative work as it includes all main elements of cross-functional integration and showed great distinctiveness over time.

Self-development: The last suggestion of Podsakoff et al. (2000) is self-development. This construct concerns the steps taken by an employee who voluntarily improves his/her skills and knowledge base to be able to participate in integrative work (George and Brief, 1992). This construct might be highly appropriate in the cross-functional setting, especially given its potential to close the gap in the area of heterogenic knowledge.

In summary, the seven constructs summarised by Podsakoff et al. (2000) seem to comprehensively capture the most cited, most influential and deep-rooted citizenship behaviours in research. However, an additional construct, which has been controversially discussed in the literature, is voice behaviour.

Voice behaviour: Podsakoff et al. (2000) did not mention voice behaviour in their critical review even though it could be highly relevant in citizenship research (Van Dyne and LePine, 1998). Voice behaviour deals with promotive behaviour that emphasises the expression of constructive challenge intended to improve rather than merely criticise. Van Dyne and LePine (1998) indicate a positive effect of voice behaviour across three different ratings, namely supervisor, peers and employee ratings in longitudinal data, and Ekrot et al. (2016) summarise the positive effect of employee voice behaviour on organisational portfolio success. However, despite these results, voice behaviour is still controversially discussed. Among the most discussed drawbacks is the high correlation of voice behaviour with other constructs (Podsakoff et al., 2009, 2018a). Many of the items proposed by Van Dyne and LePine (1998) can be exchanged with items in altruism and also in civic virtue. All three constructs share elements in engagement in constructive behaviour, such as constructive feedback in addition to suggestions (Podsakoff et al., 2014).

Mackenzie et al. (2011); Podsakoff et al. (2018a); Van Dyne and LePine (1998) suggest adopting only one of the highly correlated constructs. Voice behaviour, despite being an old construct, has still not been thoroughly researched. Yet, altruism and civic virtue belong to

the earliest conceptualisation of OCB and proved their distinctness over many decades. The inter-functional context is a novel area of research, and having a poorly defined construct could potentially weaken the results. Podsakoff et al. (2018a) indicate that "*when constructs are operationalised differently but simultaneously draw on a similar pool of items, one must be cautious of the jangle fallacy, which occurs when two ostensibly distinct psychological constructs appear different by virtue of their names but in essence represent the basic phenomena*" (Podsakoff et al., 2018a, p.37). This research examined the similarity of the items in the literature. The pre-study indicated the presence of voice behaviour, but the comprehensive coverage of the seven behaviours, as well as the high inter-correlation of voice behaviour with multiple, deep rooted constructs, justifies the exclusion of voice behaviour from this research. In summary, voice behaviour is dismissed from this dissertation. Altruism and civic virtue are taken forward to the inductive part of item generation where particular attention is given to its "extra-role" distinction of altruism as indicated by the pre-study.

The remaining 7 constructs and their corresponding items comprehensively cover the four-decades-old literature in OCB. These were taken forward to the semi-structured interviews for further discussion and elimination: (1) *Altruism*, (2) *Sportsmanship*, (3) *Organizational Loyalty*, (4) *Organizational Compliance*, (5) *Individual Initiative*, (6) *Civic Virtue*, and (7) *Self Development*. Additionally, *cheer-leading* will be tested during the semi-structured interviews.

### **5.3.2 Results and discussions from the empirical research**

#### **5.3.2.1 Exploratory and inductive interviews**

The 16 semi-structured interviews were exploratory and also confirmatory. In the exploratory part of the interview, general questions about the inter-functional integration were asked. The researcher guided the interview with a pre-set of questions (e.g. How do you communicate with the other function? Is your interaction with the other function based on a regular schedule? Does your function provide training for the other employees or vice versa? Is there an agreed process for the interaction?) (please see Appendix B for the full set of question). The aim was to foster a discussion in which interviewees indicated specific behaviours and items. In the confirmatory part of the interviews, interviewees were asked about their expertise regarding the 7 constructs and items derived from the literature.

The exploratory interview data was mapped using the thematic network analysis method proposed by Attride-Stirling (2001). Having the global theme of CFI in mind, two middle-order organising themes were discovered in the textual data. Both organising themes, *job*

*dedication* and *participation* were indicated by various basic themes. However, scholars for long had already discussed their presence organisational behaviour and citizenship research.

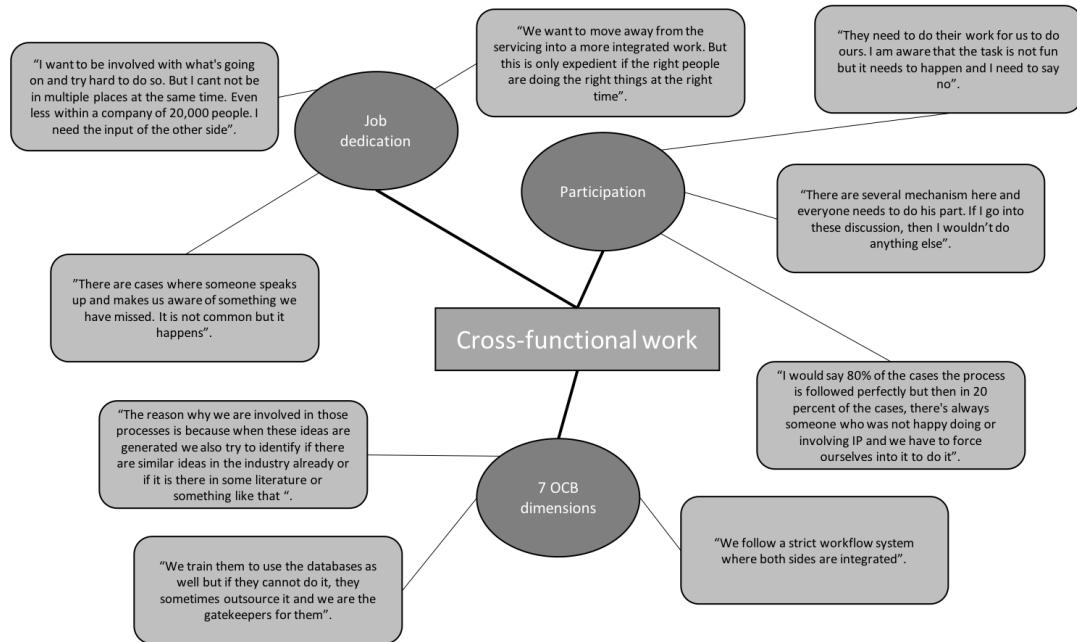


Fig. 5.3 Thematic network analysis of exploratory interviews

The summary of the first organising theme is labelled as *job dedication*. It involves the commitment of employees to inter-functional integration beyond what is expected from them. Interviewees indicated the importance of mutual commitment and motivation to integrate and mentioned that the lack of commitment hampers interaction. Some interviewees indicated the need to be involved in as many projects as possible. Others acknowledged the lack of interest and urged for this to change. These thoughts are supported by quotes from interviewees in figure 5.3. Three basic themes are linked to the organising theme of job dedication.

While these thoughts are precious, they represent an underlying phenomenon, which general OCB research labels as *individual initiative* and *altruism*. Following Podsakoff et al. (2018a) and by cross-checking items, job dedication appears to be not distinct enough from the other constructs and therefore, this study excludes job dedication as an additional construct from further analysis. Another construct and organising theme, which emerged from the interviews is labelled as *participation*. Inter-dependencies between employees from different functions are based on heterogenic activities. Interviewees insisted on the importance of adhering to the process and doing the job by thinking about the other function. Three basic themes support the existence of the organising theme labelled as participation. These thoughts are in line with the OCB literature and scholars like Graham (1991) who researched organisational obedience,

job dedication researched by Van Scotter and Motowidlo (1996) and the compliance construct of Smith et al. (1983). As indicated in section 5.3.1, Podsakoff et al. (2000) bundled those constructs in his definition of *loyalty*. The item pool of loyalty captures the indications of the interviewees very well. As a consequence, the participation is also dismissed as an additional construct from further research.

The remaining part of the semi-structured interviews were confirmatory. A structured focus on the 7 constructs from the literature were discussed and thoughts about items from the literature were generated. Interviewees commented on the item pool, which was derived from the literature and the potential effect of the specified behaviours on integration (please see appendix A for the initial item collection).

### **5.3.2.2 Confirmatory interviews for item elimination and item-construct classification**

The initial item generation revealed 52 items and 7 constructs, derived from the literature and the 16 semi-structured interviews with domain experts from high-innovative industries. These 52 items were subsequently analysed with the help of an additional set of domain experts (9 confirmatory interviews). Interviewees confirmed the previous constructs, eliminated items and examined the item-construct classification. The final item pool consisted of 28 items, classified into 7 constructs.

#### **Civic virtue - Inter-functional constructiveness**

This construct is one of the early conceptualisations by Organ (1988) and interviewees indicated high importance of civic virtue for cross-functional affairs. It describes the general interest of an employee towards the integration process as a whole, including constructive involvements and behaviours. Interviewees confirmed that an individual, who is committed joining inter-functional meetings and policy debates, expresses his/her opinion and proactively shares information or introduces his/her network of relevant people and resource to the respective function is highly valuable and would support the functioning of the integration.

*"There are cases where my organisation performs poorly in an area and colleagues from the other function introduced someone of immediate help to us"* (G2); *"In 20 years, yes, you build a network of which can be of help"* (F1); *"We have 60 commissions and the money we are spending, yes, are not peanuts. I expect them to join [the meetings]"* (C2).

Podsakoff et al. (2000) supports this thought and argue that civic virtue reflects an individuals' recognition of being a part of the larger whole. Furthermore, Graham (1989) hints to organisational participation and George and Brief (1992) to protection when talking about civic virtue. Interviewees condensed the seven items, which went into the initial item pool to four main items which establish the civic virtue construct. The name civic virtue was cross-checked with interviewees. A majority expressed a more meaningful name in which the researcher adapted the name towards Autry et al. (2008)'s nomenclature of ICB and adjusted the definition to cross-functional integration accordingly. Figure 5.4 shows the root of the *constructiveness* construct, the adjusted definition, examples and the items which will be tested statistically in study 2.

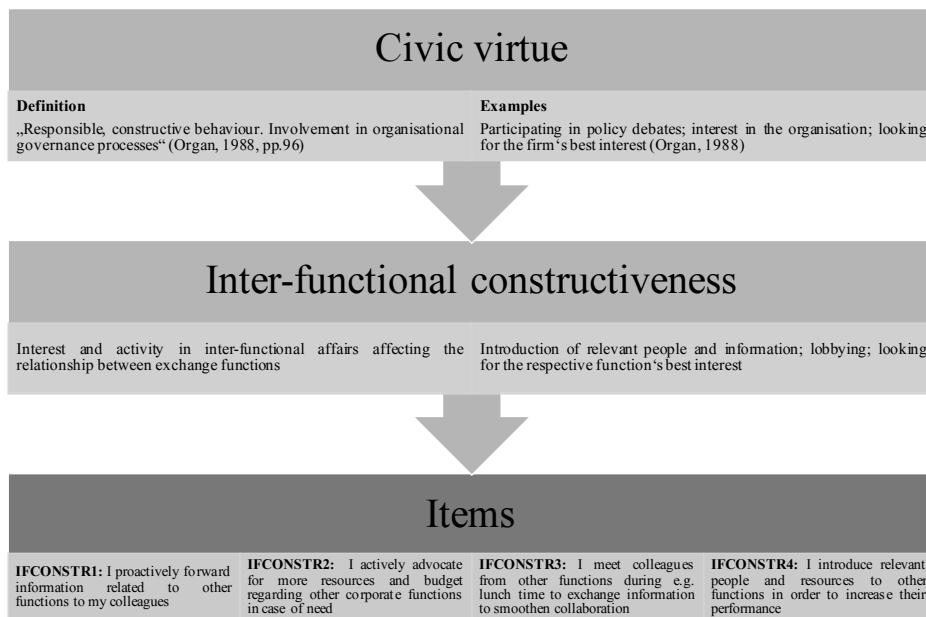


Fig. 5.4 Conceptualisation of inter-functional constructiveness

### **Compliance - Inter-functional compliance**

The compliance construct was controversially discussed among interviewees. Despite its long tradition in OCB, rooting to the original contribution of Smith et al. (1983), interviewees did not see an immediate value of compliance, which would directly support task performance in CFI. As indicated by Williams and Anderson (1991) and Morrison (1994), the adherence to company rules was seen as something to happen by default. Graham (1991) refers to this behaviour as *obedience* and not following company rules and policies was regarded as fraud by some of the interviewees. Research generally reported a high distinction for compliance. In cross-functional integration, compliance might indeed be important and can be operationalised in information sharing, general obedience in rules and policies, and the respect of functional boundaries and aims. However, research argues that employees do not scrupulously adhere to policies, rules and processes all the time (Podsakoff et al., 2000). Nonetheless, interviewees were sceptical about inter-functional compliance behaviour:

*"The process is pretty much defined. Can they even go beyond that?" (G2);  
Sometimes, I get a half-baked solution, a boogey of work. But I need to deal with it" (G3). "In any case, the information about this manner is mission critical. Not sharing would be not doing the job" (A1).*

Following the guidance of redundancy (DeVellis, 2011), the long and rooted history and further steps in which this construct can fail statistically, this study includes inter-functional compliance with four items shown in figure 5.5.

### **Helping behaviour - Inter-functional altruism**

Altruism is another deep-rooted construct, which was proposed by Organ (1988). It attracted high attention of the interviewees as it was regarded as a fundamental behaviour, which summarises the cross-functional integration.

*"Helping? Well, that's the daily business" (G3); "We do not have anyone working between us. We have a direct link. That is the beauty of this collaboration. We can go and clarify. I have seen other organisations working differently. But I like this more" (G2); "Sometimes, I just know what they want. I do it to and they appreciate" (G2); "I know they are extremely busy, with direct pressure from the customer. I try to help wherever I can but they also know what to do already" (I1).*

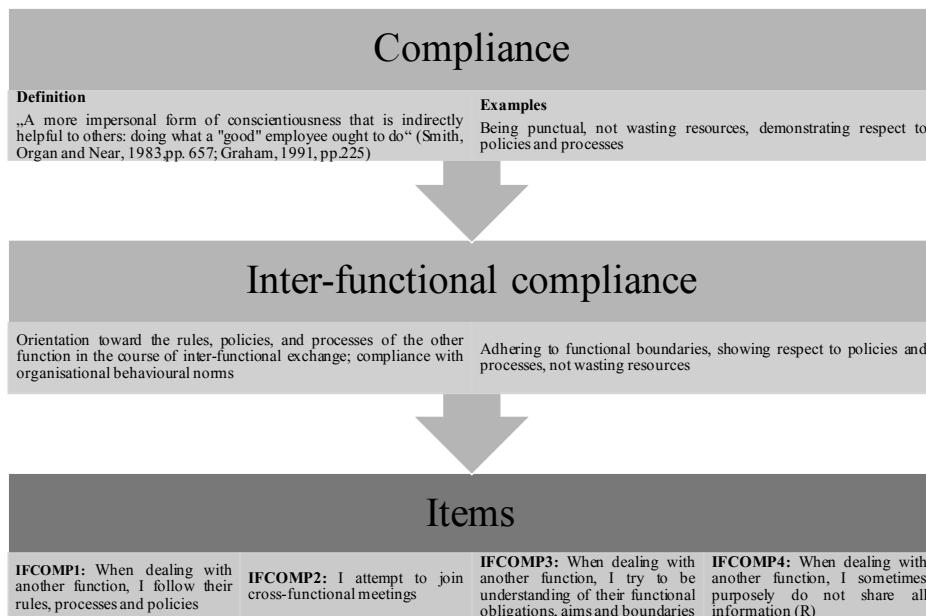


Fig. 5.5 Conceptualisation of inter-functional compliance

This quote is indeed in line with research. The construct of altruism bundles many behaviours which researchers tried to establish as sole behaviours over time. Podsakoff et al. (2000) summarise that among others, courtesy, peacemaking and cheer-leading are measured by altruism. Empirical research confirms that all of the sub-behaviours can be measured by a single factor, which OCB research summarises with altruism. This study paid special attention to this behaviour due to the lessons learned from the pre-study. The distinction of "in-role" and "extra-role" was the key topic during the interview phase in which interviewees confirmed the distinction and its applicability in inter-functional settings. Interviewees described helping out a colleague from another function to solve problems and supporting in learning new skills as altruistic behaviours in cross-functional settings.

Cheer-leading aroused the interest of this study as a sole construct. However, this thought was denied by many interviewees in the relevant cross-functional setting. Thus, cheer-leading is dismissed as a sole construct for this dissertation. Figure 5.6 summarises the pathway of altruism.

### Individual initiative - Inter-functional conscientiousness

Among the initial five constructs of Organ (1988), the notion of individual initiative highlights the voluntary aspect of over-performance. Conscientiousness is the "extra-mile" Organ (1988) proposed in his conceptualisation. interviewees expressed high interest in the concept of the "extra-mile". The voluntary approach of conscientiousness indicates that employees need to

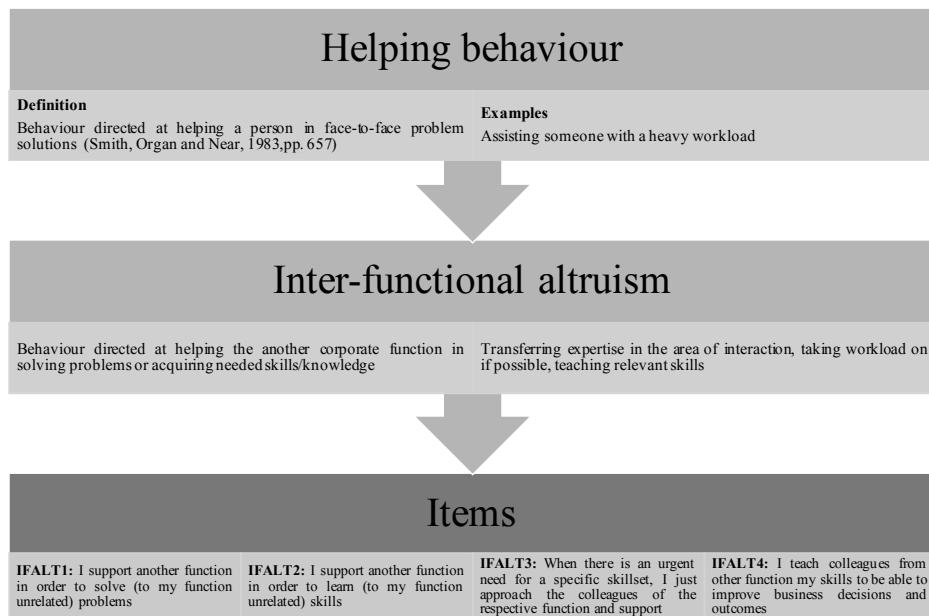


Fig. 5.6 Conceptualisation of inter-functional altruism

go beyond what is required from them. Integrative work challenging, and it involves multiple, inter-dependent activities. The interactions are sequential and even circular and ensuring that the involvement runs smoothly by monitoring activities or delivering additional information to smoothen the process have been described as ideal behaviours for inter-functional integration.

*"I know they are extremely busy, with direct pressure from the customer. I try to help wherever I can but they also know what to do already" (I1); "Of course I am interested in whats happening. I take the phone and call" (F1); "I know the business, they know the business. We know our areas of priority. If there is something I know, I tell. If there is something we need to do better, I tell" (G3); "We do not do half-baked stuff. Depends on the time horizon, we give them what they want. Mostly non-textual. Graphics so they understand better" (G3).*

This behaviour has a long history in research, and scholars have controversial arguments about its use. Organ (1988) himself implied that the distinction of this behaviour from others is more difficult. There is empirical research for and against the distinction, and some of the key researchers in OCB did not include the construct into their work (MacKenzie et al., 1991; Podsakoff, 1994). Nonetheless, the positive feedback from the interviewees as well as the hint from the pre-study towards its adequacy gave enough evidence to involve it for further analysis further. Figure 5.7 shows its link to the OCB theory and the items.

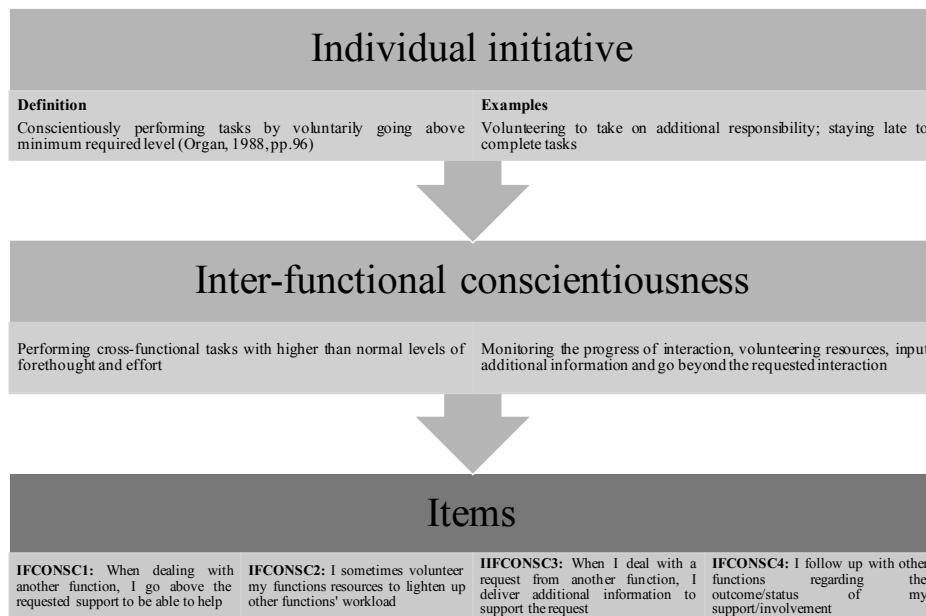


Fig. 5.7 Conceptualisation of inter-functional conscientiousness

### Loyalty - Inter-functional loyalty

Loyalty is another construct, which was highly discussed during the confirmatory interview phase. Aligned with scholars, some were in favour of its uniqueness, and some others did not see any use of loyalty in cross-functional interactions (Podsakoff et al., 2000). The confusion among interviewees was based on the definition of loyalty in the inter-functional context. Generally, researchers include the external factor of loyalty into their conceptualisation and definition (Borman and Motowidlo, 1997; Motowidlo and Van Scotter, 1994). Protection, defending and, goodwill were used to describe how loyal an employee is towards his/her employer outside of work time. The original definition of loyalty puts the leader in the focus of attention which is dismissed by the interviewees for the context of this study.

*"They do not have anywhere else to go" (G2); "Based on the criticality of the projects, this needs to be done with us. They cannot outsource" (G2).*

The adaptation of the definition towards the commitment in uncertain times changed the mindset of the interviewees and items in favour of loyalty were developed.

*"Budgets are controlled more. We are spending a lot. Sometimes, we need to make sure that we focus and they can help" (A1)*

Figure 5.8 summarises the loyalty construct.

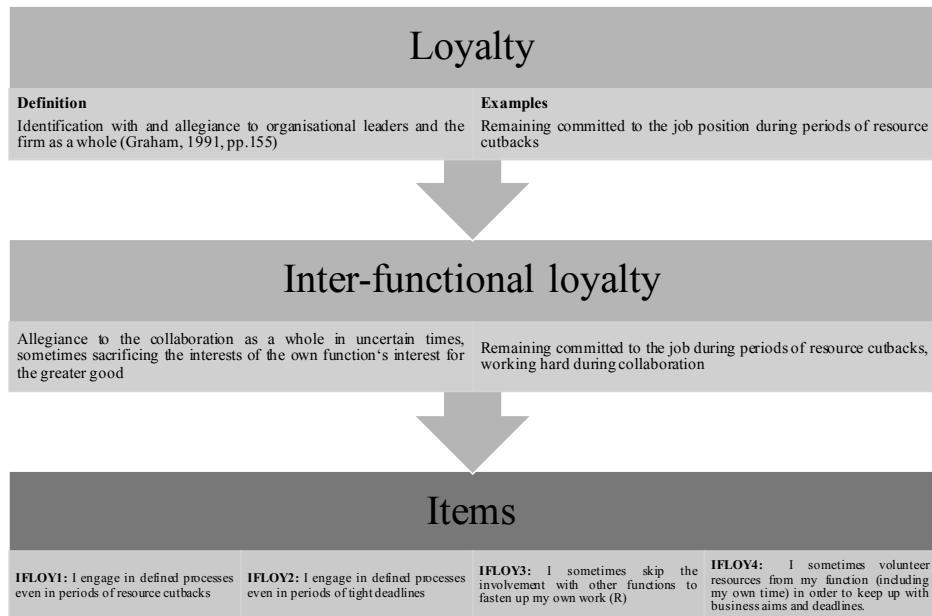


Fig. 5.8 Conceptualisation of inter-functional loyalty

### Self development - Inter-functional advancement

Interviewees acknowledged the importance of continuous advancement and self-development but were not able to confirm this in cross-functional work. Most of the self development in employees are more individual than integration focused, and the link to cross-functional integration cannot be expressed easily.

*"Well, of course we want training. Makes us more attractive internally and externally" (A1); "What role does my personal education play in integration? I think that link does not exist" (F1); "We learn new tools, yes. But these are general tools everyone learns. Do we have tools which we use only with one function? Yes. But more forced than voluntarily" (G2).*

There might be exceptional cases of self development where an employee learns a new skills to smoothen integration. However, self development, as a sole construct, was rejected collectively by all interviewees. Surprisingly, self development is used in OCB research as a distinct behaviour but lacks any empirical confirmation. In order to keep the redundancy high and also to pursue a potential empirical confirmation, items are kept and will be checked further in study 2. Figure 5.9 represents the advancement behaviour.

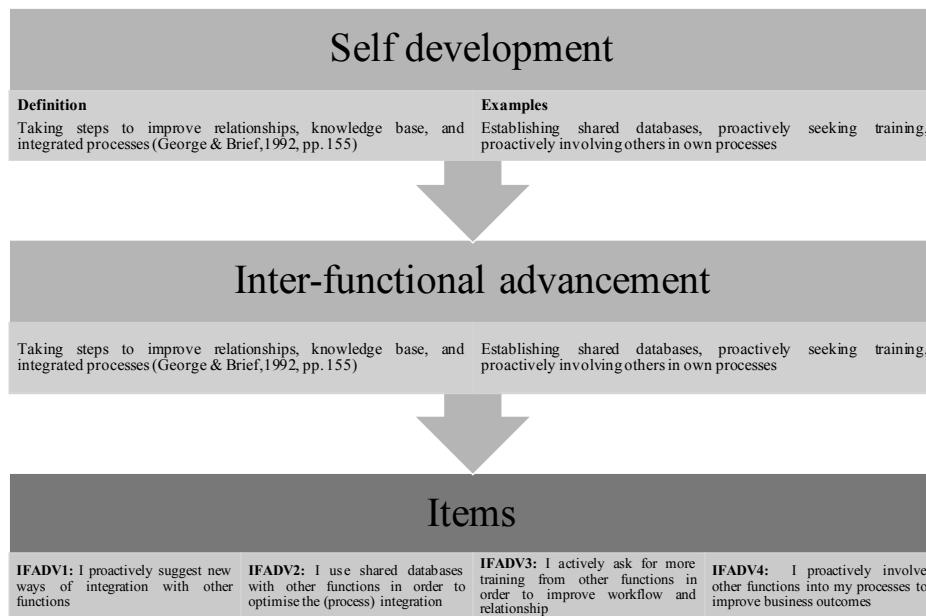


Fig. 5.9 Conceptualisation of inter-functional advancement

### Sportsmanship - Inter-functional tolerance

The last construct of Organ (1988) received much less attention from scholars but high attention from the domain experts in cross-functional integration. The re-definition of sportsmanship, as well as the change of its name to tolerance spurred discussion among interviewees. Inter-functional integration is about activities and the inter-dependence of those activities. These inter-dependencies come with natural delays and potentially missing information based on expectations. Inconveniences happen and are inevitable. Interviewees hint to behaviours during those times which separate "good" and "bad" integration. In general, escalation mechanisms are in place and can be used accordingly. However, how tolerant an employee is can be seen by focusing on tolerance when inconveniences happen and deliverables are missing.

*"There are occasions where the work is not as we want even terms are agreed"* (A1); *"If it is not that big, I do it myself. Not optimal but it is ok"* (G3); *"We need to minimise the risk. Their input is as important than ours. In these cases, we need to make sure to communicate top-down"* (I2).

Figure 5.10 illustrates the definition and the items which focus on deliverables, inconveniences and impositions.

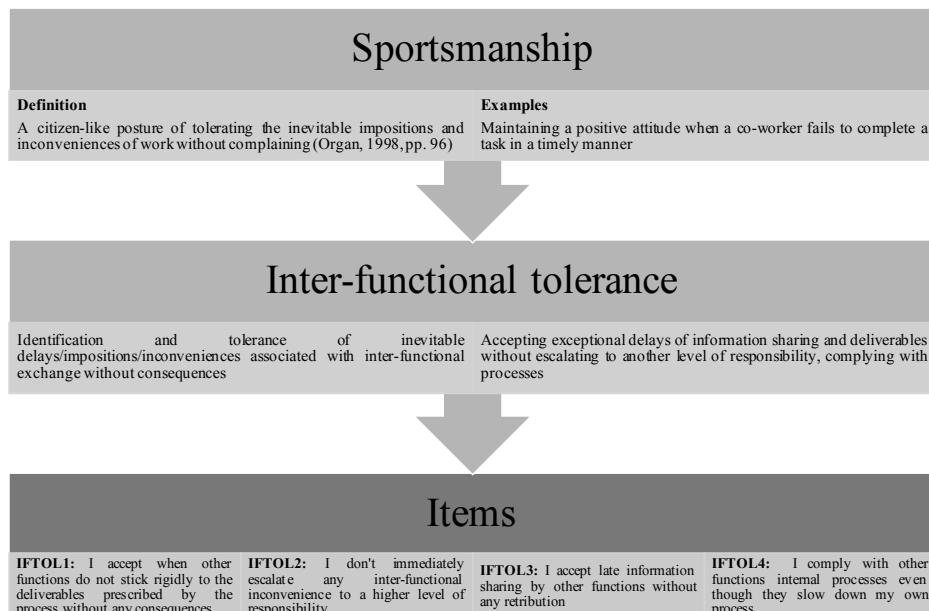


Fig. 5.10 Conceptualisation of inter-functional tolerance

### 5.3.2.3 Final item-construct classification

The procedure for item generation, as well as elimination and classification, follow best practices. Domain experts in cross-functional integration have expressed valuable insights into the practical phenomenon, and with their experience, the item-construct classification was accomplished. However, to avoid domain bias, this study also chose 6 grad students (four doctoral and two masters with working experience but no experience in citizenship behaviours) and designed a mapping workshop. Construct names with definitions were placed on a table, and 28 items were distributed to the participants for them to map. No further information (about how many items per construct) were given. Participants successfully mapped the items to the constructs, where an item was kept in the construct classification if it was successfully mapped to its adequate construct by five out of six participant students ( $5/6 = 83.33\%$ ). The mapping was performed where no item was mapped to a wrong construct more than once. Main confusion points for a single mismatch were observed for loyalty, compliance as well as constructiveness. Table 5.3 summarises the item-construct classification, which will be tested further in study 2.

Table 5.3 Items of the IFCB scale

OCB	Definition
<b>Inter-functional Advancement</b>	<ol style="list-style-type: none"> <li>1. <b>IFADV1</b> I proactively suggest new ways of integration with other functions</li> <li>2. <b>IFADV2</b> I use shared databases with other functions to optimise the (process) integration</li> <li>3. <b>IFADV3</b> I on purposely involve colleagues from other functions into my work to improve decision making</li> <li>4. <b>IFADV4</b> I actively ask for more training from other functions to improve workflow and relationship</li> </ol>
<b>Inter-functional Alturism</b>	<ol style="list-style-type: none"> <li>1. <b>IFALT1</b> I support another function to solve (to my function unrelated) problems</li> <li>2. <b>IFALT2</b> I support another function to learn (to my function unrelated) skills</li> <li>3. <b>IFALT3</b> When there is an urgent need for a specific skillset, I just approach the colleagues of the respective function and support</li> <li>4. <b>IFALT4</b> I teach colleagues from other function my skills to be able to improve business decisions and outcomes</li> </ol>
<b>Inter-functional Compliance</b>	<ol style="list-style-type: none"> <li>1. <b>IFCOMP1</b> When dealing with another function, I follow their rules, processes and policies</li> <li>2. <b>IFCOMP2</b> I attempt to join cross-functional meetings</li> <li>3. <b>IFCOMP3</b> When dealing with another function, I try to be understanding of their functional obligations, aims and boundaries</li> <li>4. <b>IFCOMP4</b> When dealing with another function, I sometimes purposely do not share all information (R)</li> </ol>

*Continued on next page*

OCB	Definition
<b>Inter-functional Conscientiousness</b>	<ol style="list-style-type: none"> <li>1. <b>IFCONSC1</b> When dealing with another function, I go above the requested support to be able to help</li> <li>2. <b>IFCONSC2</b> I sometimes volunteer my functions resources to lighten up other functions' workload</li> <li>3. <b>IIFCONSC3</b> When I deal with a request from another function, I deliver additional information to support the request</li> <li>4. <b>IFCONSC4</b> I follow up with other functions regarding the outcome/status of my support/involvement</li> </ol>
<b>Inter-functional Constructiveness</b>	<ol style="list-style-type: none"> <li>1. <b>IFCONSTR1</b> I proactively forward information related to other functions to my colleagues</li> <li>2. <b>IFCONSTR2</b> I actively advocate for more resources and budget regarding other corporate functions in case of need</li> <li>3. <b>IFCONSTR3</b> I meet colleagues from other functions during, e.g. lunchtime to exchange information to smoothen collaboration</li> <li>4. <b>IFCONSTR4</b> I introduce relevant people and resources to other functions in order to increase their performance</li> </ol>
<b>Inter-functional Loyalty</b>	<ol style="list-style-type: none"> <li>1. <b>IFLOY1</b> I engage in defined processes even in periods of resource cutbacks</li> <li>2. <b>IFLOY2</b> I engage in defined processes even in periods of tight deadlines</li> <li>3. <b>IFLOY3</b> I sometimes skip the involvement with other functions to fasten up my own work (R)</li> <li>4. <b>IFLOY4</b> I sometimes volunteer resources from my function (including my own time) to keep up with business aims and deadlines.</li> </ol>

*Continued on next page*

OCB	Definition
<b>Inter-functional Tolerance</b>	<ol style="list-style-type: none"> <li>1. <b>IFTOL1</b> I accept when other functions do not stick rigidly to the deliverables prescribed by the process without any consequences</li> <li>2. <b>IFTOL2</b> I don't immediately escalate any inter-functional inconvenience to a higher level of responsibility</li> <li>3. <b>IFTOL3</b> I accept late information sharing by other functions without any retribution</li> <li>4. <b>IFTOL4</b> I comply with other functions internal processes even though they slow down my own process</li> </ol>

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## 5.4 Summary

Existing scales did not capture the conceptualised inter-functional integration with its nuances and assumptions. Potential tensions between individuals from different functions who need to work together were not captured adequately. Thus, an adequate scale to measure inter-functional behaviours was lacking. Study 1 was designed to generate items, which aim to measure the inter-functional citizenship behaviours between employees from different functions who inhabit different thought worlds.

The best practice in the item generation stage is a mix-method approach, which fits the overall research method of this dissertation. The study generated items from the rich citizenship research. This deduction was very valuable as the citizenship literature introduced a high number of research over the last decades and indicated numerous items and constructs. This deductive approach was supported by inductive interviews with 16 domain experts who gave additional input and thoughts about the items. The resulting pool of 52 items was examined in confirmatory interviews with another set of domain experts (9 confirmatory interviews) who eliminated items due to redundancy and adequacy to the CFI stream. The pool was reduced to 28 items and seven constructs, which in the last step was subjected to an item-construct classification by six graduate students who confirmed the distinctness of behaviours with its items.

The final inter-functional citizenship behaviour scale consists of 7 different constructs with four items for each construct. The next chapter describes study 2, which is designed to confirm the IFCB scale with its underlying structures and items quantitatively.

**Summary 6:** Study 1 - item generation

- (g) The items for the inter-functional citizenship scale were developed with the help of the literature and 25 exploratory, inductive and confirmatory interviews.
- (g) This coherent methodology is based on best practice and supports all content validity criteria.
- (g) Study 1 suggests that the inter-functional work can be characterised with seven constructs with four items for each construct.
- (g) These seven constructs are grounded in the well-established citizenship literature.



# **Chapter 6**

## **Scale development - Confirmatory factor analysis - Study 2**

Chapter 6 of this dissertation is the continuation of the prescribed three-stage scale development process. It introduces the assumptions and theoretical foundation for the proposed latent structure and reports details about the robust statistical modelling.

The primary concern of stage 2 is internal consistency and reliability. Until this stage, items and the item-latent construct structures were defined. Stage 2 tests the items under the assumptions and expectations of the structure and aims to confirm that (i) the developed items and the proposed structure are coherent, meaning that they measure what they are supposed to measure; (ii) they belong to the best possible structure and (iii) also do not show redundancy within the underlying construct.

Furthermore, this study performs a series of tests to establish measurement invariance. By establishing measurement invariance, this study hopes to administer the scale/survey to multiple groups that are differentiated by group variables, such as gender or proficiency. Consequently, a measurement invariance gives the scale a higher degree of generalisability and introduces the option for multi-group analysis.

### **6.1 Confirmatory factor analysis**

Confirmatory factor analysis (CFA) is the chosen method for this stage. Factor analysis is a statistical method to describe the relationship of items with latent constructs based on the covariation of the items (Rosseel, 2012). The aim is to distribute (a large pool of) items to a lower number of latent constructs which sufficiently describe the underlying

latent phenomenon<sup>1</sup>. This can be done in an exploratory way in which initial items are freely distributed on as many latent constructs as the covariance allows (DeVellis, 2011). This method is called exploratory factor analysis (EFA), and scholars utilise it in research purposes where the theoretical foundation is unclear, and the item-latent construct structure is undefined. The difference between the EFA and the CFA is the given a priori latent structure and the item-latent construct classification. The structure is generally inferred from the literature or with the help of exploratory studies in which the item-latent construct classification, the inter-item correlation and inter-item variances are defined. The IFCB scale is very close to the original OCB scale and therefore grounded in the theoretical foundation of citizenship research. Furthermore, study 1 developed the latent structure with the help of the literature and domain experts. Taken all this, assessing the fit between the observed data and an a priori latent structure using CFA appears to be justified.

Scholars generally utilise a CFA as a disconfirming technique. Items are removed when a) items indicate a non-expected fit to the a priori latent construct (in factor analysis language, this will be referred to as loading); b) items have very high inter-item correlations; or c) items load to another latent construct, which was not defined in the a priori latent structure (Mueller and Hancock, 2008). These approaches aim to increase the overall robustness of the theorised model and also aim to create a unique scale for further research. Furthermore, there are cases in which d) items in one latent construct cross-load with another latent construct. This cross-loading suggests a mismatch of the item with its conceptualised latent construct. In this case, scholars advocate for removing items or even single latent constructs from the initial model (Devlieger and Rosseel, 2017). Lastly, there is a possibility that e) latent structures indicate high covariances, showing that two or more latent constructs measure the same latent phenomenon. This would suggest redundancy in the initial latent structure and leads to the elimination of one or more latent constructs.

Overall, the CFA examines the item-latent construct structure, tests the assumed model specifications, reduces the initial pool of items and suggests a unique conceptualisation of the IFCB scale (Devlieger et al., 2016; Devlieger and Rosseel, 2017; Hinkin and Tracey, 1999; Hinkin, 1995; Likert, 1961). As stated above, this dissertation performs a CFA to test if a pre-defined latent structure fits the items developed in study 1 statistically. However, in order to further validate the IFCB scale, an independent CFA with a novel primary dataset is going to be performed in chapter 7 prior to the polynomial regression analysis.

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<sup>1</sup>As defined in chapter 5, researchers use 'construct', 'behaviour', 'factor' or 'variable' interchangeably. This dissertation adheres to construct. However, statistical methods use "factor" for the same meaning

## 6.2 Research methodology CFA

The standard CFA defines a model and tests this with the statistical methods described earlier. However, the popularity of the CFA method in other research streams introduced a need for more flexible approaches. These approaches examine, for example, correlations between latent constructs or the independence of item errors from each other subsequently (Rosseel, 2012). The structural equation modelling (SEM) offers this flexibility and introduces a two-way approach for factor analysis and regression modelling. It alters the measurement model (the specification about item-latent construct) and the regression testing model (the regression with, e.g. residual regression) separately (Rosseel, 2012). Furthermore, SEM tests alternative model combinations and compares the fit to the initial, *a priori* model. By doing so, it confirms, strengthens and introduces the option to adjust the initial model respectively. However, DeVellis (2011) warns about the extensive opportunities SEM presents researchers and urges to have the initial model, which is deeply grounded on the theoretical foundation in mind. Only looking at the fit statistics could potentially give stronger evidence for an alternative model, which cannot be linked to the theoretical foundation and hence cannot be justified. Thus, a better fit is not enough justification for accepting the alternative model. Theoretical foundations and domain expertise are fundamental to the decision process.

The chosen research methodology adheres to the prescribed scale development process proposed by DeVellis (2011); Hinkin (1995); Likert (1961); Schwab (1980) and deploys a psychometric survey design with the model and items developed in study 1. Figure 6.1 shows the initial model in the pathway illustration. Each of the seven constructs from table 5.3 is a latent construct with four items. Those latent constructs are abbreviated (for a better CFA in R) according to table 5.3. For example, the first construct is inter-functional advancement, abbreviated with IFADV, where the third item is called IFADV\_3. This study uses the SEM

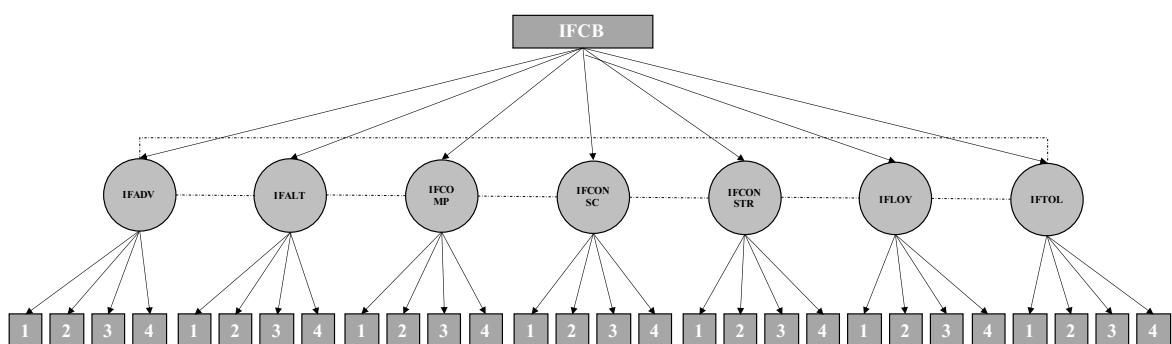


Fig. 6.1 Initial IFCB model - pathway illustration

approach to confirm the structure given by the theoretical foundation of the IFCB scale and the results from study 1.

### **6.2.1 Data collection and sample description**

Following DeVellis (2011); Hinkin (1995); Likert (1961); Schwab (1980), this study designed a survey with the retained items from stage 1 and utilised the third-party provider Surveymonkey ([www.surveymonkey.com](http://www.surveymonkey.com)) to gather 250 responses from a strictly defined sample. The specified sample was based on the theoretical foundation of IFCB: excluding students, limiting respondents to work full time, having obtained at minimum four years graduate degree and working in an organisation with more than 250 employees in an inter-functional context. These limitations helped to create a sample, which represent the theoretical foundation of the IFCB scale. Namely, an individual who is a) working in an inter-functional context, being dependent on another skillset which cannot be obtained or replaced easily; b) working full time with regular inter-functional interactions and duties; and c) performing a task, which is generally performed in an organisational context.<sup>2</sup> The data collection process involved a very collaborative and iterative engagement with the third-party provider. Through multiple meetings and reviews, the above-defined overall sample population (>10.000 potential respondents) was created where the researcher had implemented control mechanisms to check for selection bias. The third-party service provider agreed to pilot the study in three different iterations with n=15 respondents from the above-defined overall sample population. With that, the researcher compared sample parameters of the pilot samples with each other and also with the above-defined overall sample population. Furthermore, in-survey control questions with regards to e.g. received task-inter-dependency and critical task-interdependency (Kiggundu, 1983; Langred, 2005) had been implemented to ensure the degree of inter-dependency the IFCB scale aims to have. IFCB survey questions can be seen in 5.3 and sample items for the task-interdependency are "most of my work activities are affected by the activities of other people on the team" or "team members have to work together to get group tasks done". The pilot samples showed no indication for selection bias as the pilot sample parameters were matching with those of the overall sample population. Consequently, an adequate randomisation was ensured where the pilot samples represented the above-defined overall sample population successfully. Hence, the survey was

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<sup>2</sup>Please note that OCB researchers commonly test OCBs with low-income jobber and in some contextual areas, which does not reflect the organisational context (for example, restaurants (Mackenzie et al., 2011). This research does not aim to discriminate people with lower education levels nor typical low-income jobbers. The sample was deliberately chosen to research jobs with a high degree of specialisation in the organisational context. Setting up the education level to graduate-level aims to get a sample, which is a proxy of this environment.

deployed to the above-defined overall sample population of >10.000 potential respondents. This study obtained 250 usable responses using a 5-point Likert scale (1= "strongly disagree" to 5= "strongly agree"). The data was scanned for missing information and extreme cases concerning the estimated time for the survey. 11 cases were removed (<2 mins and >30 mins by an estimated time of 8 minutes), and 11 additional responses were obtained from the service provider in order to continue with 250 responses. The respondents were comprised of employees from various functions: Manufacturing, Engineering, Information systems, Human resources and Intellectual Property and worked in multiple industries like Healthcare, IT or Manufacturing. Out of 250 respondents, 55,2% were female, and 44,8% were male. The average age was between the range of 35 and 44 (no free text entry - defined range in survey), the average time a respondent was employed in the respective function was between 1-2 years and the overall task-interdependency was at 4.32 using a 5-point Likert scale (1= "strongly disagree" to 5= "strongly agree"). The researcher is aware of the discussed limitation of utilising third-party providers for data collection and the argument of a panel not being able to deliver a generalisable representation. However, research indicates that results from panels do not differ from data collected through a random sample (Pollard, 2002) and taking the respondent limitations, the initial work to avoid selection bias and other high-quality research using panel data, e.g. (Menges et al., 2011), into account, an online panel is an appropriate and accepted solution for this study.

### 6.2.2 Measures

This study commits to the IFCB scale consisting of 7 constructs, which study 1 concluded (please see table 5.3) Before conducting the survey, all items were framed according to the inter-functional context:

Advancement: Autry et al. (2008) describes advancement as "*taking steps to improve relationships, knowledge bases, and integrated processes linking one or more supply chain partners*" (p.56). Advancement might fit well to the theorised inter-functional context and was discussed study 1 with domain experts. Thus, this study adheres to the definition of study 1 and adapts the items according to the inter-functional context. A sample item is "*I on purposely involve colleagues from other functions into my work to improve decision making*".

Altruism: Altruism is one of the constructs defined by Organ (1988) and focuses on the helping behaviour of an employee towards a new employee, helping an overloaded colleague to finish his/her tasks or helping a colleague to learn a new skill. This study adheres to the definition and items from study 1 and emphasises the (long-term) acquisition of skills. A

sample question is "*When there is an urgent need for a specific skillset, I just approach the colleagues of the respective function and support*".

Compliance: Compliance is a construct dating back to the earliest conceptualisation of Smith et al. (1983). Compliance concerns impersonal behaviour, which indirectly affects others. Examples of compliance are, for example, being punctual or not wasting time and resources. This study adheres to the items developed study 1 towards rules, policies and processes of one function and the compliance of another with these. A sample item for compliance is "*When dealing with another function, I follow their rules, processes and policies*".

Conscientiousness: Conscientiousness belongs to the five OCBs defined by Organ (1988) and describes the behaviour of the 'extra-mile'. The emphasis in the inter-functional context is on deliverables as the outcome of the inter-functional exchange, as discussed in study 1. A sample item is "*When I deal with a request from another function, I deliver additional information to support the request*".

Constructiveness: Constructiveness is also one of the five constructs of Organ (1988) and focuses on the relationship side of inter-functional exchange. The items of study 1 fit closely to the context of inter-functional integration. A sample question is "*I proactively forward information related to other functions to my colleagues*".

Loyalty: Loyalty is one of the four constructs of Graham (1986). It is aimed at the allegiance of an employee towards the firm and leadership team. The IFCB definition from study 1 concerns the time and deliverable aspect of the process and includes loyalty in uncertain times. A sample item is "*I engage in defined processes even in periods of tight deadlines*".

Tolerance: Tolerance is one of the five constructs defined by Organ (1988) which captures the humming, complaining and moaning of employees. Definitions and items were adapted in study 1 towards the context of inter-functional integration. A sample question is "*I comply with other functions internal processes event though they slow down my own process*".

### **Control variables**

The primary concern to include control variables is to assess the potential impact of additional variables on the prediction of the estimation. The CFA aims to develop the IFCB scale with robust statistical results, and thus, multiple individual and organisational control variables have been included. Firstly, organisation size was set to >250 by the limitations of the survey provider. This aimed to proxy organisations with formal functions and integrative processes. Further, organisational size has been reported to affect employee attitudes, and behaviours (Ragins et al., 2000). Hence, this study includes organisational size as a control variable. This information was measured by asking the approximate number of employees to each respondent, which was then log-transformed to reduce the skewness of the data. This common

practice is established in quantitative research and can be found in, e.g. Menges et al. (2011). An additional bias could be the industry difference reported in Ernst and Fischer (2014); Meng (2016); Menges et al. (2011). Following common practice, respondents reported industry affiliation in order to classify these into dummy variables.

On the individual level, survey recipients indicated functional affiliation. The functional affiliation was then classified to two different dummy variables, named "technical" and "non-tech" to proxy different thought worlds. Furthermore, respondents indicated the duration of employment in the respective function, which could potentially have a big effect in the cross-functional context. Thought worlds are adopted over time (Dougherty, 1992), and the acceptance and adoption period of citizenship behaviours might impact the answers. Hence, the duration of employment in the respective function was controlled. Participants were asked to indicate their duration in five categories (1-3 months, 3-6 months and >6 months-1 year, 1-2 years and >2 years). Data analysis revealed that a binary clustering is more appropriate in which two dummy coded variables indicated the duration of employment (1 months-2 years and >2 years). Furthermore, all respondents had at least four years of graduate education, which is important to define the organisational context where the IFCB takes place. Finally, two demographic information were collected: gender and age.

## 6.3 Data analysis and results

### 6.3.1 Confirmatory factor analysis

This study applies confirmatory factor analysis using the Lavaan package in R (Rosseel, 2012) to assess the defined construct measurement. The standard estimator for the CFA is the maximum likelihood method (ML). The ML method is an accepted estimator, which is very robust for data which is normally distributed and does not have any skewness (Rosseel, 2012). In case of non-normality, the ML estimating is very unreliable and it is common practice to introduce the maximum likelihood, mean adjusted (MLM) estimator, which adjusts to the skewness by robust standard error calculations and a mean-adjusted chi-square test (Mplus.com). This method is also called the maximum likelihood estimation with robust standard errors, and a Satorra-Bentler scaled test statistic (MLM). Scholars acknowledge this benefit and recommend using MLM in case of non-normality (Rosseel, 2012). The dataset of study 2 shows a slight non-normality for some variables and hence, study 2 implements the MLM method to overcome the challenges with skewed datasets. Furthermore, committing to the MLM estimation, this research follows the established norm of treating the Likert scale

as a numerical variable, as described in chapter 3.

The initial model revealed that items IFCOMP\_3 and IFLOY\_4 were not loading to the defined latent construct with loading at 0.101 and 0.113 (please see Appendix E for the initial CFA loadings and the covariance matrix). There is no agreed threshold for item-construct loadings . Research suggestions start from loadings higher than ( $>0.30$ ) or even higher than ( $>0.70$ ) (Hair et al., 2009). This study defines the cut off at the midpoint to balance the strict and the very lenient cut off suggested by the literature: ( $>0.50$ ). Both items are undoubtedly below the threshold and were removed from the defined model.

A new CFA excluding the eliminated items indicated that all loadings were higher than the defined threshold of ( $>0.50$ ) (minimum: 0.522 for IFADV\_3) (please see Appendix M for the loadings and covariance matrix of the adjusted CFA). However, the adjusted model showed high and significant cross-loadings between inter-functional compliance (IFCOMP) and inter-functional loyalty (IFLOY) with multiple other constructs. Both latent constructs - *inter-functional compliance* and *inter-functional loyalty* - were removed in a stepwise process after careful consideration of the theoretical grounding and the comments from the domain experts of study 1. Removing either of the latent constructs neither improved the model fit, nor the high inter-construct correlations. Hence, with the aim to create a unique scale, both constructs were removed from the model. The adjusted CFA covariance matrix is identical. An adjusted 5-construct model revealed excellent fit and good construct loadings (please see Appendix N for loadings and covariance matrix). However, a high covariance between inter-functional constructiveness (IFCONSTR) and inter-functional advancement (IFADV) suggested a redundancy between both constructs (multicollinearity with variance inflation factor (VIF)  $>10$ ) (Hair et al., 2009). Referring to the literature and the 5 OCBs, which were part of the early conceptualisation, and the comments of the domain experts in study 1, dropping inter-functional advancement due to its non-existing link in the literature is justified. A four-construct model, which captures the inter-functional citizenship behaviour, is hence proposed.

- (i) inter-functional-altruism (helping behaviour)
- (ii) inter-functional-conscientiousness (individual initiative)
- (iii) inter-functional-constructiveness (civic virtue)
- (iv) and inter-functional tolerance (sportsmanship)

All four constructs are part of the initial conceptualisation of Smith et al. (1983) and Organ (1988) and statistically adhere to the items developed during stage 1. Overall loadings are

described in table 6.1 (std.all) and are higher than the defined threshold of (>0.50) (minimum at 0.518). Please see Appendix G for inter-item residual correlations.

Table 6.1 Final loadings of IFCB items

Latent construct	Item	Estimate	Std.Err	z-value	p-value	std.all
IFALT	IFALT1	0.742	0.0072	10.274	0	0.684
IFALT	IFALT2	0.727	0.069	10.515	0	0.683
IFALT	IFALT3	0.570	0.076	7.491	0	0.578
IFALT	IFALT4	0.545	0.074	7.357	0	0.561
IFCONSC	IFCONSC1	0.702	0.070	10.028	0	0.666
IFCONSC	IFCONSC2	0.535	0.078	6.897	0	0.551
IFCONSC	IFCONSC3	0.712	0.072	9.839	0	0.647
IFCONSC	IFCONSC4	0.602	0.058	10.324	0	0.691
IFCONSTR	IFCONSTR1	0.602	0.064	9.465	0	0.671
IFCONSTR	IFCONSTR2	0.661	0.069	9.577	0	0.640
IFCONSTR	IFCONSTR3	0.508	0.062	8.240	0	0.630
IFCONSTR	IFCONSTR4	0.570	0.057	10.053	0	0.687
IFTOL	IFTOL1	0.457	0.060	7.591	0	0.518
IFTOL	IFTOL2	0.641	0.060	10.700	0	0.657
IFTOL	IFTOL3	0.671	0.070	9.549	0	0.597
IFTOL	IFTOL4	0.595	0.060	9.974	0	0.669

Based on the established cut off criteria for the 5 most important fit indices, which Devlieger et al. (2016); Devlieger and Rosseel (2017); Fornell and Larcker (1981); Hu and Bentler (1999); Lewis (2017); Schreiber et al. (2016) summarise as

- (i) Chi-square significance
- (ii) CFI  $\geq 0.95$
- (iii) RMSEA  $< 0.06$  to 0.08 with confidence interval
- (iv) SRMR  $< 0.08$
- (v) TLI  $\geq 0.95$

global fit statistics for the four-construct model (please see table 6.2) are excellent. Fit indices are presented in table 6.2 and are interpreted by the explanations of Credé and Harms (2015). Researchers agree on the misleading nature of cut off values. Fit indices must align with overall research objectives and support the theory in the given context. Nonetheless, i.a. Hu and Bentler (1999) and Credé and Harms (2015) recommend to evaluate and compare the model with the  $\chi^2$  significance test and well-established fit indices as defined above.

Study 1 derived the 7-construct model. However, domain experts did not agree on the inter-construct structure of citizenship behaviours. Some argued for an inter-correlated structure of constructs, and some rejected the inter-construct correlation fundamentally (Podsakoff et al., 2018a). This study includes both models and examines fit indices. The orthogonal (inter-construct correlation is not allowed) models show worse global fit indices compared to all oblique models (allowing correlation among constructs).  $\chi^2$  of the orthogonal model is significantly higher than the oblique model, and fit indices are undeniably lower. Hence, a oblique model is adopted. Table 6.2 summarises the fit indices for all models. Fit indices of the seven-construct model are non-satisfactory due to the reasons described above (cross-loading, loadings  $< 0.50$ ). The seven-construct model was adapted with multiple CFAs due to cross- and non-satisfactory loadings and the final four-factor model shows the best global fit indices and also the best  $\chi^2$  results.

Popper and Hudson (1963) advise researchers in any scientific discipline to seek out for potential disconfirming evidence. In support of the four-construct model, this study tested various alternative models (please see table 6.2). Credé and Harms (2015) suggest to contrast the fit of the chosen model with the fit of plausible alternative models. They argue that when plausible alternative models are not examined, the conclusions cannot be seen to be fully supported because alternative models can indicate better fit. However, the number of possible

alternative models to any model can be very large (MacCallum et al., 1993). It is practically not feasible to test all alternative models, thus Credé and Harms (2015) suggest that the selection of alternative models should strongly rest on theoretical considerations. Firstly, the fit of the four-construct model with a single-construct model, where all 28 items load to one single construct, was approached. Whereas the theoretical consideration does not determine this alternative model, it is suggested by Porath et al. (2012) to test a one-construct model in order to account for an extreme case. As expected, fit indices are unacceptable.

In a final step, two alternative models were tested to seek out for disconfirming evidence. A second-order CFA for the 7-construct model and a second-order CFA for the 4-construct model has been tested. In second-order models, all latent dimensions load onto the overall IFCB scale and as expected and displayed in 6.2, fit indices for the second-order models are comparable with the first-order models (Rosseel, 2012). However, an ANOVA test to examine the significance revealed that first order models fit the data better than the examined second-order models.

Figure 6.2 summarises the results. The oblique, first-order four-construct model shows the best fit indices and is chosen for further testing with regards to validity and reliability criteria.

Table 6.2 Global fit statistics of alternative models

Model	$\chi^2$	CFI.robust	RMSEA.robust 90% confidence interval	SMRM	TLI.robust
Initial 7 construct model (oblique)	516 (df=329)	0.88	0.056 (0.047-0.066)	0.063	0.860
Initial 7 construct model (orthogonal)	1078 (df=350)	0.54	0.107 (0.100-0.114)	0.235	0.499
Second-order 7 construct model	536 (df=343)	0.88	0.056 (0.047-0.065)	0.065	0.862
4 construct model (oblique)	128 (df=98)	0.96	0.041 (0.016-0.060)	0.047	0.949
4 construct model (orthogonal)	280 (df=104)	0.78	0.096 (0.083-0.110)	0.182	0.719
Second-order 4 construct model	131 (df=100)	0.96	0.042 (0.017-0.060)	0.050	0.947
1 construct model	596 (df=299)	0.79	0.076 (0.067-0.085)	0.073	0.774

### 6.3.2 Validity and reliability

Construct validity is established by the construct-item loadings which are above the defined cut off value of ( $>0.50$ ) (Hair et al., 2009). Each construct loading is significant at 5% level of significance. Overall fit indices support the distinctive construct structure of the inter-functional citizenship behaviour scale. Reliability tests were conducted to measure the reliability of each measurement item according to its defined construct. The established test to assess reliability is the test for Cronbach's alpha. Hair et al. (2009) recommend the cut off value of ( $>0.70$ ) for Cronbach's alpha where values exceeding ( $>0.70$ ) support reliability. All

constructs show an alpha value of ( $\geq 0.70$ ) with an alpha (total) of 0.84 (please see table 6.3).

Table 6.3 Cronbach alpha, omega and avevar values of IFCB constructs

	IFALT	IFCONSC	IFTOL	IFCONSTR	Total
Alpha	0.7202579	0.7302959	0.7486664	0.6952811	0.8404904
Omega	0.7282249	0.7325667	0.7499947	0.7028043	0.8734232
Omega2	0.7282249	0.7325667	0.7499947	0.7028043	0.8734232
Omega3	0.7322356	0.7314338	0.7488338	0.7061270	0.8711271
AveVar	0.4056806	0.4096116	0.4307451	0.3760157	0.4046220

Next, the procedure suggested by Fornell and Larcker (1981) to assess discriminant validity was taken into consideration. Discriminant validity is given if the square root of the average variance ( $\text{sqrt}(\text{AveVar})$ ) for each latent construct is bigger than all inter-construct correlations in the model (please see table 6.3 for avevar values and table 6.4 for inter-construct correlations). This is given for all the constructs except for inter-functional constructiveness, where the inter-construct correlation between inter-functional constructiveness with inter-functional altruism as well as with inter-functional tolerance is higher than the ( $\text{sqrt}(\text{AveVar})$ ) value. The positive difference ( $\Delta=0.10$  and  $\Delta=0.13$ ) does not support discriminant validity in the

Table 6.4 Inter-construct correlation IFCB

	IFALT	IFCONSC	IFTOL	IFCONSTR
IFALT	1			
IFCONSC	0.46	1		
IFTOL	0.48	0.37	1	
IFCONSTR	0.71	0.42	0.74	1

first instance. However Fornell and Larcker (1981) propose to accept a difference if the composite reliability (CR) is ( $>0.60$ ). The composite reliability (omega value in table 6.3) of all constructs are ( $>0.70$ ) with CR(total) of 0.87 and thereby supports overall discriminant validity.

The procedure of Fornell and Larcker (1981) is best practice and the established procedure to test discriminant validity. However, Henseler et al. (2014) propose a new procedure to assess discriminant validity. They propose to use the Heterotrait-monotrait (HTMT) ratio of correlations which gives another indication for discriminant validity. The ( $\text{sqrt}(\text{AveVar})$ ) method tests if "*a latent construct accounts for more variance in its associated indicator constructs than it shares with other constructs in the same model*" (Henseler et al., 2014, p.115-135). Unlike AveVar, the HTMT method tests the geometric-mean correlation among

indicators across constructs relative to the geometric-mean correlation among indicators within the same construct. Even though the discriminant validity using Fornell and Larcker (1981) is established, the authors of the HTMT method argue that it can have some drawbacks. To support the conclusion based on Fornell and Larcker (1981), this study calculates the htmt matrix and ratio (table 6.5). There is not yet an accepted cut off value for the HTMT ratio of correlation, but a correlation closer to 1 is agreed to indicate a lack of discriminant validity (Henseler et al., 2014). The htmt ratio is compared to the cut off value of (<0.85) as proposed by Voorhees et al. (2016), and support discriminant validity - all HTMT values lie below 0.85 (0.38-0.75) (please see table 6.5).

To summarise, the four-construct model of IFCB shows excellent statistical fit, establishes construct validity and reliability, adheres to discriminant validity criteria and shows good composite reliability results. The next step examines measurement invariance to increase the generalisability of the IFCB scale.

Table 6.5 HTMT matrix IFCB

	IFALT	IFCONSC	IFTOL	IFCONSTR
IFALT	1			
IFCONSC	0.453	1		
IFTOL	0.495	0.379	1	
IFCONSTR	0.745	0.446	0.739	1

### 6.3.3 Measurement invariance

Measurement invariance of latent constructs has become very important in research to be able to obtain multi-group responses. Examining for the equivalence of measures in groups when comparing psychometric constructs is key to assure that the model and constructs are valid concerning loadings, intercepts and/or residuals (Brown, 2006). Byrne et al. (1989) are among the first scholars to introduce the measurement of invariance in multi-group research. Following them, multiple contributions underline the importance of testing the model for measurement invariance (Brown, 2006; Steenkamp and Baumgartner, 1998; Van De Vijver and Fischer, 2009). This research follows the contribution of Brown (2006) for the multi-group confirmatory analysis and examines for configural, metric, scalar and strict invariance taking the *gender*, *duration of employment* in the respective function and *the functional affiliation* as a group variable. All three variables can affect the scale, the response pattern and are important in the cross-functional integration setting. This study examines

each variable with a full measurement invariance test separately.

Brown (2006) proposes a step-by-step guide to establish measurement invariance for the chosen group variable. It starts with a separate CFA for the subsets of the chosen group variable, where a comparison between the subset establishes the basic measurement invariance. In a second step, both subsets are nested in a big model, grouped by the chosen variable, which is called configural invariance. The nested model can be seen as a (weighted) average of the separate group models. In a third, fourth and fifth step, the measurement invariance restricts the nested model to analyse if the fit indices change with higher restrictions. Metric invariance forces the loadings to be equal, scalar invariance forces the loadings and residuals to be equal and the most restrictive model, strict invariance, forces the loadings, residuals and intercepts to be equal across the groups (please see figure 6.2 for the step-by-step procedure to establish measurement invariance).

The established decision criteria to assess measurement invariance is the change in CFI ( $\Delta$  CFI) (Cheung and Rensvold, 1999). Model restrictions influence the parameter estimation. By forcing the estimations to be equal across groups, several fit indices change. Cheung and Rensvold (1999) suggests calculating  $\Delta$  CFI, which calculates the CFI difference between the forced model and the less forced models. A  $\Delta$  CFI of less than 0.01 indicates that the model holds similar results across groups. A higher  $\Delta$  CFI indicates variance across groups where an intervention prior to deployment of the survey is suggested. This study performs

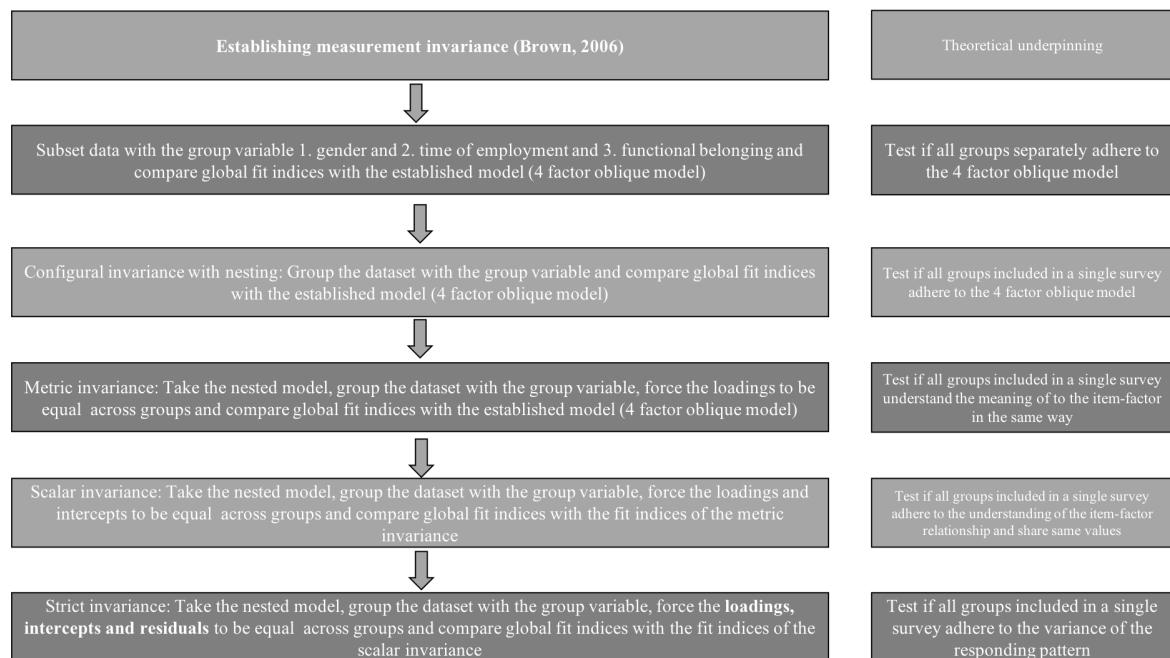


Fig. 6.2 Step-by-step procedure to establish measurement invariance

separate CFAs each of the step, using three group variables.

### 6.3.3.1 Measurement invariance - Gender

Global fit indices when subsetted by gender are excellent (please see table 6.6). Female group fit indices show a slightly better fit than the men group in all the indices. This result might be since the subset of the female is slightly bigger than the men.

**Configural invariance:** Brown (2006) suggests testing for configural invariance as the second step to establish measurement invariance. Configural invariance tests the conceptualisation of the construct in a nested model across the groups. It is established if the model structure is invariant across the chosen group variable (Milfont and Fischer, 2010). This study applies the CFA with the robust standard errors, and Satorra-Bentler scaled test statistic and forced the structure (as shown in table 6.1) to be same by grouping by the chosen variable. Fit measures are excellent and confirm that both groups conceptualise the construct in the same way. Following Brown (2006), the third step is to test for metric invariance which examines if both groups respond to the items in the same way.

Establishing metric invariance suggests that the underlying item-construct relationship across both group is the same.

**Metric invariance:** The metric invariance test is more restricted, and it forces the loadings of each item to its defined latent construct to be equal across both groups. When metric invariance is established, both groups adhere to the same item-latent construct pathway with regards to loadings. CFA results are still excellent, but in order to establish metric invariance, this study commits to Cheung and Rensvold (1999)'s established suggestion of obtaining a delta  $\Delta$  CFI which needs to be ( $< 0.01$ ).

$\Delta$  CFI is at (0.004) which is below the defined threshold which establishes metric invariance.

**Scalar invariance:** The fourth test inspects scalar invariance, which essentially compares the latent means across both groups by constraining the intercepts and loadings to be equal across both groups. A scalar variance indicates that one group answers particular latent constructs more positively than the others which can be traced back to the values and norms of the group. Scalar invariance fit statistics are still robust, and the delta CFI confirms scalar invariance ((0.008); $<0.01$ ).

**Strict invariance:** Lastly, this study performs a test for strict invariance (or sometimes called residual invariance or error variance invariance) by forcing loadings, intercepts and residuals to be equal across both groups. Establishing strict invariance indicates that the spread of the latent constructs is invariant across both groups.

Strict invariance fits are still acceptable according to the defined cut offs. However, the  $\Delta$  CFI

test does not hold for strict invariance as the  $\Delta$  CFI is at 0.033 and thus ( $>0.01$ ), indicating a variant spread of answers across the groups. However, strict invariance is hardly achieved

Table 6.6 Step-by-step procedure to establish measurement invariance by gender - own illustration from Brown (2006)

Fit indices Model	$\chi^2$	CFI.robust	RMSEA.robust (90% confidence interval)	SRMR	TLI.robust	$\Delta$ CFI
4 construct model (oblique)	128 (df=98)	0.958	0.041 (0.016-0.060)	0.047	0.949	-
Female	110 (df=98)	0.970	0.034 (0.000-0.064)	0.063	0.963	-
Male	118 (df=98)	0.947	0.050 (0.000-0.079)	0.067	0.935	-
Configural invariance	228 (df=196)	0.959	0.042 (0.000-0.064)	0.065	0.945	-
Metric invariance	242 (df=208)	0.955	0.042 (0.000-0.063)	0.072	0.949	0.004
Scalar invariance	262 (df=220)	0.947	0.045 (0.016-0.064)	0.074	0.942	0.008
Strict invariance	304 (df=236)	0.914	0.055 (0.035-0.072)	0.079	0.913	<b>0.033</b>

in practice as it is the most restrictive model (Brown, 2006). Brown (2006) argues that this theoretical measure (forcing the loadings, intercepts and residuals to be equal across both groups) is unreasonable in practice and does not negatively affect the measurement invariance. Further, he recommends to examine the failure of strict invariance with a detailed parametric analysis.

This study follows this recommendation and examines the modification indices (MI), which allows the researcher to examine the effect of each parameter on the overall result. If there is no single parameter which causes the failure of strict invariance, partial strict invariance is established (Steenkamp and Baumgartner, 1998). Results reveal that the highest expected parameter change (EPC), the parametric increase of the estimation, which occurs when any single parameter is changed or removed, is at 0.0046649 (please see Appendix F for the modification indices output of R). This value is, according to Steenkamp and Baumgartner (1998), not significant enough to link the failure of strict invariance to a single parameter. Results suggest that none of the 16 items significantly cause the failure of strict invariance. Thus, partial strict invariance is established with the *gender variable* and does not limit the outcome of the study as the study explicitly takes care of measurement errors. This conclusion is also supported by the MI output in R where the column "decision.ci" claims "NM= No model misspecification" for all items (<https://cran.r-project.org/web/packages/lavaan/lavaan.pdf>).

### 6.3.3.2 Measurement invariance - Duration of employment

The same procedure for the variable of *duration of employment* was performed. Fit indices when following the same procedure by the group variable *duration of employment* are acceptable (please see table 6.7). All fit indices are closely below the well-established cut off values, and the decrease is marginal for most of the fit indices. It can be traced back to the sensitivity of the indices to the sample size (Brown, 2006; Fornell and Larcker, 1981).

However, the SRMR is the only fit measure which goes beyond the acceptable range and increases continuously. Hu and Bentler (1999) points out that the SRMR is sensitive to the covariance and latent structure. Taking that into account, an analysis of the covariance and latent structure of each group were performed. The covariance structure of group 1, which is the group with the shortest employment duration indicates a high covariance between the latent constructs. The covariance is between 0.668 and 0.854 and drives the SRMR value high. Nonetheless, all covariance indices are below 1 which would have indicated redundancy among the latent constructs (1). In fact, the high covariance structure can be traced back to the theoretical foundation of the inter-functional citizenship behaviour conceptualisation. The group which shows the continuous high covariance is the group with the shorter duration of employment within the same function. The adoption of functional habits and behaviours might take time, which can be seen in the high covariance between the latent constructs. Behaviours are not as distinct as for employees who have spent more time working in the same function. Therefore, the high SRMR value appears to be not a major indicator for this study.

Table 6.7 Step-by-step procedure to establish measurement invariance by duration of employment in the function - Brown (2006)

Fit indices Model	$\chi^2$	CFI.robust	RMSEA.robust (90% confidence interval)	SRMR	TLI.robust	$\Delta$ CFI
4 construct model (oblique)	128 (df=98)	0.958	0.041 (0.016-0.060)	0.047	0.949	-
1 months- 2 year	121 (df=98)	0.866	0.065 (0.017-0.081)	0.095	0.836	-
>2 years	133 (df=98)	0.872	0.066 (0.033-0.094)	0.081	0.843	-
Configural invariance	384 (df=294)	0.891	0.071 (0.049-0.089)	0.081	0.866	-
Metric invariance	412 (df=318)	0.887	0.069 (0.048-0.087)	0.093	0.872	0.004
Scalar invariance	447 (df=342)	0.878	0.069 (0.050-0.086)	0.095	0.872	0.009
Strict invariance	486 (df=374)	0.867	0.069 (0.050-0.086)	0.103	0.872	0.011

Concerning measurement invariance, none of the invariance measures fail the  $\Delta$  CFI criteria (please see table 6.7 for maximum  $\Delta$  CFI at strict invariance at 0.011). All measures are on the spot of holding all invariance tests. This result suggests that all items are the same across employees with different duration of employment within the same function. However, high SRMR values and the slightly decreased fit indices indicate that the duration of employment can play a role in the inter-functional context. Hence, duration of employment can be used as a control or even moderator variable in further analysis to capture the different behaviours between individuals with longer/shorter functional affiliation.

### 6.3.3.3 Measurement invariance - Functional affiliation

Lastly, the same procedure was performed with the functional affiliation group variable based on the dummy variable for tech and non-tech. Full measurement invariance was established where max.  $\Delta$  CFI was at strict invariance:  $\Delta$  CFI is 0.007 ((0.007);<0.01) (please see table 6.8).

Table 6.8 Step-by-step procedure to establish measurement invariance by functional affiliation to the tech/non-tech function

Fit indices Model	$\chi^2$	CFI.robust	RMSEA.robust (90% confidence interval)	SRMR	TLI.robust	$\Delta$ CFI
4 construct model (oblique)	128 (df=98)	0.958	0.041 (0.016-0.060)	0.047	0.949	-
Functional affiliation:Tech	120 (df=98)	0.921	0.059 (0.026-0.074)	0.071	0.904	-
Functional affiliation:Non-tech	99 (df=98)	0.995	0.013 (0.000-0.042)	0.056	0.994	-
Configural invariance	226 (df=196)	0.960	0.040 (0.006-0.052)	0.063	0.951	-
Metric invariance	238 (df=208)	0.960	0.039 (0.002-0.050)	0.072	0.954	0.000
Scalar invariance	258 (df=220)	0.951	0.043 (0.015-0.053)	0.074	0.946	0.009
Strict invariance	279 (df=236)	0.944	0.044 (0.018-0.053)	0.077	0.943	0.007

## 6.4 Discussion

The aim of study 2 was to further develop and test the underlying item-latent construct structure in the context of inter-functional integration where inter-functional citizenship behaviours are hypothesised to be apparent. Inter-functional citizenship behaviours are based on the theoretical foundation that employees in different functions might have different

thought worlds (Dougherty, 1992) and that these thought worlds influence the integration from the behavioural perspective. The IFCB scale takes the functional context into account, and results indicate the proximity of the IFCB scale with the early conceptualisation of the OCB theory. All four constructs are anchored to the early conceptualisation of Smith et al. (1983) and Organ (1988). This research deductively developed items from the citizenship behaviour literature, closely linking them to numerous adaptations and progressions of the OCB theory, and subsequently assessing the items in the context of inter-functional integration. The resulting analysis suggests that a four-construct model based on the early conceptualisation of the OCB theory characterises the inter-functional citizenship behaviours scale.

Altruism is mainly about helping behaviour and may play a key role in the context of inter-functional integration. Help from a (supporting) function can be seen as 'in-role' behaviour and part of the job description. However, the focus on the 'extra-mile' of altruism and the (long-term) acquisition of skills is the main focus of the items. Helping another function in reducing the heavy workload to meet deadlines or solving an issue immediately instead of going the conventional way is indicated by the items. The second behaviour is tolerance which is associated with late deliverables between two functions. Inconveniences, as a result of the lack of information sharing or late/missing deliverables, can result in escalation to a higher degree of responsibility and may slow down processes and affect the working environment. Conscientiousness indicates the over-performance in task execution. Going the "extra-mile" in performing the task could help with the process of value creation. Furthermore, delivering additional information and also offering additional resources tightens the bonding between functional employees and opens up new pathways for functional integration. At last, constructiveness supports task execution at the relationship level by engaging in inter-functional activities besides task execution. Constructiveness might help to strengthen inter-functional affairs between functional employees and could create an integrative working environment.

This study performed a series of statistical analysis and reduced the initial IFCB model, consisting of seven constructs to four constructs which characterise the inter-functional context. The reduction of 3 constructs is theoretically justified as their role in the inter-functional context was highly discussed among the domain experts in study 1. The disconfirmatory nature of the interviews indicated that loyalty and compliance are complex to grasp and do not fully capture the inter-functional habits observed in practice. The interviewees criticised compliance for being a default behaviour in which not displaying this behaviour would indicate non-compliant behaviour based on the policies, rules and processes in the company.

Even though there is a part of compliance which suggests more 'extra-mile' compliance (please see table 5.3), interviewees hint to the sensibility of the topic in which interviewees would admit a potential non-compliant behaviour. Compliance does not perform well in the CFA, and the elimination of this behaviour was manageable. Domain experts mentioned similar critical thoughts for loyalty. The items and definition of loyalty would also indicate potential non-compliant behaviour. Additionally, the inter-functional context does not allow for the economic thinking of changing the partner in case of non-satisfaction. Employees from different functions need to work with each other - even in difficult times - and stay loyal. The poor performance of loyalty in the CFA presents an additional reason to eliminate loyalty which forms a statistically more robust and less complex survey.

Lastly, this study eliminated the advancement construct due to redundancy. The elimination of advancement was, on the one hand, statistically justified, but on the other hand, the assessment against multiple alternative strategies supported the decision. The first strategy was to combine items of advancement with items of constructiveness. An alternative CFA model examined this option in which constructiveness and advancement had eight items instead of the four for each. The resulting fit indices were similar to the accepted four-construct model in which advancement was eliminated. However, the new combined scale would have had eight items compared to four items for every other construct. The effect of the imbalanced construct on the indices like coefficient alpha and the effect on future outcome variables would have been biased (Brown, 2006). Consequently, this study disregarded the option of creating a bigger construct by putting two constructs together. Another option was to mix the items and create a set of items which represented both constructs and definitions. The mix of items resulted in worse fit and overall worse loadings. Considering that constructiveness captured the area of interest of both constructs very well and additionally showed excellent loadings, the elimination of the advancement construct was manageable as well.

Overall, study 2 can be seen as an important and quantitative confirmation of the behavioural difference displayed in an inter-functional context, which the pre-study suggested already in the context of technology transfer (Cengiz and Geiger, 2019). The so-named behavioural dichotomy between functions seems to have not only disrupted value-generating processes, but it also seems to have created tensions between functions, which might have reduced the well-being of individuals. The focus from the behavioural perspective of integration is in line with the current research shift, which takes people-oriented factors and behaviours as the focus for integration (Cho et al., 2018; Ernst and Fischer, 2014; Gerke et al., 2017; Somaya, 2012; Somaya et al., 2007; Zhang et al., 2007). Whereas this study paid the highest attention to avoid common method bias, the self-reporting of all questions are undoubtedly a limita-

tions which needs to be taken into consideration. Although all questions are psychometric in nature and are i.a. reverse coded, double controlled in the survey and also fully anonymous, self-reporting of inter-functional citizenship behaviours can only be seen as a proxy of the reality - even more when triangulation or dyadic response patterns can not be inferred.

Taking the focus of items in table 5.3 and definition of table 5.2 into account, the remaining four behaviours indicate a distinction into relationship-oriented behaviours and task-oriented behaviours. Task-oriented behaviours (tolerance and conscientiousness) aim to smoothen the integration of tasks by going above and beyond to create a supportive environment. Relationship-oriented behaviours (altruism and constructiveness) focus on the inter-personal level of citizenship behaviours and aim to show citizenship behaviours towards the individual rather than the task itself. This distinction is a valuable contribution to the citizenship domain. Up until now, there has been no agreed way of differentiating citizenship behaviours. On the inter-functional level, a distinction remained after a multiple CFAs, which can be an important indicator to differentiate citizenship behaviours.

## 6.5 Summary

Neither the OCB scale nor the multiple adaptations fully captured the theorised picture of this dissertation. This study, therefore, enriches the citizenship theory will a new scale, taking the directionality and functional dependency of citizenship behaviours into account. People behaviours became an important field of research in the area of integration. With this study, a novel scale to analyse inter-functional integration from the behavioural perspective is proposed. Overall, this scale is sought to support the design and the functioning of integrative processes by including the behavioural perspective onto the existing process perspective. This study also reveals the potential for an important practical implication. The scale and survey can be used as an investigation tool to pinpoint behaviours in the inter-functional context between employees of two functions. Potential negative effects in inter-functional integration from the behavioural perspective might offer a novel way to optimise inter-functional work. As Cengiz and Geiger (2019) indicate in the area of technology transfer, an optimised process for technology transfer from the process perspective does not guarantee a successful integration. The behavioural needs and preferences appear to be important and might affect the process, the performance and even the fundamental motivation of employees.

## 6.6 Limitations

Despite several methodological strengths, this study has some limitations that should be recognised to inform future research. The main limitation is the single source of data collection via self-reporting. The researcher took several precautions to eliminate the concerns of common method bias (anonymity of the respondents, clarity about the research aim with no right/wrong answer, multiple rounds of deductive item generation to clarify item ambiguity, methodological separation of measurement) as suggested by Podsakoff et al. (2003). These pre-data collection strategies helped to reduce the risk of common method bias. However, future research could test and improve the scale by collecting data from multiple sources (hierarchical level) and also by including a time lag for data collection. A second limitation is the sample size. A sample of 250 is suggested and supported by the framework of Hinkin (1995). Nonetheless, a larger sample size would give higher robustness to statistical analysis and increases the validity and reliability of the research. Thirdly, as discussed in 6.2.1, the selection bias in panel data can be a problem. The overall population can be unknown and researchers can not compare if respondents are different to non-respondents. This research engaged in multiple efforts to avoid selection bias. A clearly defined overall population helped to understand underlying factors of potential respondents and control for these. Further, by engaging in pilot studies, initial sample parameters were checked with each other and also with the overall sample population. Additionally, with in-survey control questions, this study examined the defined population and their adherence to conceptual factors, such as task-interdependency. Finally, valid for every research, this study included a limited number of control variables. Whereas these were defined by the context of the research, additional control variables would increase the generalisability of the IFCB scale.

**Summary 7: Study 2 - confirmatory factor analysis**

- (a) The seven behaviours (constructs) derived in study 1 reduced to four behaviour (constructs) in the context of inter-functional integration.
- (b) The four constructs are all part of the early conceptualisation of the OCB theory and rooted in the citizenship domain.
- (c) The four-construct model shows an excellent statistical fit and meets all reliability and validity criteria.
- (d) The test for measurement invariance was successful. The scale is robust for the gender, duration of employment and functional affiliation variables.



# **Chapter 7**

## **Scale evaluation and testing - IFCBs in the inter-functional integration between R&D and IP team members - Study 3**

This chapter describes the final stage of the prescribed scale development process. As of now, the scale was rigorously developed by following established methods of (1) item generation (study 1) and (2) statistical confirmation (study 2). These steps resulted in the inter-functional citizenship scale (IFCB) with an excellent and statistically significant fit. Schwab (1980) recommends administering the "new" scale to an independent sample to validate previous results. Thus, in this final study, the IFCB scale is tested by researching the between R&D and IP employees from the behavioural perspective (Ernst and Fischer, 2014; Gassmann and Bader, 2011; Somaya et al., 2007).

This study assesses the response discrepancy/agreement effect of R&D employees' perceived IFCB from IP colleagues (hereby called perceived IFCB) and his/her display of the respective IFCB towards IP colleagues (hereby called displayed IFCB) on perceived organisational support for innovation (POSI), an established organisational culture variable which proxies the innovation culture in the R&D function. By using polynomial regressions, this study accounts for the combined effect of behaviours of employees from different functions on POSI. This constitutes a unique and novel method to analyse citizenship behaviours (Edwards, 2006; Shanock et al., 2010).

## 7.1 The research scene

### 7.1.1 Introduction

Including the behavioural perspective into cross-functional integration bears the potential to “*understand behavioural factors that facilitate (or inhibit) inter-functional collaboration*” (Ellinger et al., 2006, p.2). Understanding the behavioural factors can help to investigate tensions between functions and its employees, which had developed over time due to the different thought worlds and inter-dependent processes (Dougherty, 1992; Moorman et al., 1998). By developing the IFCB scale, this dissertation aims to introduce a novel approach on how to measure inter-functional working behaviours, which is fundamentally different from the existing, process-oriented approaches. This behavioural perspective might, in the long term, help to design better integrative processes by taking behavioural inclinations of employees into account.

Many studies have shown that citizenship behaviours are influential and have significant effects on multiple organisational outcome variables (please see section 2.3.1.2). These studies take the organisational view on citizenship behaviours and suggest that an organisation benefits when employees adopt citizenship behaviours. Numerous scholars recently introduced adaptations and progressions of citizenship behaviours in different boundary conditions and developed novel scales, such as customer-citizenship behaviour (CCB) (Langner and Seidel, 2014), project citizenship behaviour (PCB) (Braun et al., 2013) or environmental citizenship behaviour (ECB) (Robertson and Barling, 2017). Acknowledging the recent adaptations, study 1 and 2 of this dissertation suggested that the level of detail in inter-functional and inter-individual settings need to be more fine-grained. This study aims to develop the IFCB scale, which is conceptually and statistically close to the original OCB theory. However, it has an adequate level of detail to capture the nuances of the inter-functional context. Research in the area of inter-individual and inter-individual citizenship behaviours, as well as in the innovative context, is only in its beginning (Podsakoff et al., 2018a). This study addresses both areas of research, the inter-individual and the innovation context by developing a scale for the inter-individual integration and empirically testing it in inter-functional integration between the R&D and IP functions.

The R&D/IP integration is chosen for various reasons. Firstly, R&D and IP employees inhabit different thought worlds. R&D employees are technically-oriented, and they appear to be more risk affine, whereas IP employees are legally-oriented and tend to be more risk-averse. They also adhere to seemingly different "languages": R&D employees use technical language to explain a phenomenon, while IP employees might use legal language

to describe the same phenomenon (Ernst and Fischer, 2014), introducing communication difficulties between both functions. Furthermore, R&D employees' job-specific duties can be creative and exploration-oriented, while IP employees have been trained to reduce/manage risk and follow legal requirements. Secondly, cross-functional integration is critical in cases where high inter-dependencies exist. Numerous researchers confirmed this inter-dependency between the R&D and IP functions (Ernst and Fischer, 2014; Reitzig and Puranam, 2009; Somaya et al., 2007). Both functions and processes are closely intertwined, and neither of the functions alone possesses the required information to fully support value creation (Ernst and Fischer, 2014; Reitzig and Puranam, 2009). Thirdly, knowledge became the key economic asset in the globalised world (Hanel, 2006). The importance of protecting knowledge as "crown jewels" for maintaining a competitive advantage is one of the principal tasks and challenges of any technology and knowledge-based organisation and its C-level suite (Ernst, 2017). The increased competitive pressure, as well as the rapid technological advancements, put R&D employees under the enormous pressure to innovate. Therefore, the integration of IP employees with R&D colleagues could offer unique opportunities for integration (Ernst and Fischer, 2014). The support from IP employees, tailored to the specific needs of R&D colleagues, may provide the leverage effect for organisations success, which Somaya (2012) indicated in his research. Finally, prior research indicates supporting, as well as intriguing results for IP and R&D integration. Patenting and organisational performance have been shown to be positively related in general (Blind et al., 2009; Ernst and Fischer, 2014; Granstrand, 1999; Somaya et al., 2013). However, research also summarised a (weak) negative complementary and integrative effect of both functions in high innovation and R&D settings (Ernst and Fischer, 2014; Somaya et al., 2007). By using the newly developed scale, this research aims to shed more light on the uncertain results with regards to IP and R&D integration Ernst and Fischer (2014); Somaya et al. (2007).

A survey collects R&D employees' perception of an IFCB, which they perceive to receive from their IP colleagues (*"How much IFCB do you perceive from IP employees"*), as well as the IFCB an R&D employee displays towards his/her IP colleague (*"How much IFCB do you display towards IP employees"*). Thus, perceived IFCB is the R&D employees' perception of a certain IFCB from IP employees (perceived IFCB) and displayed IFCB is the R&D employees' displayed IFCB towards IP colleagues (displayed IFCB). It uses a 5-point Likert scale for assessing the effects of a response discrepancy/agreement between perceived and displayed IFCB on perceived organisational support for innovation (POSI). POSI is an established organisational culture variable which proxies the innovation culture in the R&D function. A response discrepancy applies when both response scores are essentially

(statistically) discrepant in one way or another. A response agreement applies when both response scores are essentially (statistically) the same. A high POSI environment creates a proinnovative culture in which experimentation, as well as the culture for trial and error, is supported and encouraged (Ashford et al., 1998). These factors are critical in the R&D function, and increasing POSI could support the psychological safety of employees who in turn then understand that adopting innovative behaviour is encouraged and supported by the organisation (Scott and Bruce, 1994). Consequently, adopting innovative behaviour could potentially increase the innovation output of an organisation and increase the competitive edge of the R&D function.

Most previous research examined the interaction between citizenship behaviours and outcome variables by regression analysis, e.g. using the structural equation modelling (SEM) or the moderated regression approach (Autry et al., 2008; Podsakoff et al., 2009; Podsakoff, 1994). SEM is a multivariate approach incorporating observed (measured) and unobserved variables (latent constructs). Moderated regression is a traditional approach, which adds a second predictor variable as a moderator and examines the influence of it in binary settings such as low and high. However, neither SEM nor the moderated regression approach incorporates the response discrepancy/agreement of R&D employees' perceived and displayed IFCB response into one analysis with the level of detail this study sought to do. Hence, by using the polynomial regression with response surface analysis method, this study introduces a detailed analysis of the effect of R&D employees' response discrepancy/agreement on POSI.

## 7.2 Research methodology - polynomial regression with response surface analysis

The polynomial regression with response surface analysis is one of the most powerful statistical tools used in many areas of research where two scores, the response discrepancy/agreement of two scores and the influence of response discrepancy/agreement on an outcome variable are the main interest of research (Edwards, 2006). This study gathers R&D employees' perceived and displayed IFCB and examines the influence of the response discrepancy/agreement on POSI. This measurement approach has its roots in fit-research, where scores of two factors are often the main interest of scholars (Podsakoff et al., 2018a). The variables are mainly a self-rating of an individual (this study asks R&D employees about "*How much IFCB do you display towards your IP colleagues?*") and another variable, which is the perception of the individual from the same conceptual space (this study determines

the perception of R&D employees from the same organisation by asking "*How much IFCB do you perceive from your IP colleagues*") (Edwards, 1995) (please see section 2.3.1.2 for a detailed description of fit-research factors).

Researching response discrepancy/agreement needs more attention than merely subtracting one response score from another. A simple difference score exposes the research to a potential bias in the reliability of response discrepancy, which Edwards (1995) explains in detail in his statistical statutes. For example, two predictor variables, with two distinct variances and reliabilities can, when using simple difference scores calculation, have lower reliability than the two individual reliabilities (please see pages 7-9 in Edwards (2002) for a full mathematical proof). Furthermore, there is a conceptual problem with simple difference score regressions. Conceptually, a difference score indicates that one variable varies compared to the other one. This might actually be the interest of the researcher. However, the polynomial regression presents an alternative to obtain much more complex regression results than that. This new method attracted a variety of other disciplines interested in studying the effect of agreement and discrepancy of response scores on an individual or organisational performance variable (Edwards, 2006; Shanock et al., 2010). Scholars use agreement/discrepancy to describe the response pattern. Agreement applies when both response scores are essentially (statistically) the same. For example, a response is classified as 'in agreement' in this study if the response of an R&D employee to "*How much IFCB do you display towards your IP colleague*" is at Likert 3, and the response score from the R&D employee to "*How much IFCB do you perceive from your IP colleague*" is also at Likert 3. R&D employees' perception from IP colleagues and his/her display towards IP colleagues are 'in agreement'. (S)he perceives as much as s(he) displays or displays as much as s(h)e perceives. On the contrary, discrepancy applies when both response scores are essentially (statistically) discrepant in one way or another. For example, a response is classified as discrepant in this study if the response of an R&D employee to "*How much IFCB do you display towards your IP colleague*" is at Likert 3, and the response score from the R&D employee to "*How much IFCB do you perceive from your IP colleague*" is at Likert 5. As mentioned above, it can also be the other way around: "*How much IFCB do you display towards your IP colleague*" at Likert 5 and "*How much IFCB do you perceive from your IP colleague*" at Likert 3. R&D employees perceive more IFCB than they display or displays more IFCB than they perceive.

### 7.2.1 Assumptions and terminology

Three assumptions need to apply in order to employ the polynomial regression with surface response analysis (Edwards, 2002):

1. Both predictor variables must be commensurate (Edwards, 2002). That is, both predictor variables must correspond to each other by representing the same conceptual domain. With that, any difference between the two variables can be interpreted by the knowledge of the conceptual domain. In this research, both predictor variables measure the same IFCB construct, one variable is a self-rating (displayed IFCB), and the other one is the perceived IFCB (perceived IFCB) of an R&D employee.
2. The second assumption is a general regression assumption for measurement scales. Edwards (2002) urges researchers to measure both predictor variable with the same (numerical) scale to compare them. Alternatively, transforming scales into the common metric is proposed. This study measures both predictor variables on a 5-point Likert scale and transforms it by applying the midpoint standardisation.
3. The third assumption is also based on the general regression approach and concerns the assumptions which are required to do any multiple regression analysis (adequate normality of data and linear combination predictor variable and the outcome variable - for a full list of multiple regression analysis, please see Edwards (1995) and Tabachnick and Fidell (2019)). Data in this study is normally distributed and does not show any significant skewness.

By applying the polynomial regression with response surface analysis, we accept the general form of a polynomial regression:

$$Z = b_0 + b_1X + b_2Y + b_3X^2 + b_4XY + b_5Y^2 + e \quad (7.1)$$

Z is the outcome variable POSI, X is the first predictor variable (R&D employees' perceived IFCB from IP employees), and Y is the second predictor variable (R&D employees' displayed IFCB towards IP employees). The outcome variable Z is hence regressed on both predictor variables (X and Y), the interaction term of both predictor variable (XY) and the squared term of each of the predictor variable ( $X^2$ ) and ( $Y^2$ ). This study includes the squared terms of X and Y to model the potential curvilinear relationship between the variables. By including both squared term, each measure is retained and allows the analysis on a much greater level. Instead of subtracting variables to create difference scores, thus reducing dimensionality and

losing information, both variables are regressed on the outcome variable and contribute to the analysis of POSI. The resulting three-dimensional (3D) graph helps to interpret results and explains underlying phenomena. As a result, polynomial regressions can model non-linear relationships without engaging in complex non-linear equations.

Polynomial regression is a special case of linear regression. By including the ( $X^2$ ) and ( $Y^2$ ) terms into the regression, the equation has hence five different variables where the regression estimates five beta coefficients, b1-b5. These beta coefficients, including error terms and covariances, calculate four surface values, a1-a4, which describe the slope and the curvature of the 3D graph, as well as the perfect line of agreement and discrepancy. The line of perfect agreement follows the exact  $X=Y$  line (please see the dark line on the ground in figure 7.1) and represents "in-agreement" X and Y variables. The line of perfect discrepancy follows the  $X=-Y$  line (please see the dashed line on the floor of figure 7.1) and indicates the discrepancy of X and Y variables. The significance of these surface values give indications about the statistical fit and indicate the effect of response discrepancy/agreement on POSI. Finally, by inputting all beta coefficients into the equation mentioned in 7.1, the 3D graph for any given X and Y is drawn (please see figure 7.1 for the resulting 3D graph).

## 7.2.2 Response surface analysis in the context of R&D/IP and inter-functional citizenship behaviours

This study captures predictor variable 1 *R&D employees' perceived IFCB from IP colleagues* (perceived IFCB) and predictor variable 2 *R&D employees' displayed IFCB towards IP colleagues* (displayed IFCB). This research approach allows to answer three questions based on the response surface analysis.

1. What is the effect of the *degree of agreement* between the two predictor variables on an outcome variable? Agreement means that both predictor variables are essentially the same. In practical terms, the "same" rating in the Likert scale can be shown as (3/3). The first value is the response to perceived IFCB, and the second value is the response to displayed IFCB. For example, in this study, an R&D employee could score Likert 3 for ("*How much IFCB do you perceive from IP employees*") and also Likert 3 for ("*How much IFCB do you display towards IP employees*"). Therefore, do R&D employees with same and increasing ('in agreement') perceived IFCB and displayed IFCB show higher POSI?
2. What is the effect of the *degree of discrepancy* between two predictor variables on an outcome variable? A discrepancy is indicated by how much predictor variables differ

from each other. For example, does POSI increase or decrease when both predictor variables become increasingly discrepant? Concerning study, does POSI decrease when response scores become increasingly discrepant, diverging from, e.g. (2/3) to (1/5)?

3. And finally, how does the *direction of discrepancy* between two predictor variables relate to an outcome variable? The direction refers to one predictor variable scoring higher than the other one or vice versa. Discrepant ratings in Likert scale can be shown with, e.g. (1/4) where the perceived IFCB score is at Likert 1 and displayed IFCB score is at 4 or with (5/2) where the perceived IFCB score is at Likert 5 and displayed IFCB score is at Likert 2. Hence, if not 'in agreement', the response discrepancy can have two directions: perceived IFCB> displayed IFCB or perceived IFCB< displayed IFCB. Concerning this study, for example, is R&D employees' POSI higher when s(he) perceives more IFCB than s(he) displays?

A 5-point Likert scale offers 25 combinations of X and Y, which are illustrated in figure 7.1 (please note that the table shows the centred Likert scale. Three (3) is the centre of a 5-point Likert scale, and consequently, this study subtracts three (3) from each score to create a standardised score, which ranges from (1-3=-2) to (5-3=2) where (-2) is the Likert 1 and 2 is the Likert (5)). Thus, the 5-point Likert scale used in the survey is transformed into a standardised 5-point scale, ranging from -2 to 2.

The 3D plot in figure 7.1 shows the outcome variable (Z-axis) for every scale point of X and Y. The shape, the slope and the curvature of the plot are mathematically described by four surface values (a1-a4), which can be interpreted to indicate the agreement, discrepancy, direction of discrepancy, as well as the implications of those values concerning the outcome variable (please see table 7.7 for a summary) (Shanock et al., 2010). These surface values are calculated using the beta coefficients from the polynomial regression

1. An a1 value is calculated as  $a1 = b1 + b2$ . It describes the slope of the line of perfect agreement ( $X=Y$ ) (please see the dark line at the base of figure 7.1). A positive a1 value indicates a positive slope. When X and Y increase in the agreement level, Z increases. A negative a1 value indicates a negative slope. Z decreases when both X and Y increase.
2. An a2 value is calculated as  $a2 = b3 + b4 + b5$ . This value describes the direction, the curvature of the line of perfect agreement ( $X=Y$ ). A positive a2 value results in a convex surface (upward curvature), a negative a2 value in a concave surface (downward curvature).

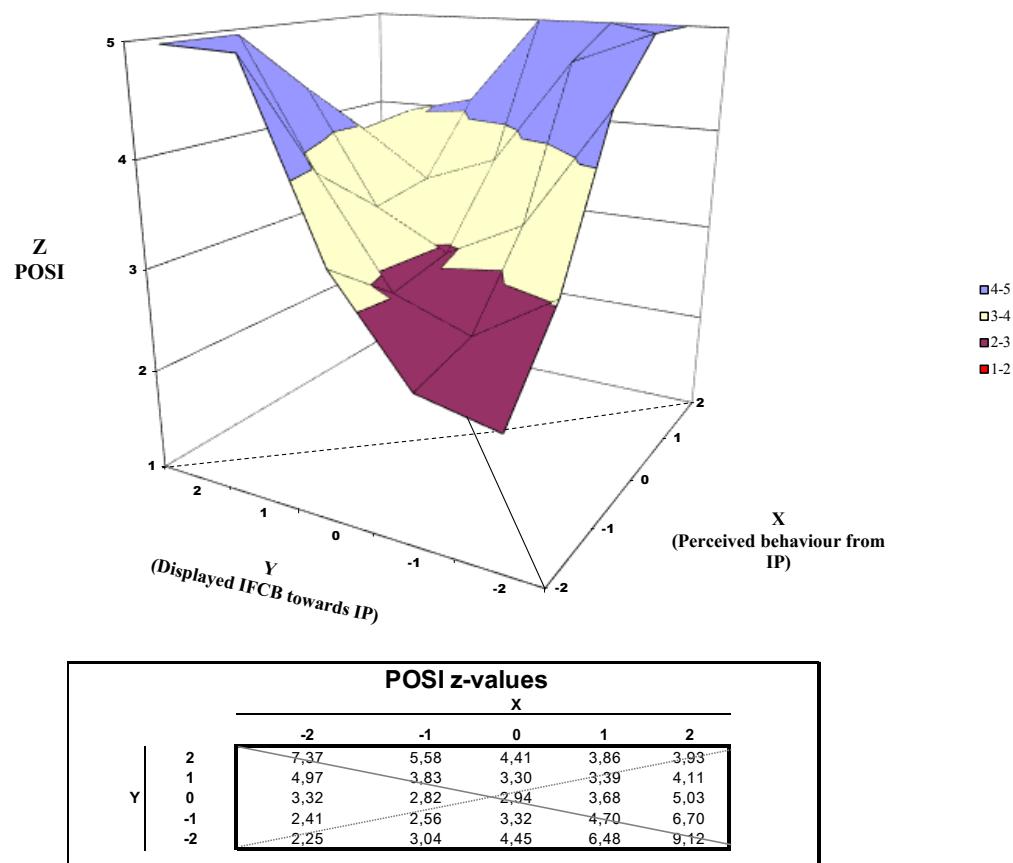


Fig. 7.1 Exemplary response surface analysis 3D plot with the relevant outcome value table

3. An a3 value is calculated as  $a3 = b1 - b2$ . Note that the a3 value uses the same estimations as a1, but the algebraic sign is reversed from + to -. Therefore, a3 represents the slope of the line of perfect discrepancy ( $X=-Y$ ) (please see the dashed line on the floor of figure 7.1). a3 thus describes the direction of discrepancy, suggesting which of the predictor variables relates stronger to the outcome variable. A negative a3 indicates that the outcome is higher when Y is higher than X, a positive a3 vice versa.
4. An a4 value is calculated as  $a4 = b3 - b4 + b5$ . Note that the a4 value uses the same estimations as a2, but the first algebraic sign is reversed from + to -. Therefore, a4 displays the value for the direction, the curvature of the line of perfect discrepancy ( $X=-Y$ ) (please see the dashed line at the base of figure 7.1). A positive a4 value results in a convex surface (upward curvature), a negative a4 in a concave surface (downward curvature).

Figure 7.1 presents an example illustrating the 4 surface values. It has a positive and significant a4 value, showing that discrepancy might be better than agreement for the chosen Z variable (please note that the Z values in 7.1 are at the highest when they are at perfect discrepancy (-2/-2) and (2/-2). a3 is positive and significant as well, suggesting that the direction of discrepancy matters. The outcome variable is higher when the discrepancy is towards X higher than Y ( $X>Y$  rather than  $Y>X$ ) (please note that the Z value in the table at the bottom right (2/-2) is higher than the value on the top left (-2/-2)). a1 is positive, indicating a positive slope of the line, which the table below summarises. Values from bottom left (-2/-2) increase along the diagonal line of the perfect agreement until (2/2). To make the results more illustrative, figure 7.2 can be seen as a 2x2 matrix where only the extreme cases of agreement and discrepancy are represented. The 2x2 integration matrix shown in figure 7.2 makes the interpretation much easier and will be subsequently used to describe results and hypotheses.

### 7.3 Development of hypotheses

Schwab (1980) recommends administering the "new" scale to an independent sample to test previous results. Stone (1978) and Hinkin (1995) support this recommendation by urging researchers to the "*use of an independent sample to provide an application of the measure in a substantive context [which] will enhance the generalisability of the new measures*" (Hinkin, 1995, p.980). By developing hypotheses based on existing theories, results, and theoretically founded relationships, this study adheres to the recommendations and the final step of the

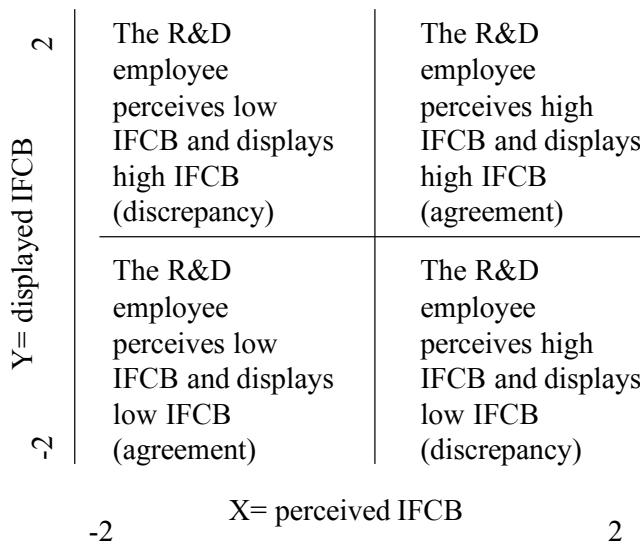


Fig. 7.2 2x2 integration matrix

scale development process prescribed by DeVellis (2011); Hinkin (1995); Likert (1961); Schwab (1980). Demonstrating the existence of a nomological network of relationships with other variables supports the construct validity and completes the scale development process (Edwards, 1995; Hinkin, 1995; Schwab, 1980; Stone, 1978).

By testing previous results provided by Ernst and Fischer (2014) and Somaya et al. (2007) from the behavioural perspective, in addition to showing a clear distinction between the behaviours, this dissertation establishes construct validity. Consequently, a novel scale which can measure inter-functional integration from the behavioural perspective is proposed. Figure 7.3 summarises the research model of study 3. Valid for all hypotheses, hypotheses 'a' indicate the discrepancy and hypotheses 'b' indicate the direction of discrepancy of IFCBs. All hypotheses follow the research proposition for the R&D and IP integration, as described in section 2.5, as well as the research methodology described above. They challenge the organisational equilibrium view, which advocates for maintenance of equilibrium between areas of tension. Following the two main contributions from Somaya et al. (2007) and Ernst and Fischer (2014), this study develops hypotheses for the R&D and IP integration in which all four hypotheses anticipate a behavioural disequilibrium between R&D and IP employees, which is associated with POSI. Research about R&D and IP employees summarises that (a) the complementary effects of high R&D spending and high IP expertise result in a (weak) neg-

ative interaction effect, which was counterintuitive to the authors (Somaya et al., 2007). Both functions are complementary in resources; matching high patent expertise with high R&D spending should have resulted in higher performance. Furthermore, a lack of one resource should have thus negatively influenced the overall performance. Moreover, Ernst and Fischer (2014) summarise that (b), in highly innovative product settings, the specific contribution of the IP functions matters more than a collaboration between R&D and IP employees. As previously discussed and argued in section 2.5, integration can be collaboration-based where Ernst and Fischer (2014) postulate the "*the affective, volitional, mutual, or shared nature of working together*" (pp.120-121). Thus, aspects like "*joint goals, open and cooperative work atmosphere, teamwork, and harmony in the working relationship*" (Ernst and Fischer, 2014, pp.120-121) are inherent. It can also be only contribution-based in which none of the collaborative aspects described above are implicit. The integration is only based on the given task in which a specialised opinion, deliverable, and help are presupposed. This postulation is particularly important in the exploration-oriented part of the R&D function. Scientists have a high expertise and posses broad and deep knowledge of the area - not only about their own development but also about the status quo of research, including competition and early-stage blue sky research. Furthermore, the freedom scientist get in the exploration-oriented part of the R&D function is much higher than in any other area of the business. A similar line of thought is also followed in Somaya et al. (2007) in which the authors conclude that [...] "*similarly, in high RD settings, larger numbers of potentially patentable inventions are likely to be readily identifiable, so that the value added by internal patent attorneys in harvesting (eliciting, identifying, and evaluating) patentable ideas may be lower*" (Somaya et al., 2007, p.933). In summary, the integration can be (a) collaboration-based ("in-agreement") or (b) contribution-based ("discrepancy"), mimicking an internal service-oriented integration. Previous results for the integration between R&D and IP employees indicate a contribution-based integration. Thus, this study develops all hypotheses according to this pre-defined relationship between R&D and IP employees.

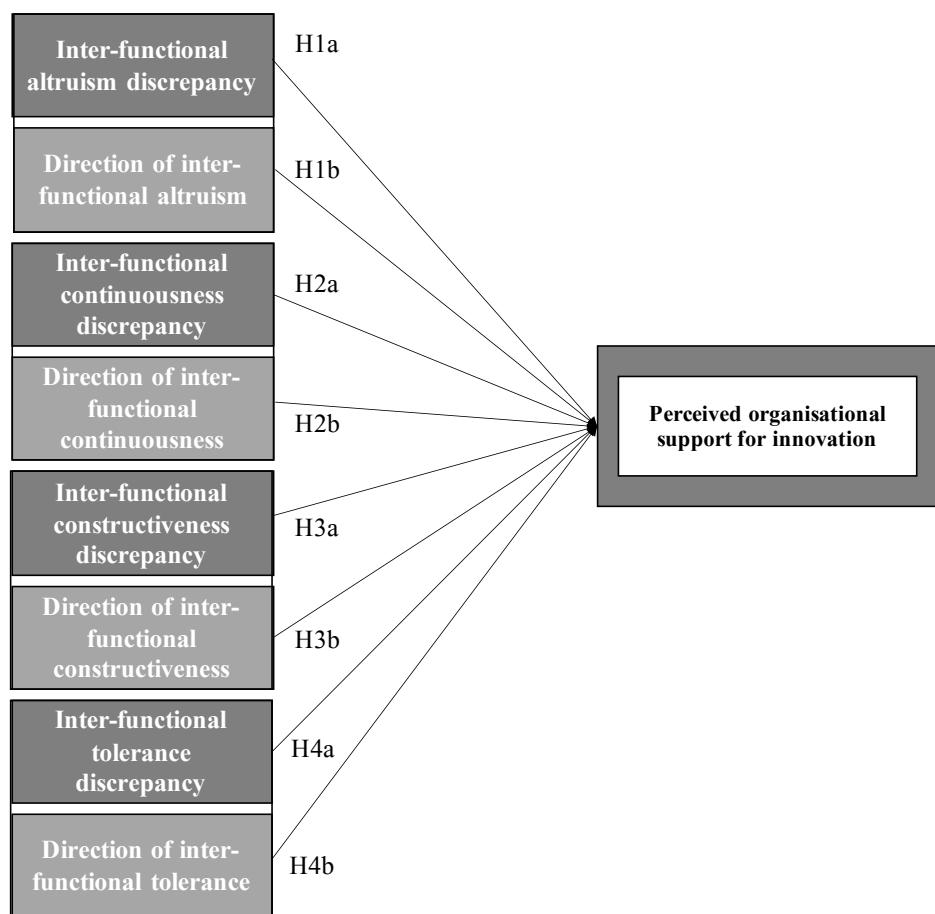


Fig. 7.3 Research model of study 3

### 7.3.1 IFCB and perceived organisational support for innovation

Perceived organisational support for innovation (POSI) (Yuan and Woodman, 2010) is an established measure for organisational culture, which appears in the literature as forming a proinnovative organisational climate and culture (Amabile, 1988; Kanter, 1988; Scott and Bruce, 1994). An organisational climate describes shared perceptions of the employees in a group or organisation. In contrast, organisational culture "*includes how people feel about the organisation and the beliefs, values, and assumptions that provide the identity and set the standards of behaviour*" (Stolp and Smith, 1995, p.21). Scholars indicate that high POSI might support values and norms that affect potential image gain and image risk associated with adopting innovative behaviour. Individuals who perceive high organisational support for innovation appear to be more likely to engage in change, seek to initiate change and perceive change as culturally appropriate (Scott and Bruce, 1994). This organisational culture could consequently increase the likelihood of inventions and image gain within the organisation and function. In practice, image gain could be achieved through internal appreciation for being a thought leader, having numerous (academic) publications or getting listed in the most innovative employee list based on patent applications. However, employees who adopt innovative behaviour also aim to reduce image risk. Adopting innovative behaviour could lead to failed projects or technological developments. The employee will be held responsible for the failure and hence could reduce his engagement in risky but innovative activities.

Innovative culture is an important parameter for employees to go above and beyond their abilities to adopt innovative behaviour. A proinnovative culture introduces opportunities to challenge the status quo, propose innovative ideas and perceive change as fundamentally important for organisational value generation and success (Scott and Bruce, 1994). Hence, image risk is reduced in high POSI relationships, making it more favourable to engage in innovative activities. In the longer term, employees could understand that innovation is linked to performance and image gains and are likely to adopt innovative behaviours (Yuan and Woodman, 2010). Respondents of this study are in the core technology development part of the R&D function (exploration-oriented R&D). They regularly engage in potentially inventive tasks in which the IP function is one of the key support mechanisms for the individual inventor. Potential inventors are supported by highly specialised IP employees who work alongside the inventor to increase the impact and likelihood of securing an IP right. A close working relationship can increase the perception of organisational support for innovation which in turn "*legitimizes experimentation*" (Yuan and Woodman, 2010, p.327). Furthermore, Ashford et al. (1998) link high POSI to an increased feeling of psychological safety for trial and error, which consequently increases the likelihood of breakthrough innovations. Moreover,

as Somaya et al. (2007) indicated, the resource complementary effect between IP and R&D is very high. A lack of support from the IP function can be a gap in the resources needed to perform, invent, and innovate.

Following this line of argumentation, a collaborative working relationship should characterise the interaction of R&D and IP. However, previous results indicate that close collaboration seems not beneficial and is also not sought by R&D employees in highly innovative contexts. There appears to be no positive complementary effect of the R&D and IP interaction in high innovative context (Somaya et al., 2007). Rather, a contribution-based integration seems to be more beneficial in highly innovative contexts when compared to a collaboration-based integration (Ernst and Fischer, 2014). As indicated earlier, the high expertise of R&D employees in highly innovative contexts can support this phenomenon. R&D employees have the highest expertise about the area of their research, including the state of the art indication. They might not need the support in the early stages of their work and an engagement can be counterproductive as it can limit their freedom and also creativity which in turn might affect the perception of perceived support innovation. This line of thought is also followed in Somaya et al. (2007) in which the authors conclude that in high R&D settings, IP employees do not need to do more "*digging and spend more time with the scientist... maybe there is a hidden jewel somewhere.*" (Somaya et al., 2007, p.933). Thus, aiming to evaluate the IFCB scale and test the integration from the behavioural perspective, a contribution-based integration for this study is hypothesised to have a positive impact on POSI. The contribution-based integration is linked to discrepancy in IFCB between the R&D and IP employees (please see section 2.5 for research proposition). Revisiting figure 7.2, a high perception of an IFCB in combination with a low display of the respective IFCB is in the 4th quadrant. Accordingly, low perception of an IFCB combined with a high display of the respective IFCB is in the 2nd quadrant. In equilibrium terms, this response discrepancy indicates a behavioural disequilibrium.

The four constructs/behaviours concluded in study 2 characterise the working relationship between R&D and IP employees. Based on the "thought world" of exploration-oriented R&D employees (Dougherty, 1992), this dissertation proposes an arrangement of behaviours into "task-oriented" (tolerance and conscientiousness) and "relationship-oriented" (altruism and constructiveness) to capture the complex working environment. "Task-oriented" behaviours are aimed at supporting the specific contribution of IP employees towards exploration-oriented R&D employees. These employees have expert-level knowledge about their field and might also have a deep understanding of the IP landscape, including state of the art, the internal IP processes and the IP rights in general. Therefore, a close collaboration-based

integration might not be needed until they feel ready to engage with their respective IP colleagues. Following previous research of behavioural disequilibrium between R&D and IP employees and postulating this relationship, this study acknowledges the complex area of the exploration-oriented R&D function and will pay the highest attention when putting the results into the context.

In contrast, "relationship-oriented" behaviours aimed at strengthening the inter-functional links on a more general level, aiming to implement a mutual and shared nature of working. Previous research did not confirm this integration in highly innovative contexts and taking the exploration-oriented R&D employees into account, this study does not expect surprising results with regards to "relationship-oriented" behaviours.

### **7.3.2 Hypotheses for the inter-functional altruism-POSI association**

Altruism is a relationship-oriented IFCB. It has been argued to be one of the most important citizenship behaviours in the research stream (Podsakoff et al., 2000). The definition of altruism directs at helping another employee from a different function to solve problems and acquire new knowledge and skills. Altruism has been linked to individual outcome variables such as performance evaluation, as well as hiring and promotion success (Hui, 2000; Shore et al., 1995; Whiting and Maynes, 2016). It has also been shown to negatively affect the intention of an employee to leave the organisation (employee turnover intention), and hence signal that employees are more likely to continue with their current work. It can be hypothesised that R&D employees who perceive high levels of altruism are more likely to perceive this as POSI as they are experiencing constant help to solve problems and acquire new skills. Potential inventors are supported by highly specialised IP employees who work alongside the inventors to increase the impact and likelihood of securing IP rights. Furthermore, Ashford et al. (1998) shows that an increased perception of altruism in individuals increases their sense of psychological safety for trial and error. This organisational culture could consequently increase the likelihood of breakthrough innovations or increase the number of invention disclosures for R&D employees under the high perception of altruism from IP employees.

Following previous academic results of non-collaboration-based integration for R&D and IP employees (Ernst and Fischer, 2014), a contribution-based integration is proposed. This study anticipates that R&D employees will not reciprocate the high perception of altruism from IP employees with altruism towards IP colleagues. This could be due to different thought worlds which could cause more tension and stress for R&D employees who work under high

competitive pressure. Both R&D and IP employees also inhabit fundamentally different thought worlds. It seems that R&D employees prefer to only engage with IP employees when needed (contribution-based integration). This practice mimics the service-oriented integration as argued by scholars like Fisher III and Oberholzer-gee (2013); Gassmann and Bader (2011); Süzeroğlu-Melchior (2017). The IP function is a dedicated support function and aims to help inventors to secure IP rights. A reciprocally displayed behaviour from R&D employees towards IP employees is hence not expected and also seems not beneficial for R&D employees (Ernst and Fischer, 2014; Somaya et al., 2007). Finally, following the above-mentioned area of exploration-oriented R&D employees and their already existing knowledge base about the IP landscape, the rights and internal processes, a collaboration-based integration would indicate a constant "*digging after hidden jewels*" Somaya et al. (2007, p.933) and could harm the perceived organisational support for innovation.

In summary, despite the positive effects of altruism as described above and the indications that integration increases performance, results for highly innovative employees in highly innovative organisations and industries show the contrary (Ernst and Fischer, 2014; Somaya et al., 2007). There seems to be no complementary effect of a collaborative R&D and IP interaction in highly innovative contexts. Instead, contribution-based integration seems to be more beneficial. Hence, aiming to test this relationship from the behavioural perspective, a contribution-based integration can be hypothesised where contribution-based integration appears to be more beneficial for POSI than collaboration-based integration. Thus, R&D employees who perceive high altruism from IP employees perceive it as organisational support for innovation. However, they do not reciprocate and hence do not display altruism towards IP employees, creating a discrepancy between perceived and displayed IFCB.

**Hypothesis 1a:** *The level of discrepancy between R&D employees' perceived and displayed altruism is positively related to POSI.*

**Hypothesis 1b:** *For the direction of discrepancy, POSI will be higher when R&D employees' perceived altruism from IP employees is higher than his/her displayed altruism towards IP employees.*

In terms of agreement and discrepancy, hypothesis 1a hypothesises higher outcome values when X and Y variables are discrepant (2nd and 4th quadrant in figure 7.2) rather than 'in agreement'. Furthermore, in terms of the direction of discrepancy, hypothesis 1b hypothesises a greater influence of X (perceived altruism) on the POSI than Y (displayed altruism) (4th in figure 7.2).

### 7.3.3 Hypotheses for the inter-functional constructiveness-POSI association

Constructiveness is a relationship-oriented IFCB. It describes the general interest of an employee in inter-functional affairs affecting the relationship between employees from different functions. High levels of constructiveness have been linked to increased performance, as well as supervisor performance evaluation (MacKenzie et al., 1991). Employees demonstrate a high level of constructiveness by, for example, committing to join inter-functional meetings and policy debates, expressing their opinions for the sake of performance increase, proactively meeting colleagues outside of work and introducing relevant people and resources to colleagues (Autry et al., 2008; Podsakoff et al., 2000).

The hypothesis for inter-functional constructiveness follows the logic of the aforementioned IFCB. The IP function is, by definition, the support function for R&D employees. Hence a high constructiveness towards R&D employees seems expected from IP employees. This practice, in turn, may increase the perceived organisational support for innovation of R&D employees, creating a working relationship in which the organisational culture favours innovation (Yuan and Woodman, 2010). R&D employees recognise the constructive behaviour of IP employees and perceive this IFCB as beneficial and supportive for their own (innovative) work. Nonetheless, similarly to altruism, a lower constructiveness of R&D employees towards IP employees is hypothesised. This practice seems to be aligned with the high competitive pressure R&D employees are experiencing, and the contribution-based integration between R&D/IP employees reported in previous research (Ernst and Fischer, 2014). Furthermore, continuing the thought of Somaya et al. (2007), a collaboration-oriented integration with high constructiveness from IP towards R&D employees would mean a higher time spend with the scientist - a situation which might not be favoured in the exploration-oriented part of the R&D function. Exploration-oriented R&D employees might have the knowledge about the IP landscape, the IP rights and the IP generation process and might not need display the constructiveness perceived from IP employees. They perceive the active participation of IP employees in meetings, the proactive sharing of information and the active advocacy for more R&D resources as organisational support for innovation. However, R&D employees do not advocate for more IP resources, do not proactively share information with IP employee nor introduce relevant people to IP employees.

**Hypothesis 2a:** *The level of discrepancy between R&D employees' perceived and displayed constructiveness is positively related to POSI.*

In terms of agreement and discrepancy, hypothesis 2a hypothesises higher outcome values

when X and Y variables are discrepant (2nd and 4th quadrant in figure 7.2) rather than 'in agreement'.

Furthermore, similar to altruism, a high perception of constructiveness, rather than displayed constructiveness, will have a greater effect on POSI (4th in figure 7.2):

**Hypothesis 2b:** *For the direction of discrepancy, POSI will be higher when R&D employees' perceived constructiveness from IP employees is higher than his/her displayed constructiveness towards IP employees.*

#### Summary 8: Relationship-oriented IFCBs

- (n) The hypotheses for relationship-oriented IFCBs postulate a discrepancy. R&D employees perceive higher organisational support for innovation when they perceive high relationship-oriented IFCBs from IP employees but displays low relationship-oriented IFCBs towards IP employees.
- (n) A high perception of relationship-oriented IFCBs is not reciprocated by R&D employees due to the high competitive pressure for value generation and the different thought worlds inhabited by both functions.
- (n) This discrepancy is linked to a behavioural disequilibrium and challenges the equilibrium view of maintenance of equilibrium of behaviours to deal with tensions.

### 7.3.4 Hypotheses for the inter-functional conscientiousness-POSI association

Conscientiousness is a task-oriented IFCB which deals with the task-related 'extra-mile' as defined by Organ (1988). In previous research, it has been linked to individual performance increase and work success/promotability (Hui, 2000). This study links conscientiousness to deliverables and the extra effort an R&D employee perceives from IP employees and displays towards them (as developed in study 1 and 2). It highlights the voluntary aspect of over-performance. Employees need to go beyond what is required on task-level to smooth the process of integration and overcome the challenges and inconveniences, which might be rooted in divergent aims, heterogenic knowledge bases and task inter-dependencies. R&D employees who perceive high conscientiousness from IP colleagues may recognise the extra effort and perceive it as organisational support for innovation and also as a support for their

own (innovative) work. In practice, IP employees might go over the requested support and might volunteer resources to lighten up the workload of R&D colleagues. Furthermore, they might follow up with their R&D colleagues concerning the outcome of their support and might show interest in the working relationship. This constant over-performance and high perception of conscientiousness could increase proinnovative climate and culture (Amabile, 1988; Kanter, 1988; Scott and Bruce, 1994) and may anchor the thought that innovation positively influences performance and image gains (Yuan and Woodman, 2010).

However, following previous research in R&D and IP integration and committing to test these results from a behavioural perspective, this study hypothesises a contribution-based integration. Thus, in line with the arguments above, it can be hypothesised that R&D employees perceive high levels of conscientiousness from their IP colleagues but display low levels of conscientiousness towards them. The low display of conscientiousness from R&D employees towards their IP colleagues might be linked to the potential negative effects of conscientiousness on task performance, the potential negative influence of conscientiousness on high-stress levels (Bolino, 2005; Halbesleben et al., 2009) and the high competitive pressure for R&D employees to generate value without engaging with extra effort in non-value generating activities. The IP function could operate as an internal service provider, guaranteeing full and high-quality IP support and contribution when needed (Gassmann and Bader, 2011). Thus, a high perception of conscientiousness may benefit R&D employees' POSI as R&D employees - the 'customer' - feels satisfied with the integration and the 'extra mile' an IP employee - the 'service provider' goes for the success of his/her work. However, it can be hypothesised that a service-oriented design does not involve a reciprocal display of conscientiousness from the 'customer' towards the 'service provider'. Putting this behaviour into the context of exploration-oriented R&D, it is imperative to mention that R&D employees might engage in high conscientiousness when they are in the process of filing the patent and want the process to be as thorough and quick as possible (task-oriented behaviour where the task is to file an IP right). Having a patent is linked to the image gain described in Yuan and Woodman (2010). Further, it might be linked to personal and financial benefit which the R&D wants to achieve. Therefore, even not in early stages of exploration-oriented R&D work, there might be times when a high conscientiousness of IP employees is reciprocated by R&D when the task is in the forefront of integration. However, following previous academic results of non-collaboration-based integration for RD and IP employees (Ernst and Fischer, 2014), a contribution-based integration is proposed.

**Hypothesis 3a:** *The level of discrepancy between R&D employees' perceived and displayed conscientiousness is positively related to POSI.*

In terms of agreement and discrepancy, hypothesis 3a hypothesises higher outcome values when X and Y variables are discrepant (2nd and 4th quadrant in figure 7.2) rather than 'in agreement'.

Also, similar to relationship-oriented behaviours, a high perception of conscientiousness, rather than displayed conscientiousness, will have a greater effect on POSI (4th in figure 7.2):

**Hypothesis 3b:** *For the direction of discrepancy, POSI will be higher when R&D employees' perceived conscientiousness from IP employees is higher than his/her displayed conscientiousness towards IP employees.*

### 7.3.5 Hypotheses for the inter-functional tolerance-POSI association

The second task-oriented IFCB is tolerance. Tolerance can play an important role in maintaining a good working relationship during integration, especially when processes, tasks and deliverables in inter-functional work are inter-dependent. These inter-dependencies come with natural delays and potentially missing information. Therefore, inconveniences happen and are inevitable. Previous research links tolerance to increased morale of employees, increased employee performance, as well as to reduced employee turnover (Podsakoff, 1997). With regards to this study, R&D employees may perceive high tolerance from IP colleagues as organisational support for innovation. They may not use (supervisor) escalation mechanisms when inconveniences happen. They also may not moan when R&D colleagues do not stick to rigidly to the prescribed process of integration and deliverables. As argued earlier, R&D employees work under high competitive and time pressure. Consequently, the above-mentioned perception of inter-functional tolerances might result in high POSI of R&D employees. Adhering to the rationale of this study, a contribution-based integration is established when R&D employees do not reciprocate the high perception of tolerance accordingly. The natural direction of support is from IP colleagues towards R&D employees. This service-design is tailored towards the core value-generating function. Similar to the task-oriented behaviour of conscientiousness, it is imperative to mention that when focusing on the task of filing a patent on later stages of the exploration-oriented function, there might be a reciprocally displayed tolerance of R&D employees towards IP employees to get the process done in the highest detail possible. However, taking previous contribution-based integration results in the integration between R&D and IP employees into account, hypothesis 4a hypothesises, in terms of agreement and discrepancy, higher outcome values when X and Y variables are discrepant (2nd and 4th quadrant in figure 7.2) rather than 'in agreement'.

**Hypothesis 4a:** *The level of discrepancy between R&D employees' perceived and displayed tolerance is positively related to POSI.*

Following service-orientation, the direction of tolerance may play an important role as well. This study hypothesises that POSI will be higher when R&D employees' perceived tolerance from IP employees is higher than his/her displayed tolerance towards IP employees.

**Hypothesis 4b:** *For the direction of discrepancy, POSI will be higher when R&D employees' perceived tolerance from IP employees is higher than his/her displayed tolerance towards IP employees.*

The influence of X (perceived tolerance) on the outcome variable POSI will be higher than the influence of Y (displayed tolerance) on POSI (4th in figure 7.2).

#### **Summary 9: Task-oriented IFCBs**

- (i) The hypotheses for task-oriented IFCBs postulate a discrepancy in the respective behaviours. R&D employees perceive higher organisational support for innovation when they perceive high task-oriented IFCBs from IP employees and displays low task-oriented IFCBs towards their IP colleagues.
- (ii) A high perception of task-oriented behaviours is not reciprocated by R&D employees due to the high competitive pressure for value generation, the different thought worlds and the service-oriented integration in which the IP function might act as an internal service provider.
- (iii) This discrepancy is linked to a behavioural disequilibrium and challenges the equilibrium view of maintenance of equilibrium of behaviours to deal with tensions.

## **7.4 Data and sample description**

The data for study 3 was collected with the help of the software platform Qualtrics. The online survey measures IFCBs, which were adapted to the language of perceived and displayed IFCB for both R&D and IP employees. For example, ("*IP colleagues accept late information sharing by me without any retribution*" and "*I accept late information sharing by IP colleagues without any retribution*") (for a full list, please see Appendix K).

To take part in this study, organisations had to be in the high-innovative sector defined by

the ZEW – Leibniz Centre for European Economic Research ([www.zew.de](http://www.zew.de)). ZEW includes automotive, aviation, electronics/optics, electrical/machine engineering/manufacturing, pharmaceutical/healthcare, software/IT in their definition of innovative sectors. Further, all organisations had to be based on the Western culture, focusing mainly on European and American organisational cultures. This study restricts the cultural aspect due to the differences of cultures concerning behaviours, hierarchies and autonomy. There are various cultural aspects which can affect individual behaviour. Hofstede (2010) describes the cultural differences with five perspectives, for example, power distance, long-term vs short-term aims and classified countries on these scales (Spector et al., 2001). Furthermore, researchers note that OCB conceptualisation and perspectives might vary from culture to culture (Bakhshi et al., 2009; Van De Vijver and Fischer, 2009). Hence, cultural differences would introduce a parameter, which is difficult to control for as the sample size per culture was not achievable in this dissertation. Thus, to control for the cultural parameter, this study is limited to Western culture only.

Table 7.1 Sample description study 3

#	# employees	Industry	R&D Team size	Country
1	> 10,000	Manufacturing	46	USA
2	> 20,000	Manufacturing	33	USA
3	> 40,000	Electrical	76	Germany
4	> 70,000	Automotive	112	Germany
5	> 130,000	Aviation	177	Germany/UK
6	> 300,000	Healthcare	41	UK
7	> 20,000	Manufacturing	28	UK
8	> 40,000	Manufacturing	18	Germany
9	> 4,000	IT/Telecom	12	USA
10	> 350	Optics tech	20	UK
11	> 10,000	Automotive tech	45	Germany

Organisations from the specified industries were identified with the help of internal institutional contacts, previous employments and the organisational social media platform LinkedIn. One of the main points of engagement was the research centre-based consortium of technology-and innovation managers. The *Strategic Technology and Innovation Management (STIM)* consortium is a practice-oriented research and networking collaboration between industrial member companies and the research centre.<sup>1</sup> It is managed by a principal researcher at the institute where this dissertation is based on. With the help of this consortium,

<sup>1</sup>With special thanks to Dr. Rob Phaal, <https://www.ifm.eng.cam.ac.uk/research/ctm/stim/>

responsible employees of industrial member companies were contacted by mail, and phone and the first contact point was either the Head of R&D or the Head of IP (or similar title with adequate responsibilities). In total, this study approached 38 organisations, which fulfilled the research criteria, from August 2019 until April 2020. From those 38 organisations, 11 agreed to participate. After agreeing to participate, both contact points were then asked to identify relevant employees in the organisation, which helped to gather the desired sample of employees who are working solely in the core technology development part of R&D (exploration-oriented R&D). Respective managers shared the survey link, and in return for their participation, the principal researcher promised each organisation a detailed benchmark report based on their behavioural integration.

In total, 223 R&D and 47 IP employees filled out the survey. The data was scanned for missing information and extreme cases concerning the estimated time for the questionnaire (<2 min and >30 min by an estimated time of 12 min). 37 responses were removed, resulting in 194 R&D employee and 39 IP employee responses. The imbalanced distribution of R&D and IP seems to be due to the nature of the functional resource distribution. As all 11 organisations belong to the high R&D sector, they tend to have a large base of scientists in the R&D function. In contrast, the size of the IP function, however, is usually comparably small, which is one of the main reason for the imbalanced sample distribution. Additionally, the gender distribution in the dataset was male-dominated. Out of the 194 responses from the R&D function, 183 respondents were male, and 11 were female. The IP sample consisted of 38 males and 1 female employee. This imbalanced gender distribution can be linked to the nature of the chosen function and industry affiliations. Manufacturing-based firms, as well as the core R&D function, are male-dominated and resulted in a dataset, which was male-dominated ([www.wisecampaign.org.uk](http://www.wisecampaign.org.uk))

Participating organisations were diverse in terms of industry affiliation - 38% in manufacturing, 18% in aviation, 16% in automotive, 14% in machine engineering, 6% in electrical engineering, 6% in optics/measurement/sensor technology and the remaining 2% in software/IT/telecommunication technology. The size varied between 350 and 300.000 employees (average=59.963). Three of the sample organisations were headquartered in the UK, three in the USA and five in Germany. The responses across the countries did not differ significantly for any of the variables used in this study. Hence, no further exploration of country differences was performed.

The researcher did not contact any of the respondents directly. This approach is best practice in quantitative research and reduces the impact of the relationship between the researcher and the respondent (Allen, 2017). Each respondent was hence treated equally, so the researcher

had little to no impact on the process, his/her behaviour nor response. Furthermore, this approach eliminated the potential power-imbalance from the principal researcher towards the participant. The Head of R&D and the Head of IP shared the link with the employees in a standardised e-mail explaining the study, specifying the exact function of interest, carbon copying the vice president or in one case the CTO. The e-mail provided a short description of the purpose of the research and the link to the survey platform Qualtrics. The distribution of responses from the R&D function of the 11 organisations was adequately balanced, ranging from min. 18 responses to max. 37 per organisation. R&D employees answered questions about the IP functions, which consisted of, on average, 4.3 employees (min 2 and max 9, median 4) per organisation. The average age among the respondents was 43, and the majority of the employees (84%) worked for more than two years in the respective function and organisation. Participants represented different hierarchical levels (67% without leadership, 13% with first-line leadership responsibility, 16% representing middle and 4% top management) with 26% having a PhD, 43% master, 22% bachelor and 9 other as the highest educational level. This study assured all respondents the highest possible anonymity.

Similar to study 1, the data collection paid the highest attention to selection and common method bias. In all participating organisations, the author worked closely with responsible employees from the R&D and/or IP departments to ensure that the chosen group fits the research aims of this dissertation. The responsible manager identified the exploration-oriented research group(s) in the organisation and the link was sent to all employees regardless of their status, hierarchy or time employed. Hence, a random sampling from all organisations was achieved. The researcher took several precautions to eliminate the concerns of common method bias (anonymity of the respondents, clarity about the research aim with no right/wrong answer, multiple rounds of deductive item generation to clarify item ambiguity, methodological separation of measurement) as suggested by Podsakoff et al. (2003). These pre-data collection strategies helped to reduce the risk of common method bias. Nonetheless, the self-reporting of all questions are undoubtedly a limitations which needs to be taken into consideration. Although all questions are psychometric in nature and are i.a. reverse coded, double controlled in the survey and also fully anonymous, self-reporting of inter-functional citizenship behaviours can only be seen as a proxy of the reality - even more when triangulation or dyadic response patterns can not be inferred.

## 7.5 Confirmatory factor analysis

In order to further validate the IFCB scale from study 1 prior to the polynomial regression analysis, a second confirmatory factor analysis has been performed. This CFA used the exact same parameters as the CFA in study 1: Lavaan package in R (Rosseel, 2012); maximum likelihood estimation with robust standard errors, and a Satorra-Bentler scaled test statistic (MLM); the same cutoff criteria for items loadings ( $>0.50$ ) (Hair et al., 2009) as well as the established cut off criteria for the 5 most important indices summarised in Devlieger et al. (2016); Devlieger and Rosseel (2017); Fornell and Larcker (1981); Hu and Bentler (1999); Lewis (2017); Schreiber et al. (2016):

- (i) CFI  $\geq 0.95$
- (ii) RMSEA  $< 0.06$  to 0.08 with confidence interval
- (iii) SRMR  $< 0.08$
- (iv) TLI  $\geq 0.95$

All items adhere to the four constructs developed in stage 1. Overall loadings are described in table 7.2 (std.all) and are higher than the defined threshold of ( $>0.50$ ) (minimum at 0.626). Please see Appendix O for the inter-construct correlation. Global fit indices as defined by the cutoff criteria above are excellent: CFI= 0.96; RMSEA 0.033 [0.012-0.041], SRMR= 0.039 and TLI= 0.9557.

## 7.6 Measures

The survey used English as the primary and sole language and paid the highest attention to ease of comprehension and clarity. The organisational context, as well as having English as the business language in all 11 organisations, prevented the need for translation efforts.

### 7.6.1 Welch's t-test

It should be mentioned that the initial aim of this study was to collect an equal number of datapoints from R&D and IP employees. R&D employees' displayed IFCB towards IP would have been used to measure their IFCB towards their IP colleagues. Likewise, data from *IP employees' displayed IFCB towards R&D* would have been used to measure IP employees' displayed IFCB towards R&D colleagues. This research design would have

Table 7.2 CFA loadings of IFCB items of R&amp;D respondents

Latent construct	Item	Estimate	Std.Err	z-value	p-value	std.all
PALT	PALT1	0.812	0.078	12.389	0	0.894
PALT	PALT2	0.787	0.063	11.627	0	0.723
PALT	PALT3	0.671	0.069	8.890	0	0.678
PALT	PALT4	0.695	0.063	8.753	0	0.661
DALT	DALT1	0.802	0.060	11.918	0	0.766
DALT	DALT2	0.635	0.063	7.791	0	0.651
DALT	DALT3	0.882	0.052	12.798	0	0.847
DALT	DALT4	0.692	0.062	8.759	0	0.661
PCONSC	PCONSC1	0.712	0.059	9.465	0	0.671
PCONSC	PCONSC2	0.860	0.055	12.458	0	0.841
PCONSC	PCONSC3	0.708	0.051	8.777	0	0.635
PCONSC	PCONSC4	0.770	0.073	9.151	0	0.682
DCONSC	DCONSC 1	0.677	0.060	8.391	0	0.668
DCONSC	DCONSC 2	0.741	0.062	10.302	0	0.687
DCONSC	DCONSC 3	0.871	0.072	12.699	0	0.827
DCONSC	DCONSC 4	0.895	0.061	13.219	0	0.869
PCONSTR	PCONSTR1	0.642	0.072	8.811	0	0.684
PCONSTR	PCONSTR2	0.637	0.049	9.919	0	0.653
PCONSTR	PCONSTR3	0.672	0.077	9.613	0	0.641
PCONSTR	PCONSTR4	0.645	0.071	8.991	0	0.661
DCONSTR	DCONSTR1	0.605	0.067	8.711	0	0.626
DCONSTR	DCONSTR2	0.638	0.071	7.898	0	0.651
DCONSTR	DCONSTR3	0.782	0.058	9.839	0	0.741
DCONSTR	DCONSTR4	0.622	0.064	8.124	0	0.601
PTOL	PTOL1	0.892	0.054	13.228	0	0.878
PTOL	PTOL2	0.861	0.071	12.618	0	0.846
PTOL	PTOL3	0.898	0.070	13.338	0	0.826
PTOL	PTOL4	0.770	0.062	10.053	0	0.672
DTOL	DTOL1	0.727	0.069	9.491	0	0.708
DTOL	DTOL2	0.731	0.052	9.110	0	0.757
DTOL	DTOL3	0.871	0.072	12.912	0	0.817
DTOL	DTOL4	0.795	0.061	9.878	0	0.739

required the collection of equal data from both functions and employees. However, during initial pilot interviews with key informants in each organisation, a natural imbalance between R&D and IP employees was observed. This imbalance resulted in the approach being adapted towards R&D employees only. Instead of using the low-number of *IP employees' displayed IFCB towards R&D*, this research adapted the approach to use the *R&D employees' perceived IFCB from IP*, which is the perception of the respective behaviour, only asked from the view of R&D employees (please see figure 7.4). Even though this design seems adequate, it is supported by the greater sample and it is also common practice in fit-research (please see chapter 2.3.1.2 for the use of perception in research), the R&D employees' perception of an IFCB from the IP employee can significantly differ from the displayed IFCB of an IP employee towards him/her. Due to information asymmetries and the lagged information processing, an IP employees' average, for example, displayed tolerance towards R&D employees could be at Likert scale 4, indicating high tolerance from IP employees towards R&D employees. However, when R&D employees were surveyed, the perception of tolerance of an R&D employee could be rated at Likert 2, which is statistically different. This is only a hypothetical example, but in order to avoid this exact pitfall in this study, a statistical test to examine the averages and standard deviations of both samples is essential. Responses from the IP dataset, including *displayed IFCB from IP employees towards R&D employees* needs to be compared to the responses from the R&D dataset, indicating *perceived IFCB of an R&D employee from an IP colleague*. The assumption is that if both datasets are statistically equal, the shift from *IP displayed* to *R&D perceived* is justified.

This dissertation collected 194 R&D and 39 IP responses. A simple t-test which compares z-scores by standardising the scores to ( $\mu = 0$ ,  $\sigma = 1$ ) is not feasible because of the uneven sample size in both datasets. Variances, standard deviations and averages would be calculated by using 194 and 39 datapoints, which introduces a large bias to the statistics (Edwards, 1995). To avoid this bias, the Welch's t-test was taken into consideration. The Welch's t-test is a common unequal-variances test, which is used in statistics to examine if two samples have an equal mean (Delacre et al., 2017). This study performed a Welch's t-test for the R&D dataset with 194 and IP dataset with 39 datapoints in R. The results are precise and indicate that both datasets can be treated equally taking the  $\mu$  and  $\sigma$  into account. For example, for inter-functional tolerance: IP displayed:  $n = 39$ ,  $\mu = 3.147$ ,  $\sigma = 1.284$  vs. R&D perceived:  $n = 194$ ,  $\mu = 3.219$ ,  $\sigma = 1.035$ ). In other words, the difference between the average and standard deviation of IP displayed and R&D perceived samples is not big enough to be statistically significant: the p-value equals to 0.744. The same calculations were completed for the remaining IFCB perspectives in which the results are as distinct as for inter-functional

tolerance. All remaining p-values are above 0.7, suggesting the possibility of introducing the type I error is at >70% (please see table 7.3 for all p-values). These results indicate that the H0 hypothesis is accepted, explicitly advocating for equal means across both samples. Thus, this study uses *R&D perceived* instead of *IP displayed* as a second predictor variable.

It is to mention that the primary reason to change from *IP displayed* to *R&D perceived* was the inherent organisational imbalance of R&D and IP employees in participating organisations. The Welch's t-test was only a support mechanism to confirm the decision of change. In case of statistical significance, a change would have been difficult.

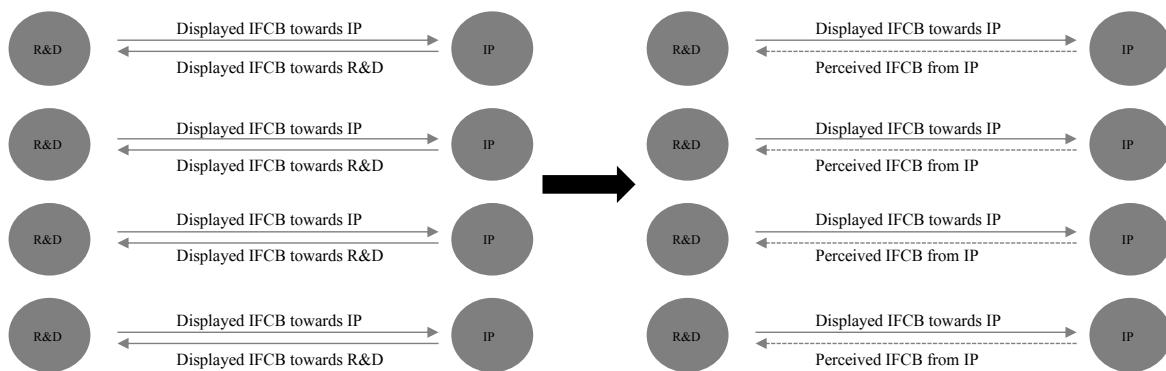


Fig. 7.4 Response shift from "IP displayed" to "R&D perceived"

Table 7.3 Welch's test summary

	IP respondents		R&D respondents		Testing p-value
	$\mu$	$\sigma$	$\mu$	$\sigma$	
Altruism	3.346	1.496	3.259	1.283	0.735
Conscientiousness	3.198	1.297	3.279	1.089	0.716
Constructiveness	3.108	1.389	3.039	1.170	0.772
Tolerance	3.147	1.284	3.219	1.035	0.744

The results of the Welch's t-test justify the shift from using respondent data from IP employees to using respondent data from R&D employees only. *R&D employees' perceived IFCB from IP* is used instead of the low-numbered *IP employees' displayed IFCB towards R&D* to continue with the polynomial regression using 194 datapoints.

## 7.6.2 Predictor variables - R&D employees' perceived and displayed IFCB

This study utilises the inter-functional citizenship constructs from study 2, which revealed robust statistics and suggested that four citizenship behaviours sufficiently characterise inter-functional integration. All items were developed in study 1, using inductive and deductive methods for item generation. This study adapts these items towards R&D and IP employees and the inter-functional context (please see Appendix K for the full item list for perceived and displayed IFCB).

Altruism: Altruism is one of the constructs defined by Organ (1988) and focuses on helping behaviour of an employee towards a new employee, helping an overloaded colleague to finish a task or helping an employee from another function in solving problems or acquiring needed skills/knowledge. This research adapts the definition and items, which indicate helping behaviour towards R&D and IP employees. A sample question for perceived IFCB is "*When there is an urgent need for a specific skillset, my IP colleagues just approach me and support*". Consequently, for displayed IFCB from R&D employee towards IP colleagues, "*When there is an urgent need for a specific skillset, I just approach my IP colleagues and support*".

Conscientiousness: Conscientiousness belongs to the five OCBs defined by Organ (1988) and aims to describe the behaviour of the 'extra mile'. Study 3 adheres to Organs definition and adapts the items towards R&D and IP employees and focuses on inter-functional deliverables and over-performance. Sample items are "*When IP colleagues deal with a request from my side, they deliver additional information to support the request*" and "*When I deal with a request from my IP colleague, I deliver additional information to support the request*".

Constructiveness: Constructiveness is also one of the five perspectives of Organ (1988) and focuses on the relationship side of inter-functional exchange. Items and definitions focus on the inter-individual over-performance, including network acceleration by introducing new people into the supporting function, lobbying and relationship-building activities such as joint lunch between R&D and IP employees. Sample questions are "*IP colleagues introduce relevant people and resources to me in order to increase my performance*" and "*I introduce relevant people and resources to my IP colleagues in order to increase their performance*".

Tolerance: One of the five perspectives defined by Organ (1988) to capture the moaning and complaining of employees. This study adheres to this definition and adapts the definition towards R&D and IP employees. Items describe tolerance associated with late deliverables, missing information and lack of process conformity. Sample questions are "*IP colleagues*

*comply with our internal processes even though they slow down their own process" and "I comply with IP colleagues' internal processes even though they slow down my own process".*

### **7.6.3 Outcome variable - perceived organisational support for innovation (POSI)**

Perceived organisational support for innovation is an organisational culture variable, which appears in the literature as forming a proinnovative organisational climate and culture (Amabile, 1988; Kanter, 1988; Scott and Bruce, 1994). Scholars indicate that POSI supports values and norms that affect potential image gains and reduce image risk associated with innovative behaviour. The POSI scale utilised by Yuan and Woodman (2010) consists of 13 items. All items were adapted to the context of this study and the respective functions and its employees. Respondents were asked to assess the items on a 5-point scale ranging from (1= "strongly disagree" to 5= "strongly agree"). A sample item is "*This organisation can be described as flexible and continually adapting to change*".

Cronbach's alpha is the most established value to report reliability for a scale. For POSI, Scott and Bruce (1994) and Yuan and Woodman (2010) report a Cronbach's alpha value of 0.92 which fulfils the criteria for scale reliability. This study adapts all 13 items and reports an alpha value of 0.91 (please see Appendix J for the full item list).

### **7.6.4 Control variables**

Prior research indicates a relationship between organisation size and behavioural/employee attitudes (Ragins et al., 2000). Thus, this study captured the organisation size to be able to account for this potential relationship. The organisational size was measured by asking the respondent about the approximate number of employees, which was log-transformed to reduce the skewness of the data. To prevent industry differences, this study obtained the industry affiliation with one of the seven categories of the high innovation cluster of ZEW (Dickson et al., 2006). Industry affiliation was clustered into seven different dummy variables. This study also included several control variables on an individual level, namely hierarchical level, gender, age, working experience and educational level.

## 7.7 Data analysis and qualifying results

This section describes the data and the chosen analytical methods for study 3. The main body of this section presents qualifying results which are required for the polynomial regression. In order to apply the polynomial regression with surface value analysis, qualifying results need to be confirmed by preliminary data analysis, including hierarchical regression analysis ( $R^2$  confirmation) and response agreement/discrepancy evaluation ('in agreement' and 'discrepant' classification of survey responses).

### 7.7.1 Descriptive statistics

Table 7.4 represents the descriptive statistics for means, standard deviations and bivariate correlations for all variables except dummy variables. As expected and valid for all four behaviours, both perceived IFCB (X) and displayed IFCB (Y) variables are positively correlated with the outcome variable POSI ( $r>0.60; p< 0.001$ ). For control variables, the log-transformed organisational size (OrgSizelog) is significantly correlated with POSI, whereas the average hierarchy level (AvgHierarchy) show no significant correlation with study variables.

Table 7.4 Descriptive statistics and correlations

	Mean	SD	1	2	3	4	5	6	7	8	9	10
1 PerceivedALT	3.26	1.28										
2 DisplayedALT	3.24	1.17	0.52 ***									
3 PerceivedCONSC	3.28	1.09	0.15	0.11								
4 DisplayedCONSC	3.37	1.18	0.07	0.05	0.58 ***							
5 PerceivedCONSTR	3.03	1.17	0.18 **	0.11	0.09	0.05						
6 DisplayedCONSTR	3.12	1.28	0.03	0.19 **	0.03	0.13	0.54 ***					
7 PerceivedTOL	3.22	1.04	0.16	0.08	0.14	0.16	0.12	0.06				
8 DisplayedTOL	3.41	1.06	0.04	0.12	0.11	0.19 **	0.08	0.17	0.58 ***			
9 POSI	3.09	0.39	0.68 ***	0.66 ***	0.67 ***	0.66 ***	0.64 ***	0.66 ***	0.68 ***	0.62 ***		
10 AvgHierarchy	3.19	1.04	-0.07	-0.04	-0.03	-0.02	-0.09	-0.05	-0.06	-0.06	0.11	
11 OrgSizelog	1.15	4.56	0.11	0.13	0.09	0.11	0.11	0.07	0.04	0.16	0.22 **	-0.07

Note: n=194, \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

### 7.7.2 Hierarchical analysis - $R^2$ value confirmation

In a next step and prior to the polynomial analysis using the response surface analysis method, this study performed an initial hierarchical linear regression using R (version 3.6.0). It primarily assessed the effect of control and interaction (XY) variables on POSI with respect to  $R^2$ . An  $R^2$  value, which is significantly higher than 0 is one of the requirements of the polynomial regression (Edwards, 1995; Shanock et al., 2010). If the  $R^2$  value is significantly higher than 0, a polynomial regression analysis is justified, and the analysis using surface values is adequate (Edwards, 1995; Shanock et al., 2010). To confirm the  $R^2$  values for all four behaviours, this study performed a hierarchical regression analysis for each IFCB individually. Following the established hierarchical regression methodology, three regression models were built. In the first model, the outcome variable POSI was regressed on all control variables. The second model added both variables, perceived IFCB and displayed IFCB into the equation. Finally, in a third model, the interaction term of both variables was entered into the regression equation. A comparison of  $R^2$  and especially  $\Delta R^2$  values examined if the model evolved and how new variables affected the regression results.

Table 7.5 summarises the  $R^2$  and  $\Delta R^2$  values. As indicated, all values are above 0 and justify the polynomial regression analysis. Furthermore, model 2 includes both predictor variables and significantly increase the  $R^2$  value with regards to model 1, where only control variables are present. In a final step, following the approach of Becker (2005) and Menges et al. (2011), the analysis was repeated without the control variables. None of the patterns changed, indicating that both perceived and displayed IFCBs (as well as their interaction) are significantly affecting the results.

This research is solely interested in the effect of response discrepancy/agreement of both predictor variables on the outcome variable. Hence, both scores of the predictor variables are essential to this study. The next subsection introduces the three-step procedure of the polynomial regression with response surface analysis. It explains the procedure prior to the regression analysis, as well as the purpose of surface values for hypotheses testing.

### 7.7.3 Polynomial regression with response surface analysis

The three-step procedure described by Shanock et al. (2010) starts the preliminary test with regards to response discrepancy/agreement. The second step centres the data and creates three new variables for the polynomial regression. In the final step, surfaces values using regression coefficients are calculated.

Table 7.5 Summary of  $R^2$  values for the hierarchical regression

**Outcome variable: POSI**

	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
<b>Altruism:</b>			
$R^2$	0.19*	0.64***	0.67***
$\Delta R^2$		0.45***	0.03*
<b>Conscientiousness:</b>			
$R^2$	0.23*	0.67***	0.68***
$\Delta R^2$		0.44***	0.01*
<b>Constructiveness:</b>			
$R^2$	0.13*	0.59***	0.63***
$\Delta R^2$		0.46***	0.04*
<b>Tolerance:</b>			
$R^2$	0.11*	0.61***	0.65***
$\Delta R^2$		0.50***	0.04*

N=194, \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$

Step 1: Descriptive statistics about dataset with regard to discrepancy

The inspection of data with regards to response discrepancy/agreement between the two predictor variables of interest (Edwards, 1995) is essential. This research is solely interested in discrepancy of predictor variables X (*perceived IFCB*) and predictor variable Y (*displayed IFCB*). Thus, variables without substantial standardised value discrepancy are not appropriate to explore the effect of response discrepancy on the chosen outcome variable. The aim of this step is to inspect if an R&D employee displays more IFCB towards IP colleagues than (s)he perceives from IP colleagues or vice versa. Hence, a substantial discrepancy of responses with regards to *perceived IFCB* and *displayed IFCB* is anticipated. This discrepancy would indicate a behavioural disequilibrium, which can be regressed to examine the effects on POSI.

This study follows the procedure of Fleenor et al. (1996) to inspect discrepancy. Both variables are standardised ( $\mu = 0$ ,  $\sigma = 1$ ). If a respondents' standardised score on one predictor variable is  $1/2\sigma$  above or below the other predictor variable, then the response is classified as 'discrepant'. If both variables are not  $1/2\sigma$  above or below each other, the response is classified as 'in agreement'. This step classifies all responses based on this criterion, and the percentage of 'discrepant' (in one direction or another) and 'in agreement' responses in the dataset is summarised in table 7.6. It shows the percentage of 'discrepant' and 'in agreement' responses in the dataset with its corresponding means. Nearly half of the responses indicate discrepancy (in one direction or another). Shanock et al. (2010) emphasises that this discrepancy is a fair indication to investigate the effects on an outcome variable of interest. Thus,

the effect of response discrepancy between R&D employees' perceived and the displayed IFCB on POSI appears to be justified for this study.

Table 7.6 Percentage of in-agreement and discrepant raw data for inter-functional conscientiousness; 'discrepant response': one predictor variable is  $1/2\sigma$  above or below the other predictor variable; 'in agreement' response: both variables are not  $1/2\sigma$  above or below each other

#### **Inter-functional perspective: Altruism**

<b>Groups:</b>	<b>Percentage</b>	<b>Mean perceived</b>	<b>Mean displayed</b>
Perceived more than displayed	20.10%	3.97	2.54
'in agreement'	56.70%	3.31	3.34
Displayed more than perceived	23.20%	2.45	3.70

#### **Inter-functional perspective: Conscientiousness**

<b>Groups:</b>	<b>Percentage</b>	<b>Mean perceived</b>	<b>Mean displayed</b>
Perceived more than displayed	23.20%	3.64	2.74
'in agreement'	55.15%	3.35	3.44
Displayed more than perceived	21.65%	2.71	3.85

#### **Inter-functional perspective: Constructiveness**

<b>Groups:</b>	<b>Percentage</b>	<b>Mean perceived</b>	<b>Mean displayed</b>
Perceived more than displayed	29.38%	3.64	2.44
'in agreement'	40.72%	3.00	3.07
Displayed more than perceived	29.90%	2.50	3.85

#### **Inter-functional perspective: Tolerance**

<b>Groups:</b>	<b>Percentage</b>	<b>Mean perceived</b>	<b>Mean displayed</b>
Perceived more than displayed	17.53%	3.63	2.64
'in agreement'	54.12%	3.34	3.43
Displayed more than perceived	28.35%	2.74	3.85

N=194

#### ***Step 2: Preparation of data and introduction of new variables***

The second step concerns the standardisation of the Likert scale used in the survey. Centring scales is one of the most common standardisation principles to make results more interpretable. Study 2 performed various statistical tests to avoid multicollinearity (please see chapter 6). Following the recommendation of Aiken et al. (1991), centring of the data is performed, which increases reliability, validity and introduces a clear way to plot the data.

Centring around the mean and centring around the midpoint of the scale are among the most prominent procedures (Shanock et al., 2010). Typically, scholars choose one of the procedures mentioned above depending on the research aims, questions and the discussions

(Aiken et al., 1991). Edwards (1995) recommends centring around the midpoint as the gold standard for Likert scale research and adhering to this, all 5-point Likert scales responses with (1= "strongly disagree" to 5= "strongly agree") were centred around the midpoint of the scale. Three (3) is the centre of a 5-point Likert scale, and consequently, three (3) was subtracted from each score to have a standardised score, which is ranging from (1-3=-2) to (5-3=2) where (-2) is the Likert (1) and (2) is the Likert (5). The result section presents all results ranging from (-2) to 2.

In order to solve the polynomial equation, three new variables are necessary:

1. the square of the centred predictor variable  $X \rightarrow (X)^2$
2. the interaction term between the first centred predictor variable X and the second centred predictor variable Y as the product of both  $\rightarrow (XY)$
3. the square of the centred predictor variable Y  $\rightarrow (Y)^2$

All new variables are computed individually for the four IFCBs and regressed on POSI individually.

### Step 3: Calculating surface values and plotting supporting graphs

One of the valuable benefits of using the response surface analysis is the incorporation of the analysis from the  $R^2$  value comparison performed in linear hierarchical regressions. Step three performs the polynomial regression and uses the beta coefficients to calculate the surface values of the graph. To recap, if the  $R^2$  value is significantly different to zero, results can be evaluated with the surface values (a1-a4) calculated using the estimation coefficients (b0-b5) (Edwards, 2002; Shanock et al., 2010). In step 1, significant and adequate  $R^2$  values for all four behaviours were confirmed. Thus, four surface values are important to interpret the results:

Table 7.7 Surface value calculations (Shanock et al., 2010)

Value	Equation	Description
a1	$a1 = b1 + b2$	Slope of the line of agreement $X=Y$
a2	$a2 = b3 + b4 + b5$	Curvature of the line of agreement $X=Y$
a3	$a3 = b1 - b2$	Slope of the line of discrepancy $X=-Y$
a4	$a4 = b3 - b4 + b5$	Curvature of the line of discrepancy $X=-Y$

Following the logic of surface values, the significance and the algebraic sign of a4 is fundamental in testing all primary hypotheses (1a,2a,3a,4a). Disequilibrium (discrepancy),

rather than equilibrium (agreement) is associated with POSI when a4 is significant and positive. Therefore, the outcome variable increases when the level of discrepancy increases. Valid all four IFCBs, all primary hypotheses state that if an R&D employee perceives a certain behaviour more than (s)he displays that behaviour towards IP colleagues or vice versa, the effect on the outcome variable POSI will be higher than when the R&D employee perceives and displays the behaviour at 'in agreement'. Thus, valid all four IFCBs, significant positive a4 values for hypotheses 1a,2a,3a,4a are anticipated.

Furthermore, in case of discrepancy, the direction towards perceived IFCB or displayed IFCB and the influence of this direction on POSI are hypothesised. A positive and significant a3 indicates that perceived IFCB results on POSI are higher than displayed IFCB results. A negative and significant a3 would indicate that the results of displayed IFCB on POSI are higher than for perceived IFCB. This study hypothesised positive and significant a3 values for all sub-hypotheses 1b,2b,3b,4b, which indicates the direction of discrepancy.

Prof. Shanock kindly agreed to share the Excel file, which uses all above variables to calculate the outcome values, do the significance test and plot the 3D graph<sup>2</sup>. The spreadsheet was adapted to the research needs of this study by adding a graph to plot the line of perfect agreement, as well as the line of perfect discrepancy. None of the mathematical formulas has been changed nor adapted (please see appendix H for a screenshot of the adapted Excel spreadsheet).

## 7.8 Polynomial regression results

This study interprets the results of the polynomial regression with three different visual and algebraic representations suggested by Edwards (2002, 2006) and Shanock et al. (2010). The primary representation is the table of algebraic surface values shown in figure 7.5. The surface values a1-a4 indicate the slope and the curvature of the graph and the lines of agreement/discrepancy. Depending on their algebraic sign and significance, hypotheses are supported or rejected. Linked to the surface values, the 3D plot shown in figure 7.1 graphically supports the primary algebraic representation. The coloured shade indicates higher and lower Z (POSI) values, and the curvature along the X and Y-axis indicates the direction and linearity of the relationship (please note that POSI can be higher than five and lower than 0 based on the estimates and the polynomial function. However, the 3D plot is capped at 0 and 5 for visualisation purposes). Finally, complementing the surface values

<sup>2</sup>The Excel spreadsheet can be accessed at ([www.springer.com/psychology/community?psychology/journal/10869](http://www.springer.com/psychology/community?psychology/journal/10869)

and the 3D graph, a 2D plot visualises POSI values along the perfect line of agreement, as well as the perfect line of discrepancy for an alternative visualisation and assessment of the hypotheses. The 2D graph illustrates if agreement or discrepancy yields better results for POSI, which is aligned with the surface values and their algebraic sign.

Results are presented for each IFCB separately, grouped into relationship-oriented and task-oriented IFCBs. To recapitulate, R&D employees' perceived IFCB from IP colleagues is called *perceived IFCB*, and R&D employees' display of altruism towards IP colleagues is named *displayed IFCB*.

### 7.8.1 Relationship-oriented IFCB - altruism

Surface value results of the polynomial regression for the inter-functional altruism citizenship construct are shown in table 7.5. All surface values a1-a4 are positive and significant. Please see Appendix P for the underlying regression parameter.

Effect	Coefficient	Standard Error	Test Stat (t)	p-value	
<b>a<sub>1</sub>: Slope along x = y (as related to Z)</b>	0,42	0,01	59,383	0,000	*
<b>a<sub>2</sub>: Curvature on x = y (as related to Z)</b>	0,04	0,01	4,901	0,000	*
<b>a<sub>3</sub>: Slope along x = -y (as related to Z)</b>	0,44	0,06	7,054	0,000	*
<b>a<sub>4</sub>: Curvature on x = -y (as related to Z)</b>	1,33	0,57	2,347	0,020	*

Fig. 7.5 Surface values for inter-functional altruism

The significant and positive a4 surface value ( $\beta = 1,33$ ,  $p < 0,05$ ) indicates that higher levels of discrepancy are positively and significantly correlated with R&D employees' perception for organisational support for innovation. This result is supported by the POSI-value table in 7.6, which clearly shows that POSI values at the discrepancy corners (-2/2) and (2/-2) are higher than the values at the agreement corners (2/2) and (-2/-2).

The 3D plots in figure 7.7 further supports the higher POSI values at the discrepancy corners. When turning the plot in the Y direction, the purple area (highest POSI) is at the edge of the X and Y-axis where discrepancy is located. Hence, the results support hypothesis 1a. It can be concluded that discrepant altruism, hence disequilibrium seems to yield better results than 'in agreement' altruism (equilibrium).

The direction of discrepancy, which indicates if perceived or displayed altruism influences POSI more, is signalled with the a3 value. The a3 value, as shown in table 7.5, is positive and significant ( $\beta = 0,44$   $p < 0,05$ ) suggesting that perceived altruism has a greater influence

		POSI z-values				
		X				
		-2	-1	0	1	2
Y	2	7,37	5,58	4,41	3,86	3,93
	1	4,97	3,83	3,30	3,39	4,11
	0	3,32	2,82	2,94	3,68	5,03
	-1	2,41	2,56	3,32	4,70	6,70
	-2	2,25	3,04	4,45	6,48	9,12

Fig. 7.6 POSI value table for inter-functional altruism

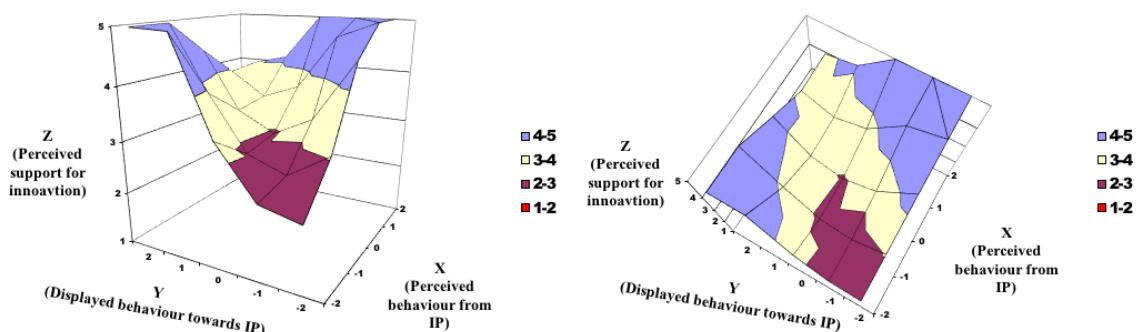


Fig. 7.7 Response surface plot for inter-functional altruism (left) - 3D turned in Y direction (right)

on POSI than displayed altruism.

Further, the significant and positive  $a_1$  value ( $\beta = 0.42$ ,  $p < 0.05$ ) shows that if an equilibrium is to be maintained, higher altruism levels are associated with higher POSI values. Finally, the significant and positive  $a_2$  value indicates that the line of agreement has a non-linear slope (convex curving).

Figure 7.8 plots the line of agreement from (-2/-2) all along to (2/2) and the line of discrepancy from (-2/2) all along to (2/2) (note that the first value is perceived and the second value is displayed altruism). Firstly, the line of discrepancy (blue line) has higher POSI values than the line of agreement (green line), supporting the hypothesis that discrepancy rather than agreement in perceived and displayed altruism is related to higher POSI. Secondly, the line of discrepancy is higher in the right part of the graph than in the left part of the graph. The x-axis plots the X (perception) values in figure 7.6 from -2 to 2. Hence, a graph which shows higher values on the right part of the plot indicates higher POSI values when perceived altruism is higher than displayed altruism. Thus, results support hypothesis 1b.

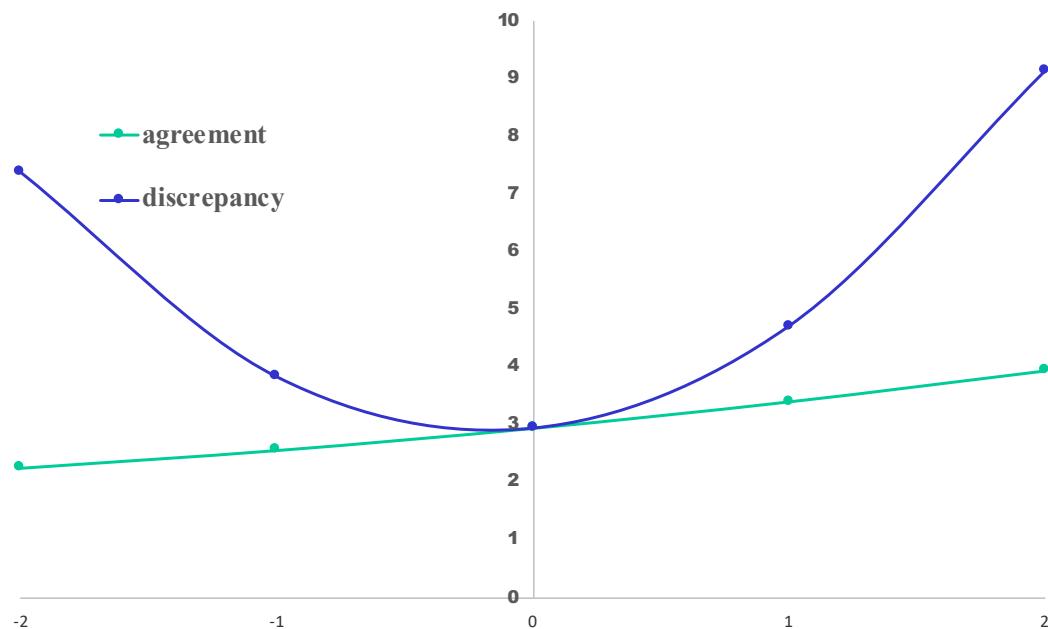


Fig. 7.8 2D plot of the line of agreement and line of discrepancy for inter-functional altruism

In summary, despite the positive slope of the line of agreement (positive  $a_1$ ), discrepancy rather than agreement in altruism appears to be related to higher POSI. Hence, results support hypothesis 1a. Furthermore, perceived altruism influences POSI stronger than displayed altruism, which supports hypothesis 1b.

### 7.8.2 Relationship-oriented IFCB - constructiveness

Table 7.9 shows the surface values for inter-functional constructiveness. All surface values are positive and significant. Please see Appendix Q for the underlying regression parameter. The results are similar to those obtained for altruism. The significant positive a4 surface value

Effect	Coefficient	Standard Error	Test Stat (t)	p-value	*
a <sub>1</sub> : Slope along x = y (as related to Z)	0,48	0,01	56,649	0,000	*
a <sub>2</sub> : Curvature on x = y (as related to Z)	0,01	0,01	2,021	0,045	*
a <sub>3</sub> : Slope along x = -y (as related to Z)	0,19	0,06	3,084	0,002	*
a <sub>4</sub> : Curvature on x = -y (as related to Z)	2,11	0,64	3,320	0,001	*

Fig. 7.9 Surface values for inter-functional constructiveness

( $\beta = 2,11$ ,  $p < 0,05$ ) indicates the correlation of discrepancy with POSI. The POSI-value table shown in figure 7.10 supports the response discrepancy for constructiveness indication. POSI values are higher at the discrepancy corners (-2/-2) and (2/-2) and lower at the agreement corners (2/2) and (-2/-2). The 3D plot in figure 7.11 backs the conclusion that discrepancy in constructiveness is related to higher POSI. The purple area (highest POSI) is at the edge of the X and Y-axis where the discrepancy is located. All in all, these results support hypothesis 2a. Response discrepancy for constructiveness; hence disequilibrium seems to yield better results than 'in agreement' constructiveness (equilibrium).

		Points to Plot				
		X				
		-2	-1	0	1	2
Y	2	11,12	7,61	5,26	4,07	4,04
	1	7,42	4,96	3,66	3,52	4,54
	0	4,68	3,28	3,03	3,94	6,01
	-1	2,92	2,56	3,37	5,33	8,45
	-2	2,13	2,82	4,68	7,69	11,86

Fig. 7.10 POSI-value table for inter-functional constructiveness

Concerning the direction of discrepancy, the significant and positive a3 value ( $\beta = 0,19$ ,  $p < 0,05$ ) shows that perceived constructiveness has a greater influence on POSI than displayed constructiveness. Hence, hypothesis 2b is supported.

Further, the significant positive a1 value ( $\beta = 0,48$ ,  $p < 0,05$ ) shows that in case of equilibrium, higher levels of constructiveness seems to be associated with higher POSI. Finally, the

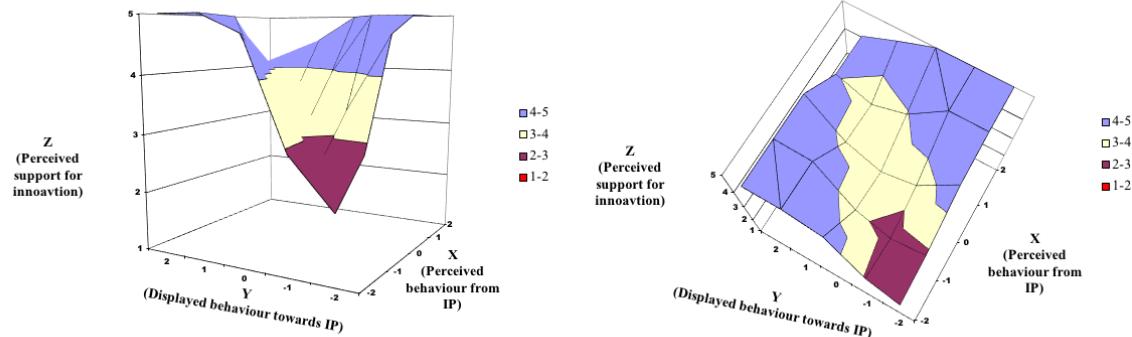


Fig. 7.11 Response surface plot for inter-functional constructiveness (left) - 3D turned in Y direction (right)

significant positive  $a_2$  value indicates a non-linear slope (convex curving) of the line of agreement.

The 2D graph in figure 7.12 summarises previous results for constructiveness by plotting the line of agreement and line of discrepancy. The influence of perceived constructiveness on POSI is greater than displayed constructiveness. The blue line is convex and shows higher values on the right side of the graph, which supports hypothesis 2b.

In summary, despite the positive slope of the line of agreement (positive  $a_1$ ), discrepancy rather than agreement in constructiveness seems to be related to higher POSI. Furthermore, perceived constructiveness has a greater influence on POSI, confirming the direction of discrepancy and supporting hypothesis 2b.

### 7.8.3 Task-oriented IFCBs - conscientiousness

Surface value results for inter-functional conscientiousness are shown in table 7.13. Please see Appendix R for the underlying regression parameter. The  $a_4$  value is negative and not significant, indicating that that discrepancy in conscientiousness is not significantly correlated with POSI. Thus, hypothesis 3a is rejected, and hypothesis 3b, which hypothesised a direction for discrepancy, is thereby rejected as well. Discrepancy appears to be not associated with POSI. Hence, no direction of discrepancy can be inferred.

However, even if not significant, the  $a_4$  surface value is negative ( $\beta = -1.26$ ) which may be in support of the hypothesis indicating that agreement rather than discrepancy in conscientiousness might be related to POSI. This anticipation is supported by the  $a_1$  surface value, which

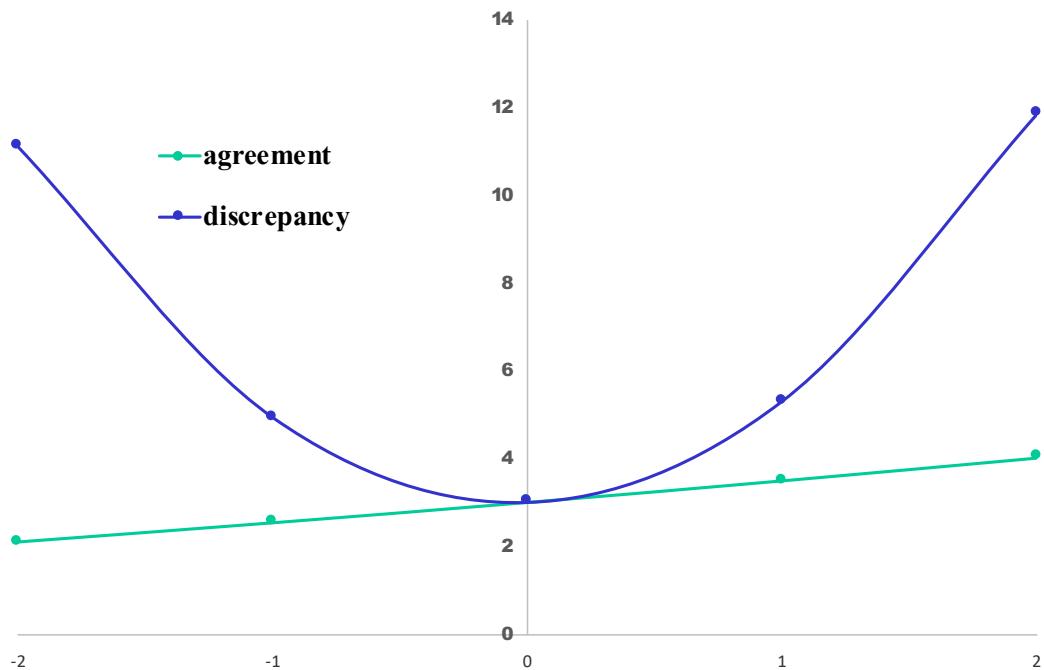


Fig. 7.12 2D plot of the line of agreement and line of discrepancy for inter-functional constructiveness

Effect	Coefficient	Standard Error	Test		<i>p</i> -value
			Stat (t)		
a <sub>1</sub> : Slope along x = y (as related to Z)	0,53	0,02	30,778	0,000	*
a <sub>2</sub> : Curvature on x = y (as related to Z)	0,06	0,01	5,223	0,000	*
a <sub>3</sub> : Slope along x = -y (as related to Z)	0,04	0,12	0,322	0,748	
a <sub>4</sub> : Curvature on x = -y (as related to Z)	-1,26	0,81	-1,555	0,122	

Fig. 7.13 Surface values for inter-functional conscientiousness

is positive and significant ( $\beta = 0.53$ ,  $p < 0.05$ ). The significant and positive  $a_1$  value indicates that when perceived and displayed conscientiousness increase, POSI increases. Hence, agreement of conscientiousness may be more beneficial than discrepancy. The POSI-value table supports this indication and shows that POSI values at the discrepant corners (-2/-2) and (2/-2) are lower than the values at the agreement corners (2/2) and (-2/-2) (please see table 7.14). Furthermore, the  $a_2$  value is positive and significant ( $\beta = 0.06$ ,  $p < 0.05$ ), indicating a slight curvature of the line of agreement.

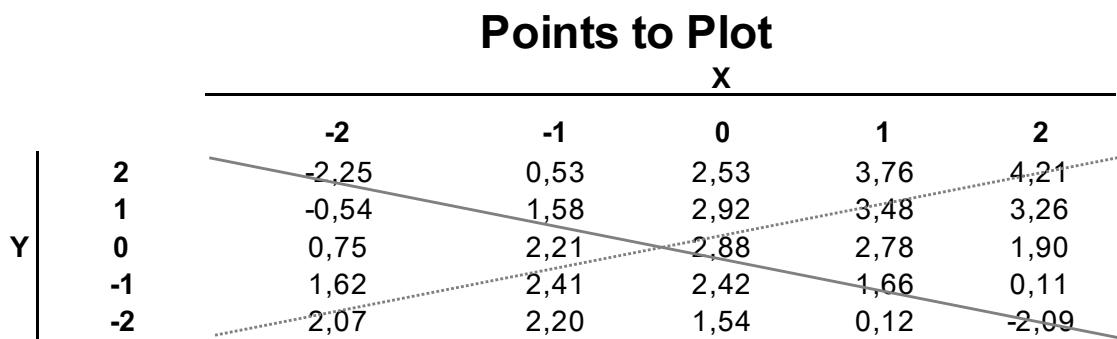


Fig. 7.14 POSI-value table for inter-functional conscientiousness

The 3D plot in figure 7.15 further supports higher values at agreement corners. When turning the plot in Y direction, the purple area (highest POSI) is at the edge of the X and Y-axis where the agreement is located.

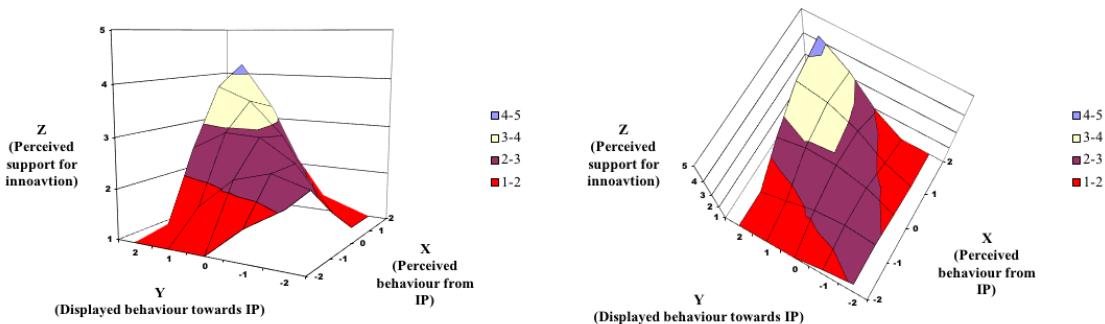


Fig. 7.15 Response surface plot for inter-functional conscientiousness (left)- 3D turned in Y direction (right)

The 2D graph showing the line of agreement and line of discrepancy backs the anticipation

that agreement rather than discrepancy in conscientiousness might be associated with POSI. The line of agreement shows higher POSI values at any point on the line compared to the

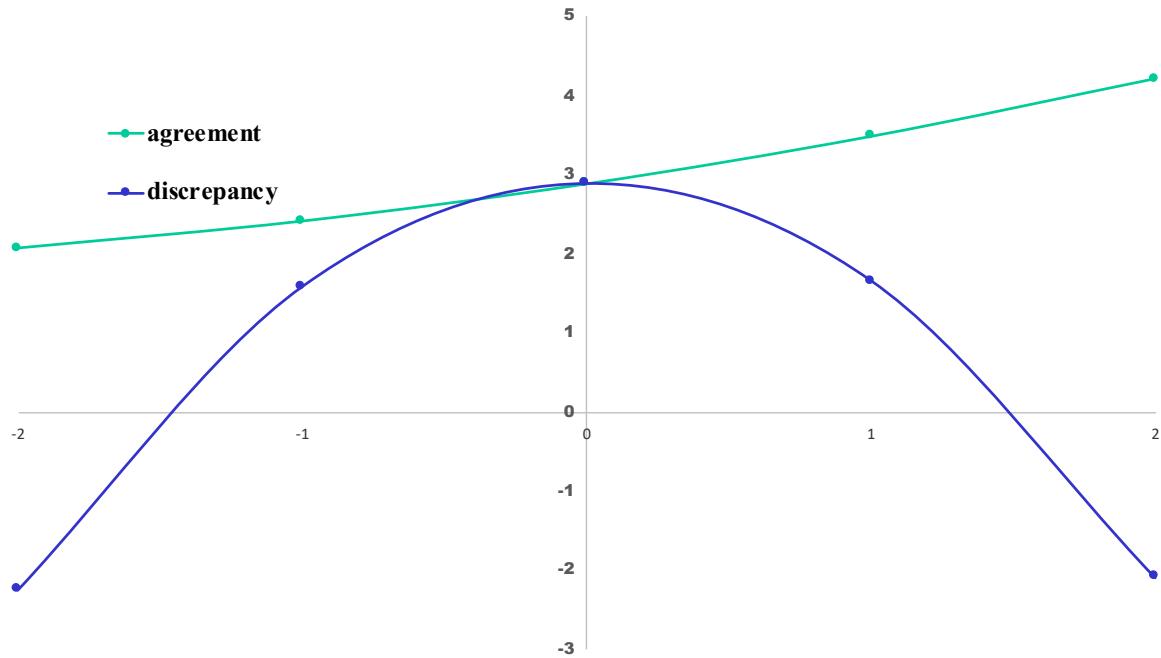


Fig. 7.16 2D plot of the line of agreement and line of discrepancy for inter-functional conscientiousness

line of discrepancy, indicating that agreement might be related to POSI. Furthermore, the significant positive  $a_2$  value indicates that the line of agreement has a non-linear slope (convex curving), suggesting that POSI values at the agreement corners might be at the highest level.

#### 7.8.4 Task-oriented IFCB - tolerance

Surface value results for inter-functional tolerance are shown in table 7.17. Please see Appendix S for the underlying regression parameter. The  $a_4$  surface value is negative ( $\beta = -0.06$ ) and non-significant, suggesting that response discrepancy for tolerance is not correlated with POSI. Hence, this study rejects hypothesis 4a, and consequently, also rejects hypothesis 4b as no direction of discrepancy for tolerance can be inferred.

However, similar to conscientiousness, the  $a_4$  value is negative, which indicates that agreement rather than discrepancy in tolerance may be associated with POSI. Besides, the  $a_1$  value is positive and significant ( $\beta = 0.57$ ,  $p < 0.05$ ), indicating that when perceived and displayed tolerance increase, POSI increases. The POSI-value table in 7.18 supports these results and clearly shows that POSI is lower at the discrepant corners (-2/2) and (2/-2) compared to the

Effect	Coefficient	Standard Error	Test Stat (t)	p-value	
<b>a<sub>1</sub>: Slope along x = y (as related to Z)</b>	0,57	0,01	58,626	0,000	*
<b>a<sub>2</sub>: Curvature on x = y (as related to Z)</b>	0,00	0,01	-0,071	0,944	
<b>a<sub>3</sub>: Slope along x = -y (as related to Z)</b>	0,07	0,07	1,036	0,301	
<b>a<sub>4</sub>: Curvature on x = -y (as related to Z)</b>	-0,06	0,32	-0,174	0,862	

Fig. 7.17 Surface values for inter-functional tolerance

highest agreement corner at (2/2).

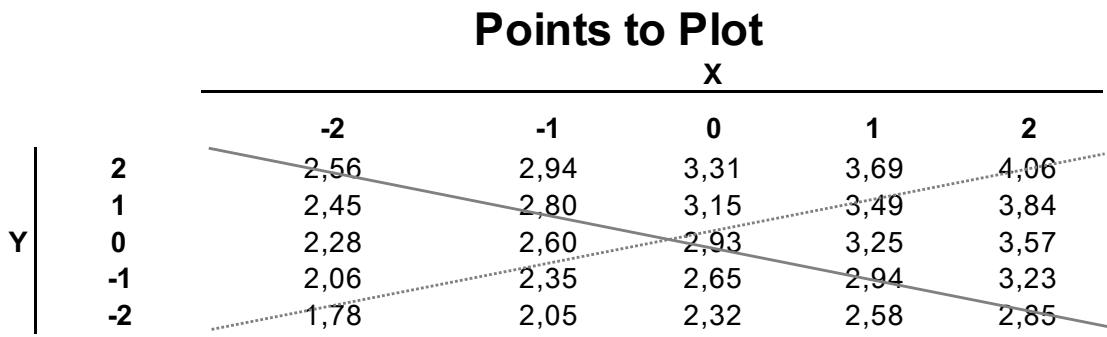


Fig. 7.18 POSI-value table for inter-functional tolerance

The 3D plot in figure 7.19 further supports the higher values at the agreement. When turning the plot in the Y direction, the purple area (highest POSI) is at the edge of the X and Y-axis where the agreement is located.

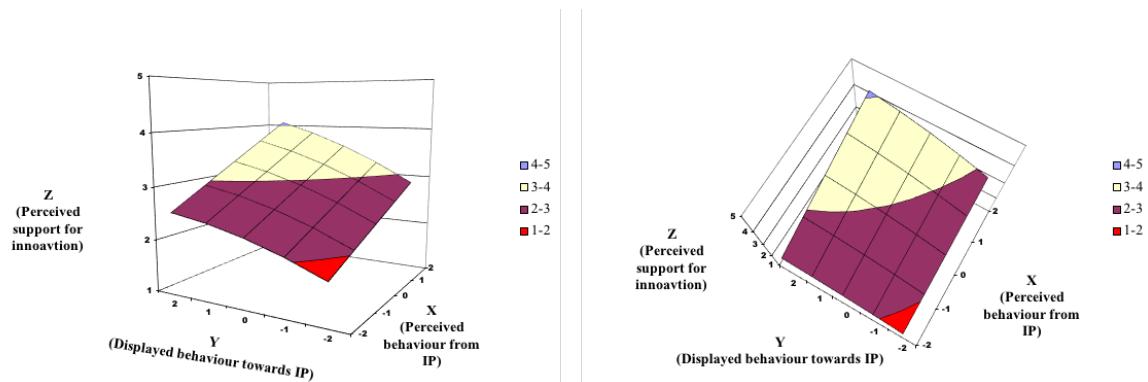


Fig. 7.19 Response surface plot for inter-functional tolerance (left) - 3D turned in Y direction (right)

Finally, the 2D graph of the line of agreement and line of discrepancy gives an additional

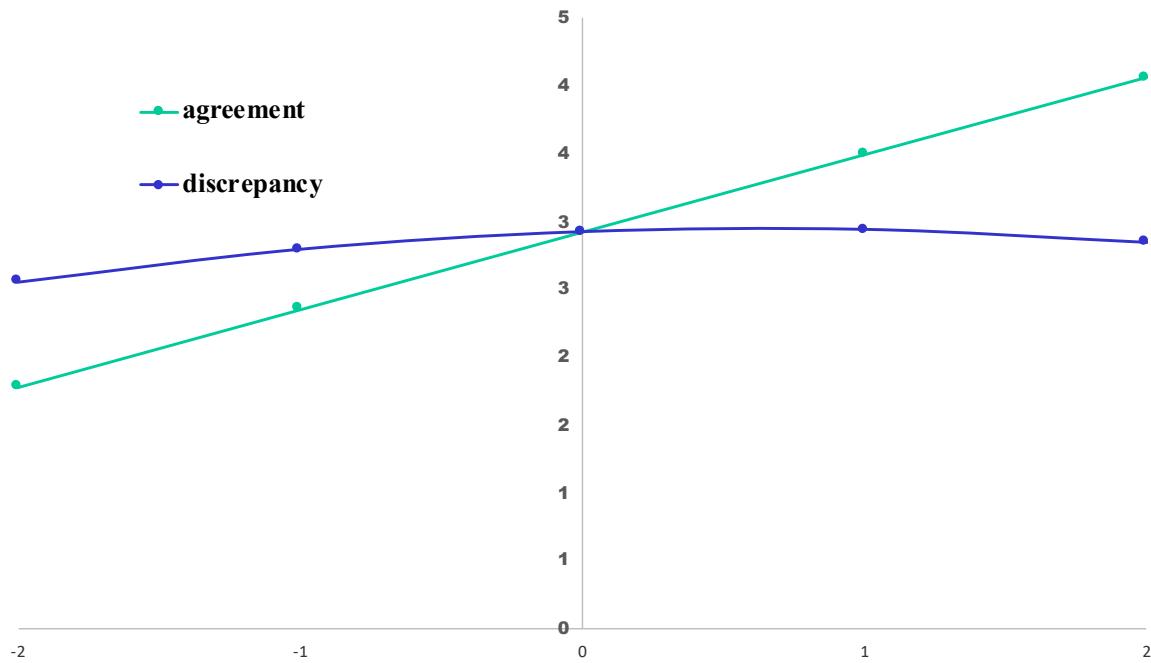


Fig. 7.20 2D plot of the line of agreement and line of discrepancy for inter-functional tolerance

indication that agreement rather than discrepancy might be related to POSI. The line of agreement shows higher POSI values than the line of discrepancy for high agreement levels, indicating that agreement rather than discrepancy may be associated with POSI.

### 7.8.5 Summary of polynomial regression results

Results for POSI were described in two pairs of IFCBs: tolerance and conscientiousness vs altruism and constructiveness. Table 7.8 summarises all surface values and indicates whether agreement or discrepancy might be related to POSI. For relationship-oriented IFCBs, altruism and constructiveness, discrepancy is related to POSI as indicated by surface values. a4 values are positive ( $\beta = 2.11$ ); ( $\beta = 1.33$ ) and indicate that POSI increases, when perceived altruism and constructiveness increase in discrepancy. Contrary to expectations, an agreement of task-oriented IFCBs, conscientiousness and tolerance, appear to be related to POSI. This can not be inferred from the surface values directly as a4 values are not significant ( $\beta = -1.26$ ; ( $\beta = 0.06$ ). However, the negative algebraic sign and the positive and significant a1 values ( $\beta = 0.57$ ,  $p < 0.05$ ); ( $\beta = 0.53$ ,  $p < 0.05$ ) suggest that agreement rather than discrepancy might be related to POSI.

With regards to the direction of the discrepancy, which explains if perceived or displayed

IFCB has a greater influence on POSI, altruism and constructiveness show significant values and indicate a direction of discrepancy. For both IFCBs, the a3 value is positive and significant ( $\beta = 0.44$ ,  $p < 0.05$ ); ( $\beta = 0.19$ ,  $p < 0.05$ ) indicating that the influence of perceived IFCB on POSI is higher than the influence of displayed IFCB.

Table 7.8 Summary surface value

	<b>Altruism</b>	<b>Constructiveness</b>	<b>Conscientiousness</b>	<b>Tolerance</b>
<b>a1</b>	$\beta = 0.42^*$	$\beta = 0.48^*$	$\beta = 0.53^*$	$\beta = 0.57^*$
<b>a2</b>	$\beta = 0.04^*$	$\beta = 0.01^*$	$\beta = 0.06^*$	$\beta = 0.00$
<b>a3</b>	$\beta = 0.44^*$	$\beta = 0.19^*$	$\beta = 0.04$	$\beta = 0.07$
<b>a4</b>	$\beta = 1.33^*$	$\beta = 2.11^*$	$\beta = -1.26$	$\beta = -0.06$
<b>Indication</b>	Discrepancy appears to be associated with POSI	Discrepancy appears to be associated with POSI	Agreement appears to be associated with POSI	Agreement appears to be associated with POSI

## 7.9 Discussion

This section links the results to the integration, citizenship and also equilibrium literature and aims to explain the results described previously. As described earlier, the results of this study show a pattern which follows the task- and relationship-oriented classification proposed in study 2. Following this, results for relationship and also task-oriented behaviours are discussed separately and linked to the prevalent literature summarised in chapter 2.

An additional short section is devoted to task-oriented behaviours and the link between the lowest level of agreement and the effect on POSI. As described earlier, the level of agreement starts at (-2/-2) and increases all along to (2/2). In this, (-2/-2) is the lowest agreement level where R&D employees perceive low IFCB and also display low IFCB. Consequently, (2/2) is the highest agreement and applies when R&D employees perceive and display high IFCBs. Whereas both extreme cases are considered as 'in agreement' and are linked to collaboration-based integration as postulated in section 2.5, the lowest level of IFCB, hence (-2/-2), is a special case of 'in agreement'. Perceived and displayed IFCBs are low, indicating the lowest level of IFCB. However, both conscientiousness and tolerance indicate different results for the lowest 'in agreement', which the respective subsection discusses accordingly.

This study aimed to analyse the relationship between R&D and IP employees from the behavioural perspective. Furthermore, it aimed to investigate the effect of response discrepancy/agreement on POSI - an organisational culture variable which proxies the innovation culture in the R&D function. In order to link integration with behaviours, this study follows the postulation as introduced in section 2.5 and prior to hypotheses development: (1) *collaboration*, which includes more than the task behaviour and spans from values to motivation

to harmony in the relationship is associated with *agreement between the perceived and displayed behaviours*. Further, (2) *contribution*, which is the direct and specialised task performance, is associated with *discrepancy between the perceived and displayed behaviours*. To recapitulate, agreement applies when an R&D employee perceives as much IFCB from an IP colleague as (s)he displays towards the IP colleague (essentially same rating on the Likert scale - e.g. (4/4)). Discrepancy applies when an R&D employee perceives more/less IFCB from IP colleagues than (s)he displays towards IP colleagues (essentially different rating on the Likert scale - e.g. (1/4)).

Agreement from the behavioural perspective might support task engagement but also the relationship between functional employees where the task performance takes place. It bears the potential to increase harmony and important individual and organisational values between the functions and its employees and establishes sustainable relationships that could support employee's motivation (Barnard, 1938; Ernst and Fischer, 2014; Kahn and McDonough, 1997; Katz, 1964; Song et al., 2018). In contrast, behavioural discrepancy does not involve reciprocity of behaviours. The specific contribution of functional employees is postulated to be sufficient for integration and task performance.

This study challenges the equilibrium view from the behavioural perspective. An equilibrium advocates for the maintenance of tension. This study derived the equilibrium from the behavioural perspective and hypothesised that a behavioural disequilibrium, hence discrepancy, might reflect the integration between R&D and IP employees who inhabit different thought worlds. In general, R&D and IP employees inhabit different thought worlds (Dougherty, 1992), which introduces difficulties, tensions and inconveniences that might influence behaviours. The literature for R&D and IP integration supports this issues. Ernst and Fischer (2014) already argued that a contribution-based integration between R&D and IP employees is associated with new product performance. Furthermore, Somaya et al. (2007) also indicated the missing complementary, positive integration effect of IP expertise and R&D spending on patenting performance. This study aimed to test the contribution-based integration indicated for the R&D and IP employees from the behavioural perspective. Thus, a positive relationship between behavioural discrepancy and POSI - an organisational culture variable which proxies the innovation culture in the R&D function is hypothesised.

### **7.9.1 Relationship-oriented IFCBs - altruism and constructiveness**

Results for the two relationship-oriented IFCBs - altruism and constructiveness - confirm the hypotheses that the outcome variable POSI is higher when perceived and displayed IFCBs

are discrepant. This finding seems to support the claim that contribution-based integration is more beneficial for POSI than collaboration-based integration. Additionally, with regards to the direction of discrepancy, POSI is higher when R&D employees' perception of an IFCB from his/her IP colleague is higher than his/her displayed IFCB towards the IP colleague. From the behavioural perspective, these results seem to confirm the conclusions of Somaya et al. (2007) and Ernst and Fischer (2014) and refine previous research on cross-functional integration between R&D and IP employees; the perception for organisational support is at the highest when relationship-oriented IFCBs are discrepant. Interpreting these results through the lens of the equilibrium theory, maintaining behavioural equilibrium seems not to increase POSI of R&D employees. A behavioural disequilibrium in which R&D employees perceive high and display low relationship-oriented IFCBs is associated with higher POSI. Inter-functional altruism is the behaviour directed at helping an employee from another function in solving problems or acquiring needed skills/knowledge. R&D employees perceive altruism as a proinnovative behaviour and support for innovation. IP employees might adopt altruism by helping R&D employees to get insights to newly patented technologies from competitors, fostering creativity with inventor workshops and training them in IP related topics for increases IP awareness. This high perception of altruism might have long-term effects on R&D employees' invention performance and could potentially support value generation. The lack of altruism from R&D towards IP colleagues is aligned with the time and competitive pressure and the natural direction of altruism in the context of R&D and IP integration. R&D is the core value-adding function, whereas IP is a support function.

However, the lack of altruistic behaviour from R&D employees towards IP employees does not summarise the integration thoroughly. Supporting the contribution-based integration between R&D and IP employees, data for altruism indicate that POSI is also associated with high displayed IFCB from R&D employees towards IP colleagues; however, only when R&D employees perceive low altruism from IP colleagues. This phenomenon can be seen in the results section for altruism, especially focusing on the POSI-value table and the discrepancy corners at (-2/2) and (2/2). POSI values in both corners are high and very close to each other. This asymmetric integration is intriguing but appears to support previous results. In this study, POSI is associated with either high perceived IFCB and low displayed IFCB or on the contrary, low perceived IFCB and high displayed IFCB. Prior OCB research linked altruism to increased performance (Podsakoff and MacKenzie, 1997) and product quality (Podsakoff, 1994) and indicated a positive relationship of altruism with performance evaluation (MacKenzie et al., 1991), market performance, as well as financial performance (Autry et al., 2008). Hence, the altruistic behaviour from R&D employees towards IP employees might be linked

to these individual performance benefits of R&D employees; however, only when perceived altruism from IP colleagues is low. This behavioural discrepancy is linked to the contribution-based integration rather than collaboration-based integration. Thus, collaboration, including "*the affective, volitional, mutual, or shared nature of working together*" (Ernst and Fischer, 2014, pp.120-121) appears to be not supported from the behavioural perspective and does not relate to POSI.

A similar argumentation applies to inter-functional constructiveness. Inter-functional constructiveness represents the interest and activity in inter-functional affairs affecting the relationship between exchange functions. POSI is associated with response discrepancy with regards to perceived constructiveness and displayed constructiveness. Previous research for constructiveness might give indications for this asymmetric result. MacKenzie et al. (1991) showed the positive effect of constructiveness on performance evaluation, Naqshbandi et al. (2016) indicated its value in open innovation contexts and Podsakoff and MacKenzie (1997) showed its positive effect on performance. Similar to altruism, these employee-level benefits might influence R&D employees' display of constructiveness towards IP employees. But only, when perceived constructiveness from IP colleagues is low. Linking these results to Somaya et al. (2007) and taking the research context of exploration-oriented R&D in highly innovative industries into account, the resulted behavioural disequilibrium for relationship-oriented citizenship behaviours can be explained further. As indicated earlier, R&D employees in the exploration-oriented part of their function are very experienced and have the highest expertise in their area of work - including the essential knowledge about state of the art. Therefore, they might have gained the expertise to deal with the early stages of IP generation themselves without engaging highly with their IP colleagues. Therefore, POSI is high when relationship-oriented IFCBs are discrepant. They want a contribution-based integration where they get the input from their IP colleagues whenever they want the input. IP employees do not need to do more digging and spend more time with the scientist to find some hidden jewel somewhere (Somaya et al., 2007, p.933). This behaviour might affect the perceived organisational support for innovation and should be taken into account when designing processes which involves continuous, collaboration-based integration mechanisms. In summary, it seems that R&D employees in highly innovative industries and the core technology area of the R&D function do not benefit from a collaboration-based integration that is characterised by mutual constructiveness or altruism. It can be argued that this mimics a service design principle in which the contribution-based integration of IP employees with R&D employees benefits R&D employees' POSI more than collaboration-based integration. These results support the research proposition derived in section 2.5. A behavioural disequi-

librium between the R&D and IP employees, indicated by behavioural discrepancy relates to R&D employees' perceived organisational support for innovation.

### **7.9.2 Task-oriented IFCBs - conscientiousness and tolerance**

As indicated in the results section, the non-significance of negative a4 values do not allow the conclusion that agreement rather than discrepancy relates to POSI without further discussion. While a4 values suggest that discrepancy is not associated with POSI, results do not allow the conclusion that agreement is. Nonetheless, results for task-oriented behaviours indicate that behavioural agreement might certainly be more beneficial for POSI. Though not significant, a4 values are negative, anticipating that agreement might be better. The line of discrepancy is convex, indicating that discrepancy is not related to POSI. Furthermore, the a1 value is positive and significant, suggesting that in case of agreement, POSI values increase when agreement levels increase (please see the POSI-value table for the increase in POSI values, where the maximum value for POSI is at the highest agreement). Considering these anticipations, the equilibrium literature, and the definitions and comments about both task-oriented behaviours in study 1, this study advocates for the conclusion that a behavioural agreement for task-oriented behaviours might be associated with POSI. This finding is contrary to the hypotheses, the research proposition of this dissertation, and previous academic publications that study the integration of R&D and IP functions. POSI values are at the highest when task-oriented behaviours are 'in agreement'. Thus, R&D employees perceive high task-oriented IFCB but also reciprocate task-oriented IFCBs, respectively.

Conscientiousness is defined as performing cross-functional tasks with higher than normal levels of forethought and effort. Results suggest that an 'extra mile' in the integration of R&D and IP employees is needed when performing inter-functional tasks. This over-performance is associated with R&D employees' POSI and is in line with previous research which indicates the willingness to share skills with others and engage in cross-functional work to support organisational goals (Svetlik et al., 2007). Conscientiousness can have a long-term effect on performance gains (Yuan and Woodman, 2010), can change the organisational culture towards innovation (Scott and Bruce, 1994) and can increase the psychological safety for trial and error (Ashton and Sen, 1989). Le and Lei (2019) furthermore indicate that high perception of organisational support increases motivation and commitment to actively participate in organisational, work and knowledge sharing activities.

Inter-functional tolerance deals with the inevitable delays/impositions/inconveniences associated with the inter-functional exchange without consequences. These inconveniences

may happen even more in highly competitive environments. 40% of R&D respondents in study 3 indicated a very strong and 55% indicated a strong competitive pressure in the survey. Hence, R&D employees are under constant market and competitive pressure in which a high perceived tolerance might benefit R&D employees in the workplace. A direct escalation of delays and impositions to another level of the hierarchy appears to be not beneficial for integration and might harm performance.

Unlike relationship-oriented IFCBs, data indicate that R&D employees reciprocate task-oriented IFCBs and display conscientiousness and tolerance as much as they perceive. This agreement (equilibrium) is associated with a higher perceived organisational support for innovation. This finding appears to be in line with the contribution-inducement theorem (Barnard, 1938), which suggests that the contribution of an employee is dependent on the inducement. This study derived behaviours as inducements for an employee in a cross-functional setting (please see section 2.5). If behaviours are understood as inducements and trigger a behavioural contribution, a high perception of conscientiousness and tolerance might increase the motivation for contribution; hence triggers the contribution in the form of reciprocal IFCBs towards IP colleagues. R&D employees might recognise task-oriented IFCBs as an inducement and reciprocate this with IFCBs. Following this argument, the reciprocal task-oriented IFCBs might form a proinnovative climate (Amabile, 1988; Scott and Bruce, 1994), and a knowledge-sharing culture (Le and Lei, 2019; Svetlik et al., 2007) which could increase trust in leadership and integration (Raab et al., 2014). By linking the equilibrium of task-oriented behaviours to the context of exploration-oriented R&D employees as well as the initial results of Somaya et al. (2007), results with regards to joint implications but also distinction can be expressed. Task-oriented behaviours are behaviours where R&D employees might get personal benefit from. When R&D employees engage with IP colleague in later stages of their potential patent application, task-oriented behaviours get more into the forefront of their integration in which an agreement is linked to POSI. As indicated earlier, having a patent granted is linked to the image gain described in Yuan and Woodman (2010). Further, it might be linked to personal and financial benefit which the R&D wants to achieve. Therefore, even not in early stages of exploration-oriented R&D work, there might be times when high task-oriented behaviours of IP employees are reciprocated by R&D employees when the task is in the forefront of integration.

As shown, the contribution-inducement theorem seems to only apply to task-oriented IFCBs and not to relationship-oriented IFCBs. This result may seem surprising when R&D employees perceive relationship-oriented behaviours as beneficial and supportive, which could be seen as an inducement and consequently trigger the behavioural contribution, hence the

reciprocal display of IFCBs. However, this finding is in line with Ernst and Fischer (2014) who conclude that '*joint objectives and an open and trustful working relationship between the R&D and the patent functions are not sufficient for achieving higher NPD performance if firms aim to develop very innovative products. In the case of highly innovative products, [...] the specific contributions of the patent department to the NPD project, matters*' (Ernst and Fischer, 2014, p.118). R&D employees perceive relationship-oriented IFCBs as beneficial and perceive it as support for innovation. However, it is not sufficient to trigger the behavioural contribution and reciprocate the IFCB to form a collaborative integration.

### **7.9.3 Special case: Low agreement of task-oriented IFCBs - conscientiousness and tolerance**

As previously mentioned, the lowest behavioural agreement in which R&D employees perceive low IFCB from IP employees and also display low IFCB towards IP colleagues (-2/-2) is considered as behavioural agreement. Whereas this situation would indicate collaboration, the lack of IFCBs needs further discussion. It is only important for task-oriented IFCBs in which conscientiousness and tolerance indicate different results for POSI at the lowest agreement level. Referring back at figure 7.16 and table 7.14, the lowest level 'in agreement' for conscientiousness indicates a higher value for POSI than any other value at the discrepancy line (please note that the value at (0/0) is higher. However, this is the intersection of both graphs and is neutral). This stresses the importance of conscientiousness as a task-oriented IFCB. Any discrepancy should be avoided in the interaction between R&D and IP employees. The 'extra mile' in the integration of R&D and IP employees is needed and is associated with POSI. Furthermore, any increase in the agreement level is associated with higher POSI and should be aimed for.

For tolerance, the lowest levels of agreement is even worse than any discrepancy (please see figure 7.20 and table 7.18. The POSI value at (-2/-2) is at 1.78, and the lowest POSI value for any discrepancy is at 2.56. For tolerance, unlike conscientiousness, the lowest level of agreement should be avoided. Tolerance is defined as inevitable delays/impositions/inconveniences associated with the inter-functional exchange without consequences. Hence, results for tolerance indicate the importance of tolerance. Low levels of tolerance are not beneficial for POSI. Even without a high perception of tolerance, R&D employees display tolerance towards their IP colleagues, indicating that tolerance might be almost a "default" behaviour between employees from different functions. Furthermore, similar to conscientiousness, any

increase in the agreement level of tolerance is associated with higher POSI and should be aimed for.

## 7.10 Summary

This study is solely interested in the effect of the response discrepancy/agreement of both predictor variables - perceived and displayed IFCB on the outcome variable POSI. The results indicate that employees have a higher perception of organisational support for innovation when task-oriented behaviours are 'in agreement'. Hence, high perception and display of tolerance and conscientiousness - a collaboration-based integration - is linked to higher POSI. On the contrary, a discrepancy in relationship-oriented behaviours is linked to higher perception for organisational support for innovation. Hence, high perception and low display of altruism and constructiveness - a contribution-based integration - is associated with higher POSI.

These results might seem contrary to each other. However, linking the results to the context of exploration-oriented R&D and also to excising results of Somaya et al. (2007) allows to draw conclusions about joint implications. The exploration-oriented part of R&D is determined by high expertise of employees with regards to their field of work/research - including the state of the art. Those employees might know what part of their work is patentable and might not need the collaborative integration of their IP colleagues. Initial processes of the internal IP processes might also be known in which the collaborative integration might look like "*digging for hidden jewels*" (Somaya et al., 2007, p.399) which in turn might affect the perception for organisational support for innovation. In line with that, an equilibrium of task-oriented behaviours might affect POSI positively as R&D employees are now pushing for the task to happen to gain the personal and potential financial benefits of the results of their engagement with IP colleagues: the IP right. Overall, it can be argued that the results support the service-oriented approach of IP in which the perception for organisational support for innovation is characterised by high levels of task-oriented citizenship behaviours (agreement) between R&D and IP employees. Both functions collaborate on task-level, tolerating inconveniences, delays and impositions and going the 'extra-mile' in task performance. This relation creates a collaborative working relationship between both employees, which is related to POSI. Nonetheless, on the relationship-side of their engagement, no collaborative-behaviour is seen which support the service-oriented design of the integration process.

Revisiting the equilibrium theory and the contribution-inducement theorem (Barnard, 1938) from the behavioural perspective, high levels of perceived relationship-oriented IFCBs can

be seen as a behavioural inducement. It could be associated with POSI and could increase individual and organisational performance. However, this high perception is not sufficient to trigger the behavioural contribution. R&D employees do not reciprocate relationship-oriented IFCBs, creating a behavioural disequilibrium which is associated with higher POSI. The contribution-inducement theorem from the behavioural perspective is applicable for task-oriented IFCBs only. High perception of task-oriented IFCBs is reciprocated, creating a collaboration-based integration in which a behavioural inducement is reciprocated with a behavioural contribution. Whereas the organisational equilibrium theory postulates that the maintenance of equilibrium is key for organisational success, this dissertation argues that a disequilibrium on the behavioural level can be beneficial when processes are defined and developed accordingly. As indicated with the exploration-oriented part of the R&D function, a disequilibrium of certain behaviours and hence a contribution-based integration can yield higher perception for organisational support for innovation than forcing a collaboration-oriented integration. A disequilibrium on the behavioural dimension does not harm the integration per se. However, if processes and the associated behaviours are not aligned, it can cause more harm than good as indicated in chapter 4 with the technology transfer process. These findings refine previous research on cross-functional integration between R&D and IP employees. A contribution-based integration as advocated by Ernst and Fischer (2014) seems to be only beneficial with regards to relationship-oriented IFCBs. On a task-level, collaboration appears to be supportive and changes the perception for organisational support for innovation positively. Instead of 'the more, the better' approach for integration (Homburg and Kuehnl, 2014), this study proposes a more detailed view to positively influence integration and organisational culture. By using the newly developed IFCB scale, a fine-grained analysis of behavioural preferences can be obtained. This can be used in support for process interventions where the integration process is misaligned, and inconveniences and tensions affect the performance, organisational culture or behaviours of employees. It is hoped that this study, by testing and also refining previous results, has successfully evaluated and validated the novel IFCB scale while giving behavioural insights to the working relationship between the R&D and IP employees.

**Summary 10:** Study 3 - polynomial regression

- (p) The level of discrepancy (disequilibrium) between perceived and displayed relationship-oriented IFCBs is positively related to R&D employees' perceived organisational support for innovation.
- (p) The level of agreement (equilibrium) between perceived and displayed task-oriented IFCBs indicate a positive relationship with R&D employees' perceived organisational support for innovation.
- (p) Task-oriented IFCBs support collaboration-based integration between both functions, whereas a contribution-based integration between both functions appears to be supported by relationship-oriented IFCBs.
- (p) The contribution-inducement theorem is only applicable on task-oriented behaviours in which a behavioural inducement is sufficient to trigger a behavioural contribution.

## 7.11 Limitation of the study

Despite all methodological considerations, strengths, and relevant results for the integration, citizenship, and innovation research, there are limitations to the present research that call for attention in interpreting the results. Firstly, one of the most substantial limitations is the imbalance of the survey responses from both functions. Whereas the sample of 194 employees for the R&D function was sufficient, the IP sample of 39 was below the requirement of robust statistics. However, the Welch's test statistically justified the methodological workaround of this limitation. This research utilised the larger sample of R&D responses and inferred the behaviour of the IP sample (R&D perceived instead of IP displayed - statistically equal). Nonetheless, a more balanced sample and ideally a balanced and dyadic response would have been ideal. The natural imbalance of the chosen functions, in which high innovative organisations employ a larger base of R&D employees than IP employees and utilise external IP support limits this ideal research design, which further research can address accordingly. Special incentive systems for IP employees can be designed to attract more IP responses within the organisation. Additionally, a more stringent sampling technique can be used to only accept organisations with similar numbers of R&D and IP employees.

Secondly, cross-sectional field studies can cause problems with causality and introduce a

potential ambiguity. This research accounted for the cross-sectional data by implementing stringent control variables prior to data collection and during regression. Additionally, multiple triangulation techniques were used to examine the comparability of participating organisations and employees. However, based on the theoretical assumptions, the inferred causality in this study is likely to represent the phenomena under observation. Nonetheless, future research can model the relationship with different research methods, such as longitudinal research studies, industry-specific studies or agent-based modelling, which all could resolve the problems associated with cross-sectional field studies.

Thirdly, responses were limited to organisations that are part of the Western culture. Cultural factors can play a potential role in shaping behaviours (House et al., 2004). Hence, cross-cultural research may achieve greater validity and generalisability. Another issue is the limited number of control variables. Control variables were chosen based on the research streams and aimed to control structural, technological, and strategic factors. Valid for every research, they can control the impact on the findings only to a limited extent. This research assessed organisational variables such as size and industry, individual variables such as education, hierarchical levels and working experience and individual demographic variables such as age and gender. In addition, the sample was influenced deliberately to the core technology function by limiting the respondents with the help of key informants. The high R&D industries were cross-checked and triangulated with structural variables, which cover market competition and R&D intensity. Further research can advance the findings by assessing more organisational variables such as age or financial situation of the organisation and also individual variables such as proficiency, cultural background or personality traits. Furthermore, a potential common source bias linked to the imbalance of the sample and could limit the findings. An organisational level factor might influence the response pattern in which belonging to one specific organisation where the culture is beneficial for pro-social behaviours can introduce a bias. Even though the R&D employee response data were controlled against the IP employee response data, further research should aim to collect data from external sources, which would give an additional indication about the reliability of the responses.

Finally, all responses were self-evaluation responses. Whereas this study paid the highest attention to avoid common method bias, the self-reporting of all questions are undoubtedly a limitations which needs to be taken into consideration. Self-evaluation responses were checked for statistical indifference in study 2 and also in study 3 with the help of the Welch's test. However, having a supervisor or third-party ratings would increase the reliability and validity of this research. It is the hope of this study that other researchers adopt the IFCB

scale and apply it in additional contexts. Scholars can examine the relationship of other functional employees, such as R&D and supply chain, R&D and finance or even functions not involving the R&D function and validate the IFCB scale with robust contributions and theoretical/practical implications.



# **Chapter 8**

## **Summary and conclusion**

### **8.1 Thesis summary**

This dissertation aimed to develop a psychometric scale for the integration between employees from different functions who inhabit different thought worlds but need to work together. Up until now, cross-functional integration was analysed from the process perspective and indicated uncertain results (Homburg and Kuehnl, 2014; Song et al., 1996). A systematic literature review helped to frame the essential problems of integration in which a paradigm shift from the process towards the people-oriented tradition in cross-functional integration (CFI) have been observed. To get a nuanced understanding of the inter-functional integration and shed light on some of the neglected factors, this dissertation proposed the behavioural perspective of integration.

Smith et al. (1983) introduced citizenship behaviours as an additional factor to understand the behavioural factors in CFI and considered citizenship behaviours distinct from task behaviours, which makes it explicitly neither directly compoundable to the formal job requirement nor the incentive system. This distinction has been already discussed among researchers from multiple theoretical lenses, such as the social psychology of organisations (Katz, 1964; Katz and Kahn, 1966), the social exchange theory (Blau, 1964) and the organisational support theory (Eisenberger et al., 1986). However, a detailed analysis of the literature indicated an even deeper-rooted link of citizenship behaviours in organisational theory. The origins of the distinction between people and process-oriented tradition in the organisational context appeared to be already an issue in Barnard (1938); Fayol (1930); Mayo (1937); Roethlisberger and Dickson (1939) and also in fit-research dominated by Lewin (1936). These organisational researchers guided the dissertation into the area of organisational theory and especially the organisational equilibrium theory.

Adapting the equilibrium theory from the behavioural perspective, a novel lens to analyse integration was proposed: the *behavioural equilibrium lens*. The behavioural equilibrium lens acknowledges the tension between employees from different functions who need to work together. Adhering to the equilibrium definition, maintenance of equilibrium of conflicting tensions for organisational survival should determine the integration between functions. However, a lack of an existing scale to proxy the tension between employees from different functions was identified and the three-stage scale development process, prescribed by Hinkin (1995); Likert (1961); Schwab (1980) and DeVellis (2011) to develop the inter-functional citizenship behaviour (IFCB) scale was followed. Each stage was supported by an adequate study where item generation is linked to study 1 (chapter 5), scale development to study 2 (chapter 6) and scale evaluation and testing to study 3 (chapter 7).

Firstly, the behavioural equilibrium lens was pre-tested in study 1. Controlling for a set of behaviours and utilising a secondary, qualitative dataset, a behavioural disequilibrium (behavioural dichotomy) has been concluded (Cengiz and Geiger, 2019). The dataset aimed to proxy different thought worlds and interviewed employees from two different thought worlds: R&D employees at the innovation subsidiary in Silicon Valley and R&D employees at the headquarters (HQ). Results indicate that a disequilibrium from the behavioural perspective is observable and could lead to inconveniences, problems and tension between employees from different functions who inhabit different thought worlds. These inconveniences can affect the process-perspective of integration in which the technology/knowledge transfer process seemed to be disrupted. Thus, results from the pre-study supported the novel avenue of researching integration from the behavioural equilibrium lens. Utilising actual behaviours, scholars might be able to analyse the integration between employees from the behavioural equilibrium lens. However, as indicated earlier, the scale to measure this inter-functional work on the employee level was lacking and initiated study 1 (chapter 5), the first stage of the prescribed three-stage scale development process.

Chapter 5 was the beginning of the scale development process and describes the stage of item generation. By adhering to best practice methods prescribed by Hinkin (1995); Likert (1961); Schwab (1980) and DeVellis (2011), a deductive and inductive research methodology to confirm items from the literature and develop new items for the context of inter-functional integration was performed. A pool of items represented the seven most prominent constructs which were confirmed in 25 exploratory and confirmatory interviews: (1) Advancement; (2) Altruism; (3) Compliance; (4) Conscientiousness; (5) Constructiveness; (6) Loyalty; and (7) Tolerance.

In Chapter 6, constructs and their underlying items underwent a series of statistical tests,

which confirmed the assumptions and expectations of the hypothesised a-priori-latent structure. A primary dataset, which was strictly limited to the inter-functional context was utilised: an individual who is a) working in an inter-functional context, being dependent on another skillset which cannot be obtained or replaced easily; and b) working full time with regular inter-functional interactions and duties; c) performing a task, which is generally performed in an organisational context. This general sample population was rigorously defined by the author and with the help of multiple pilot studies. Therefore, the sample of study 6 is an adequate randomisation of the overall general sample population in which sample parameters were checked in pilot studies and also with in-survey questions. Utilising this dataset and adhering to all established statistical measures and their cut off values, four constructs which characterise the inter-functional work remained: (1) Altruism; (2) Conscientiousness; (3) Constructiveness; and (4) Tolerance. These constructs form the inter-functional citizenship (IFCB) scale, which study 3 tested subsequently in chapter 7.

Chapter 7 was devoted to the final stage of the scale development process and tested the scale with a hypothesised relationship between R&D and IP employees in highly innovative industries. Adapting the behavioural equilibrium lens, chapter 7 investigated the effect of IFCB response discrepancy/agreement on POSI - an organisational culture variable which proxies the innovation culture in the R&D function. By using polynomial regressions, chapter 7 accounted for the combined effect of behaviours of employees from different functions, introducing a unique and novel method to analyse citizenship behaviours. Instead of reducing dimensionality and losing information by calculating simple difference scores, the polynomial regression allowed a nuanced understanding of the integration between employees from both functions. Results indicated that an equilibrium of task-oriented IFCBs - conscientiousness and tolerance is associated with POSI. Unlike, a disequilibrium of relationship-oriented IFCBs - altruism and constructiveness relates to POSI.

## 8.2 Reporting individual study findings

This section summarises the findings of each study and links it back to the overall research aim, the research gaps, as well as the research questions. Findings are presented based on the following research questions:

1. Which inter-functional citizenship behaviours characterise the inter-functional work between employees from different functions who inhabit different thought worlds?

2. Under what circumstances with regards to IFCBs is a behavioural (dis)equilibrium beneficial for the integration between R&D and IP functions and its employees?
3. How do IFCBs influence R&D employees' perceived organisational support for innovation?

In order to answer these questions, the following objectives were set and represent milestones of this dissertation:

- Identify inter-functional citizenship behaviours (IFCBs) apparent between employees from different functions who inhabit different thought worlds.
- Apply the *behavioural equilibrium* lens to examine the inter-functional work between R&D and IP employees using IFCBs.
- Research the influence of IFCBs on R&D employees' perceived organisational support for innovation.

### **8.2.1 Pre-study**

As indicated in chapter 2, the distinction between the people-oriented tradition and the process-oriented tradition with its inconveniences, problems and tensions was already an issue in the 1930s (please see section 2.4.3). Organisational scholars, such as Barnard (1938); Fayol (1930); Roethlisberger and Dickson (1939); Weber (1947) argued for the maintenance of equilibrium of tensions for organisational survival. This dissertation accepted the existence of tensions in organisations and postulated that tension could also exist from the behavioural perspective between employees from different functions who inhabit different thought worlds. Findings of the pre-study (chapter 4) researching the interaction between R&D employees in the HQ and R&D employees in the innovation subsidiary within the same organisation supported this phenomenon. By retrospectively analysing a secondary dataset in the context of technology/knowledge transfer between employees from two functions with different thought worlds, study 1 concluded a behavioural disequilibrium. Applying a defined set of behaviours, employees from the HQs displayed fewer, and a distinct set of behaviours towards employees in the innovation subsidiary which was different from the behaviours displayed from the subsidiary towards the HQ. Cengiz and Geiger (2019) called this phenomenon 'behavioural dichotomy' and confirmed the tension between employees from different functions. A disequilibrium can exist and can influence the organisational culture and the motivation of employees. Employees at the innovation subsidiary, who displayed more behaviours than they perceived, seemed to feel less valued and could procrastinate with their work. Moreover, HQ employees displayed behaviours, such as envy and threat, which can influence

day-to-day activities and further (work) engagement. Overall, taking the research limitations into account, pre-study results suggest that the research of tension between employees from different functions who inhabit different thought worlds, utilising the behavioural equilibrium lens, is justified and a promising avenue to pursue.

### **8.2.2 Study 1**

Study 1 was the first stage of the prescribed three-stage scale development process this dissertation adhered to. In this study, items for the IFCB scale were developed in a combined, deductive and inductive way. Items are psychometric questions, which aim to measure the integration between employees from two functions from the behavioural perspective. They proxy the actual phenomenon of interest and act as a "mediator" to understand the abstract relationship between theory and the phenomena. Through exploratory and confirmatory interviews, as well as a comprehensive literature review, seven different constructs with four items each were established: (1) Advancement; (2) Altruism; (3) Compliance; (4) Conscientiousness; (5) Constructiveness; (6) Loyalty; and (7) Tolerance. These constructs are anchored in the citizenship literature and items were pooled from multiple academic sources and also developed in a close working relationship with domain experts. Domain experts further confirmed the inconveniences, problems and also tensions in cross-functional settings from the behavioural perspective. They suggested new constructs based on their expertise and experience in cross-functional work. However, these constructs were already part of the constructs this dissertation derived from the citizenship literature. Nonetheless, domain experts' engagement and the congruence of their suggestions with existing citizenship constructs confirmed the importance of the seven behaviours derived from the literature. Study 1 was the first step to answer the first research question asking *which inter-functional citizenship behaviours characterise the inter-functional work between employees from different functions who inhabit different thought worlds?* This is aligned with the first objective of this dissertation, which aims to *identify inter-functional citizenship behaviour (IFCB) perspectives displayed on a functional perspective in a directional and resource-dependent context*. However, neither RQ1 nor the research objective, as mentioned above, could be answered by study 1 solely. The prescribed scale development process required a statistical confirmation of the scale/items, which study 2 approached.

### 8.2.3 Study 2

Study 2 tested the seven constructs from the previous study and compiled a new dataset in which employee working in the inter-functional context were investigated. The a-priori structure defined in study 1 was subjected to a confirmatory factor analysis (CFA). Based on the results, seven constructs reduced to four. The remaining four-construct model, consisting of

1. inter-functional altruism
2. inter-functional conscientiousness
3. inter-functional constructiveness
4. inter-functional tolerance

showed excellent fit and withstood a series of measurement invariance testing.

The disconfirmatory nature of the (CFA) reduced the complexity from seven to four constructs in which the elimination of the respective three constructs was theoretically and also empirically justified. Domain experts scrutinised their adequacy in the inter-functional context in chapter 5 already. Among the three eliminated behaviours, they challenged inter-functional loyalty and inter-functional compliance with regards to organisational policies and rules. A link to potentially non-compliant behaviour has been anticipated by interviewees who projected the missing link and the potential inconsistent fit during the statistical testing. Despite these comments, both behaviours were kept to introduce redundancy. However, both constructs were eliminated due to poor statistical fit. Lastly, inter-functional advancement was eliminated due to its redundancy and high cross-correlation with inter-functional constructiveness. With that, RQ1, which aimed to characterise the inter-functional integration with IFCBs, was answered. A four-behaviour model appears to characterise and capture the inter-functional context sufficiently: (1) Inter-functional altruism measures helping behaviour of employees to acquire new skills and reduce workload. The focus is on the extra-mile an employee goes in order to help and maintain a relationship. (2) Inter-functional conscientiousness pursues the maintenance of a positive relationship between employees by performing a task with higher effort. It is about task execution, which in turn creates a supportive working environment. (3) Employees displaying inter-functional constructiveness go beyond task execution and aim at tightening the bond between functions, which consequently creates an environment of trust and mutual understanding. Finally, (4) inter-functional tolerance is associated with task-oriented inconveniences, problems, delays and impositions. A high

degree of tolerance smoothens the interactions as inconveniences are not escalated to a higher responsibility.

Study 2 provided the answer to RQ1 and opened the pathway to test and evaluate the novel IFCB scale in the specific context of R&D and IP integration. This was achieved with study 3, which is the final stage of the prescribed three-stage scale development process.

### **8.2.4 Study 3**

Chapter 7 is devoted to study 3 and aimed at scale evaluation and testing. Study 2 established the four-construct model, which characterises the inter-functional integration between employees from different functions. Following the established scale development procedure, the new IFCB scale was administered to an independent sample to measure the integration between employees of two functions: the IP and the R&D function.

Employees from the R&D function were asked about their perception of a certain IFCB from IP employees (perceived IFCB; predictor variable 1) and also about the extent they display the respective IFCB towards their IP colleagues (displayed IFCB; predictor variable 2). This study was solely interested in the effect of the response discrepancy/agreement of both variables on the outcome variable POSI, the perception of organisational support for innovation. If a respondents' standardised score on one predictor variable is  $1/2\sigma$  above or below the other predictor variable, then the response is classified as 'discrepant'. If both variables are not  $1/2\sigma$  above or below each other, the response is classified as 'in agreement'. As described in chapter 7 and argued in section 2.5, integration can be collaboration-based where Ernst and Fischer (2014) postulates the "*the affective, volitional, mutual, or shared nature of working together*" pp.120-121. Thus, aspects like "*joint goals, open and cooperative work atmosphere, teamwork, and harmony in the working relationship*" (Ernst and Fischer, 2014, pp.120-121) are inherent. It can also be only contribution-based in which none of the collaborative aspects described above are implicit. The integration is only based on the given task in which a specialised opinion, deliverable, and help are presupposed. Existing literature in the inter-functional integration between R&D and IP functions argues for a contribution-based integration in which a discrepancy of behaviours is hypothesised.

Utilising IFCBs, a primary new dataset was collected for the purpose of this study and the polynomial regression with surface analysis indicated that POSI is related to a response discrepancy of two behaviours, but also to a response agreement of two others. The overall sample population represented the exploration-oriented part of the R&D function - an area

where employees have high subject matter expertise and work on very early stage research with little commercial applicability. This sample is deliberately chosen to analyse the IFCB scale as the distinction between relationship-oriented and task-oriented was anticipated. Results for relationship-oriented IFCBs - altruism and constructiveness - confirm the hypotheses and previous research results that a contribution-oriented integration is more beneficial than a collaboration-oriented integration. R&D employees' POSI is at the highest level when relationship-oriented IFCBs are discrepant. However, results support the hypotheses only for relationship-oriented IFCBs. Results for task-oriented IFCBS - conscientiousness and tolerance - indicate that agreement is associated with POSI. Higher levels of POSI has been observed for cases in which R&D employees perceive and display task-oriented IFCBS reciprocally. This finding appears to be contrary to previous research results of Ernst and Fischer (2014); Somaya et al. (2007) and also contrary to research hypotheses based on the behavioural disequilibrium argument developed in section 2.5. R&D employees in highly innovative industries seem to engage in collaborative behaviour when behaviours are task-oriented. Maintenance of behavioural equilibrium seems more beneficial than a disequilibrium.

Study 3 helps to answer the remaining research questions RQ2 and RQ3. As indicated above, behavioural equilibrium seems only beneficial for POSI when behaviours are task-oriented. For relationship-oriented behaviours, a disequilibrium between the R&D and the IP employees is more beneficial. At last, RQ3 is concerned about the relation of IFCBs on POSI. As indicated above, the influence of IFCBs on POSI, an organisational culture variable, does not seem to be always beneficial. An environment in which relationship-oriented IFCBs are reciprocated between R&D and IP employees can negatively affect the perception of organisational support for innovation. Thus, results support the contribution-based integration between IP and R&D employees from the behavioural perspective, mimicking the service-oriented integration design argued by Gassmann and Bader (2011); Süzeroğlu-Melchior (2017). This design involves a collaboration-based integration only for task-oriented IFCBs but not for relationship-oriented IFCBs.

### 8.3 Theoretical contributions

Whetten (1989) defines 'theoretical contribution' as the process of demonstrating how additional insights change the way people understand a phenomenon. The process of theoretical contribution is more than just the process of exploring and summarising facts. Following Poincare (1903) who states that " *Science is facts, just as houses are made of*

*stone. . . . But a pile of stones is not a house, and a collection of facts is not necessarily science*", this research aims to give a better understanding of a phenomenon by committing to a full-scale development process.

The major contribution of this dissertation is the scale development for measuring IFCBs. This dissertation consists of one pre-study and three main studies which were all designed according to the criteria of the scale development process prescribed by Hinkin (1995), Likert (1961), DeVellis (2011) and Schwab (1980). These studies resulted in the IFCB scale, which measures the integration between employees from two functions from the behavioural perspective. The IFCB scale is a confirmation of the early conceptualisation of the OCB theory (Organ, 1988; Smith et al., 1983), but also a progression of the OCB theory, which takes the inter-functional behaviours of employees into account. This introduces a novel pathway to analyse other inter-functional integration between employees from the behavioural perspective. As described in chapter 2, numerous researchers developed novel scales for specific organisational contexts. I.a. Autry et al. (2008); Gerke et al. (2017) developed the inter-organisational citizenship behaviour (ICB) scale, Langner and Seidel (2014) customer-citizenship behaviour (CCB) scale, Braun et al. (2013) project citizenship behaviour or Robertson and Barling (2017) the environmental citizenship behaviour (ECB) scale. The IFCB scale joins the recent scale developments and introduces the scale to measure individual, inter-functional citizenship behaviours which support the call in the OCB literature to examine the "inter"-effects of citizenship behaviours (Podsakoff et al., 2014). This dissertation makes an additional contribution to the CFI research stream. It introduces citizenship behaviours into the people-oriented CFI in the specific context between R&D and IP employees. This contribution responds to the call in the CFI literature to "*understand behavioural factors that facilitate (or inhibit) inter-functional collaboration*" (Ellinger et al., 2006, p.2). By researching the behavioural perspective of inter-functional integration, IFCBs are measured, which might help to design better inter-functional processes taking more than the blueprint of the process into account. Behavioural preferences of the employees involved in the process are included and could potentially explain some of the deep-rooted tensions, inconveniences and problems in CFI. Finally, this dissertation makes a contribution to the organisational theory/organisational equilibrium literature by deriving the equilibrium from the behavioural perspective. Equilibrium research and scholars have traditionally focused on the tension and maintenance of equilibrium between the organisation and the individual, or the individual and the environment (Barnard, 1938; Fayol, 1930; Lewin, 1936; Mayo, 1937; Roethlisberger and Dickson, 1939). This research proposed the tensions between employees from two functions who inhabit different thought worlds and challenges the

assumption of the organisational equilibrium theory, which proposes that the equilibrium of tensions is fundamental for organisational survival. The results show that equilibrium is not always beneficial and that disequilibrium of IFCBs between employees from the R&D and IP functions can lead to higher POSI than equilibrium of IFCBs. This responds to the call in organisational theory to research how organisations in different fields can maintain balance in organisational tension (Müller-Christ, 2014).

In a broader sense, it is the hope that the IFCB scale, the behavioural equilibrium lens of integration and the anchoring of the IFCB scale in the organisational equilibrium theory advance the literature of innovation management by introducing an additional factor to manage R&D process, including technology creation, use, and protection (Gregory, 1995). Furthermore, it is the hope that results also advance the CFI literature by giving suggestions on how to create and increase value by combining interdependent resources (Pagell et al., 2004). Finally, the specific context of R&D and IP functions allows the contribution towards IP management researchers and practitioners who are trying to manage IP and technology development strategically (Ernst and Fischer, 2014; Somaya et al., 2013, 2007).

## 8.4 Practical contributions

Aligned with the theoretical contribution, the biggest practical contribution of this dissertation is the introduction of the IFCB scale as a tool to analyse inter-functional integration from the behavioural perspective. Prior research and managerial practices aimed at integration from the process level. Tasks, inter-dependencies and integrated information and communication systems (IICS) were optimised to deal with heterogenic goals, activities and knowledge. However, the optimisation of integration from the process perspective did not answer some of the fundamental questions about how to integrate and how to deal with tensions and inconveniences between employees.

A shift of focus from the process towards the people perspective integration (please see section 2.2.3) is supported by the novel IFCB scale where the state-of-the-art integrative process can be "diagnosed" from the behavioural perspective. Managers can utilise a survey to gather information about IFCBs and can obtain a snapshot of the behavioural perspective of integration. With the help of these results and also the effect on the chosen outcome variable, a process intervention from the behavioural perspective can be recommended.

Furthermore, integration bears the potential risk of conflict due to tensions between employees who are working together due to inter-dependent processes in place. An imbalanced process based on behaviours could increase the potential conflict and impede work, value generation

and also the motivation of employees. The IFCB survey could give indications to avoid, resolve and proactively change processes to support inter-functional integration. A final practical contribution is with regards to team design. High-performing teams need to be formed to support the aims of the organisation. By obtaining reviews of IFCBs, a high performing team based on the behavioural perspective could be formed. These teams might yield better results (performance) than the team in place.

All in all, the practical contributions need to be seen as an additional perspective which supports the process perspective of integration. The behavioural perspective can help to understand the nuances of inter-functional work and might be able to support integration efforts and, as a consequence, organisational aims.

## 8.5 Future research directions

This dissertation proposes a novel scale to measure the effect of behaviours in cross-functional settings. While the first application of the IFCB scale was tested in chapter 7 in the integration between R&D and IP employees, it is the hope that further research can add more nuances to the integration between R&D and IP employees by applying additional variables, such as creative behaviour of R&D employees or risk affinity of R&D/IP employees. These endeavours would increase the scope of the scale and further evaluate the pre-defined relationship between both functions. Furthermore, the focus can be shifted towards the IP function to analyse the influence of IFCB on a support function. Whereas this is an interesting avenue to pursue, sample limitations might hinder an optimal research design and analysis. Efforts to increase the generalisability of the IFCB scale is another direction for further research. Using the scale to analyse the integration of employees from different functions would increase the generalisability of IFCB. Similar to the inter-functional research between R&D and IP employees, scholars can adapt the scale towards other key inter-functional integration. For example, a very promising avenue could be the inter-functional work between R&D and manufacturing, R&D and supply chain or inter-functional integration between other key functions, such as purchasing and manufacturing or marketing and sales. Additionally, researching low innovative industries with the IFCB scale could be a fruitful topic to understand the differences between both industries and derive tailored recommendations for low innovative industries and also SMEs. A promising avenue to pursue further research is also the advancement of the equilibrium theory from the behavioural perspective. Whereas this dissertation derived the behavioural equilibrium and tested its applicability in practice, further research by using the novel lens as a primary lens in other areas of research could

start a revival of the general equilibrium theory which might help other theoretical lenses to evolve and consequently this dissertation to thrive.

## 8.6 Conclusion

Despite many years of research in the academic field of integration and also practical experience, cross-functional integration is not fully understood yet. Throughout this dissertation, it has become evident that the behavioural perspective is relevant in cross-functional work. The latent nature of behaviours and the predominant focus on the process-side of integration disregarded the people-side of integration and introduced tension and conflict between employees and thus might dissipated value in cross-functional projects.

This dissertation embraced the idea of the behavioural perspective in inter-functional work and aimed to characterise inter-functional work from the behavioural perspective. Multiple studies supported this endeavour, specifically designed to answer the question of *which inter-functional behaviours characterise the interactions between functional functions?* Study 1 and study 2 jointly answered the research question and introduced the IFCB scale, consisting of four behaviours which characterise the inter-functional work between functional functions. By combining the behavioural perspective and cross-functional integration, a novel advancement of the equilibrium theory was proposed: The behavioural equilibrium. This theoretical lens anchored the people-side of integration to the beginnings of organisational theory research and tested its applicability with the pre-study, as well as study 3. By doing so, this dissertation answered the remaining research question, utilising the behavioural equilibrium lens. A behavioural equilibrium is beneficial for POSI only for task-oriented IFCBs.

It is hoped that the IFCB scale will advance the understanding of cross-functional integration between R&D and IP employees, as well as in other functional contexts. Furthermore, it is hoped that this dissertation, especially the novel behavioural equilibrium lens, will stimulate future research discussions and invigorate new ties to other research streams and theoretical lenses.

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## **Appendix A**

### **Item pool study 1 - deductive and inductive item generation**

Citizenship Behaviour	Definition	Items
<b>Civic virtue (Constructiveness) (Organ, 1988)</b>	“Responsible, constructive behaviour. Involvement in organisational governance processes”. (Organ, 1990, pp.96)	<ul style="list-style-type: none"> <li>• I forward information to my colleagues immediately</li> <li>• I regularly attend meetings even not required</li> <li>• I look and advocate for potential input for change</li> <li>• I read and engage with company initiatives</li> <li>• I introduce relevant people to my colleagues</li> <li>• I meet colleagues during e.g. lunch to talk exchange information and updates</li> <li>• I advocate for more resources in case I see a need</li> </ul>
<b>Compliance (Smith, Organ and Near, 1983; Graham, 1991)</b>	“A more impersonal form of conscientiousness that is indirectly helpful to others: doing what a "good" employee ought to do.” (Smith, Organ and Near, 1983, pp.657; Graham, 1991, pp.225)	<ul style="list-style-type: none"> <li>• I rarely waste time at work</li> <li>• I obey company rules and policies</li> <li>• I strictly follow defined processes, rules and policies</li> <li>• I regularly join organisational meetings</li> <li>• I respect defined organisational/functional boundaries</li> <li>• I share all information related to work immediately</li> </ul>
<b>Helping Behaviour (Altruism) (Smith, Organ and Near, 1983)</b>	“Helping behaviour that involves voluntarily helping others with, or preventing the occurrence of, work-related problems” (Smith, Organ and Near, 1983, pp. 657)	<ul style="list-style-type: none"> <li>• I help colleagues when they have a heavy workload</li> <li>• I update colleagues who have been absent</li> <li>• I support colleagues to solve their problems</li> <li>• I support colleagues to learn a new skillset</li> <li>• In urgent times, I proactively offer my helping hand and skillset to solve the problem</li> <li>• I help in orienting new employees</li> <li>• I teach colleagues to learn new skills</li> <li>• I am willing to help others who have work-related problems</li> </ul>
<b>Individual Initiative (Conscientiousness (Organ,1988)</b>	“Going well beyond minimally required levels of attendance, punctuality, housekeeping, conserving resources, and related matters of internal maintenance” (Organ, 1988, pp. 96)	<ul style="list-style-type: none"> <li>• I don't take extra breaks</li> <li>• I go above and beyond at work</li> <li>• I volunteer my resources in order to help</li> </ul>

		<ul style="list-style-type: none"> <li>• I deliver additional information even not needed</li> <li>• I believe that I am one of the most conscious employees</li> <li>• I follow up with others to make sure everything is right</li> <li>• I take additional workload from others to support</li> <li>• I update others about my work and results frequently</li> </ul>
<b>Loyalty (Graham, 1991)</b>	“Identification with and allegiance to organisational leaders and the firm as a whole”. Graham, 1991, pp.225)	<ul style="list-style-type: none"> <li>• I informed about products and services and tell others</li> <li>• I represent my organisation to outsiders</li> <li>• I engage in defined processes even in periods of resource cutbacks</li> <li>• I engage in defined processes even in periods of tight deadlines</li> <li>• I actively promote organisation’s products and services</li> <li>• I sometimes skip the involvement with other departments to fasten up my own work</li> <li>• I share ideas for new products or improvements widely</li> </ul>
<b>Self Development (Advancement) (George &amp; Brief, 1992)</b>	“Taking steps to improve knowledge, skills, abilities so as to be better able to contribute to organisational goals”. (George & Brief, 1992, pp. 155)	<ul style="list-style-type: none"> <li>• I engage in self-training</li> <li>• I use and maintain shared databases</li> <li>• I proactively suggest new ways of working</li> <li>• I ask and seek for more training</li> <li>• I pursue academic education off work</li> <li>• I purposefully involve others into my work to improve decision making</li> <li>• I meet colleagues regularly to discuss work</li> </ul>
<b>Sportsmanship (Tolerance) (Organ, 1988)</b>	“A citizen-like posture of tolerating the inevitable impositions and inconveniences of work without complaining.” (Organ, 1988, pp. 96)	<ul style="list-style-type: none"> <li>• I always focus on what’s wrong</li> <li>• I don’t escalate inconveniences immediately</li> <li>• I don’t complain about late deliverables</li> <li>• I accept the formal agreements and try to do my best</li> </ul>

- I focus on what we are doing wrong instead of what we are doing right
- I tend to make “mountains out of molehills”
- I accept non-compliant deliverables
- I am not resentful for late information sharing



## **Appendix B**

### **Question set semi-structured interviews - item generation**

Table B.1 Question set - item generation

<b>Questions asked during the semi-structured interviews</b>	
<b>Q1</b>	How do you communicate with other functions?
<b>Q2</b>	Are there any joint training with other functions?
<b>Q3</b>	Do you provide training to other functions?
<b>Q4</b>	Can you provide some mechanisms to overcome inter-functional problems?
<b>Q5</b>	Are there any "escalation processes in place for solving the problems?
<b>Q6</b>	Are there any mechanisms to monitor your interaction with other functions?
<b>Q7</b>	Are those interactions regular?
<b>Q8</b>	Are there any milestone meetings?
<b>Q9</b>	Have you ever experienced any lobbying for more budget or resources in favor of your function from other functions?
<b>Q10</b>	Do you engage in other functions processes and suggest new ways of working?
<b>Q11</b>	How do you transfer knowledge across functions?
<b>Q12</b>	Are there any shared databases with other functions?
<b>Q13</b>	Do other functions adhere and respect your policies, functional boundaries and processes?
<b>Q14</b>	How do you deal with non-complaint deliverable and/or people?



# **Appendix C**

## **Key journals with regards to this dissertation**

Research domain	Journal title	Link to dissertation
Innovation Management	Journal of Product Innovation Management	Innovation, NPD, IPM-NPD integration
	R&D Management Journal	Innovation, NPD, IPM-NPD integration
	Technovation	NPD, IPM, OB
Management	Journal of Management	IPM-NPD integration, OB
	International Journal of Product Economics	CFI, OB, Management
	Journal of Business Research	CFI, OB, Management
	Research Policy	CFI, OB, Management
	Academy of Management	Management
IPM	World Patent Information	IPM
	California Management Review - special issue on IPM	Innovation, NPD, IPM-NPD integration
CFI	International Journal of Product Economics	CFI, OB
	Journal of operations Management	CFI, OB, Innovation
	Research Policy	CFI, OB
OB	Organisational Science	OB
	Academy of Management	Management, OB
	The Leadership Quarterly	Management, OB
	Journal of Applied Psychology	Management, OB
	Administrative Science Quarterly	Management, OB
	Personnel Psychology Journal	Management, OB
	Human Performance	Management, OB



## Appendix D

# Key publications with regards to this dissertation

Authors	Title	Journal	Year	Method	Main findings
Somaya et al. (2007)	Combining patent law expertise with R&D for patenting performance	Organization Science	2007	US Fortune 500 longitudinal secondary panel data n=101, cross-industry	Counterintuitive (weak) negative interaction between patent law expertise and R&D
Kalanje (2009)	Role of intellectual property in innovation and new product development	WIPO	2009	Theory conceptualisation	IP integration supports the innovation process and facilitates successful innovation
Nakata and Im (2010)	Spurring cross-functional integration for high new product performance: A group effect	JPIM	2010	Cross-industry survey about NPD projects Multi-informant survey n=222	Specific internal team factors positively correlated with new product performance in NPD teams
Fisher III and Oberholzer-gee (2013)	Strategic management of intellectual property: An integrated approach	California Management Review	2013	Theory conceptualisation Descriptive case studies	An integrated approach of IP with other departments brings strategic importance and options for deploying IP
Al-Aali and Teece (2013)	Towards the (strategic) management of intellectual property: Retrospective and prospective	California Management Review	2013	Theory conceptualisation Descriptive case studies	Strategic management of IP and the opportunity for integrated business model design
Somaya et al. (2013)	Innovation in multi-invention contexts: Mapping solutions to technological and intellectual property	California Management Review	2013	Theory conceptualisation Descriptive case studies	IP as a part of commercialisation strategy for successful business model design
Ernst and Fischer (2014)	Integrating the R&D and patent function: Implications for new product performance	JPIM	2014	Cross-industry survey about NPD projects Multi-informant survey n=101	No link between attitudinal (collaboration) dimension in cross-functional integration between R&D and IP in highly innovative products
Gerke et al. (2017)	The role of inter-organizational citizenship behaviors in the innovation process	Journal of Business Research	2017	Single case study in the marine industry innovation cluster in New Zealand	ICB play an important role in multiple stages of the innovation process



## **Appendix E**

### **Initial loadings and inter-construct covariance matrix of the initial CFA**

Table E.1 Initial loadings of IFCB items

Latent construct	Item	Estimate	Std.Err	z-value	p-value	std.all
IFALT	IFALT1	0.741	0.071	10.432	0	0.683
IFALT	IFALT2	0.706	0.070	10.132	0	0.674
IFALT	IFALT3	0.594	0.073	8.175	0	0.603
IFALT	IFALT4	0.540	0.073	7.372	0	0.555
IFTOL	IFTOL1	0.688	0.071	9.684	0	0.653
IFTOL	IFTOL2	0.538	0.077	6.955	0	0.554
IFTOL	IFTOL3	0.706	0.072	9.818	0	0.642
IFTOL	IFTOL4	0.614	0.058	10.672	0	0.705
IFLOY	IFLOY1	0.534	0.055	9.767	0	0.627
IFLOY	IFLOY2	0.556	0.063	8.839	0	0.639
IFLOY	IFLOY3	0.101	0.088	1.140	0	0.089
IFLOY	IFLOY4	0.590	0.063	9.391	0	0.656
IFCONSC	IFCONSC1	0.589	0.061	9.690	0	0.657
IFCONSC	IFCONSC2	0.656	0.070	9.318	0	0.636
IFCONSC	IFCONSC3	0.498	0.064	7.804	0	0.619
IFCONSC	IFCONSC4	0.592	0.056	10.472	0	0.713
IFCONMP	IFCONMP1	0.578	0.057	10.159	0	0.694
IFCONMP	IFCONMP2	0.498	0.062	8.077	0	0.550
IFCONMP	IFCONMP3	0.598	0.049	12.112	0	0.705
IFCONMP	IFCONMP4	0.113	0.093	1.216	0	0.093
IFCONSTR	IFCONSTR1	0.484	0.061	7.867	0	0.548
IFCONSTR	IFCONSTR2	0.652	0.057	11.472	0	0.669
IFCONSTR	IFCONSTR3	0.631	0.066	9.214	0	0.561
IFCONSTR	IFCONSTR4	0.598	0.060	9.858	0	0.661
IFADV	IFADV1	0.587	0.057	10.287	0	0.654
IFADV	IFADV2	0.560	0.057	9.889	0	0.601
IFADV	IFADV3	0.472	0.062	7.634	0	0.522
IFADV	IFADV4	0.548	0.058	9.513	0	0.633

Table E.2 Initial CFA covariance matrix

	IFALT	IFTOL	IFLOY	IFCONSC	IFCOMP	IFCONSTR	IFADV
IFALT							
IFTOL	0.458						
IFLOY	0.699	0.471					
IFCONSC	0.482	0.378	0.824				
IFCOMP	0.584	0.371	0.878	0.863			
IFCONSTR	0.720	0.429	0.908	0.735	0.859		
IFADV	0.649	0.352	0.909	0.804	0.887	0.953	

## Appendix F

# Modification indices - R output

lhs	op	rhs	group	mi	epc	target.epc	std.epc	std.target.epc	signifcant.mi	high.power	decision.pow	se.epc	lower.epe	upper.epe	lower.std.epe	upper.std.epe	decision.ci
63	IFALT	=~ IFCONSC_1	I	0.19247764	0.03667114	0.5267	0.0348118	0.5	FALSE	TRUE	NM	0.08359	-0.1008167	0.174160	-0.0207047	0.235276	NM
64	IFALT	=~ IFCONSC_2	I	0.09354944	-0.0238206	0.4860	-0.0245043	0.5	FALSE	TRUE	NM	0.07788	-0.1519237	0.104282	-0.1562843	0.167756	NM
65	IFALT	=~ IFCONSC_3	I	1.23881987	-0.0970631	0.5504	-0.081809	0.5	FALSE	TRUE	NM	0.08721	-0.2405054	0.046579	-0.2189969	0.0421351	NM
66	IFALT	=~ IFCONSC_4	I	0.74847424	0.060618	0.4356	0.0699618	0.5	FALSE	TRUE	NM	0.06945	-0.0541505	0.174318	-0.0621515	0.200547	NM
67	IFALT	=~ IFCONSTR_1	I	0.554562	0.0538671	0.4482	0.0609002	0.5	FALSE	TRUE	NM	0.07233	-0.0651132	0.172847	-0.0726205	0.1928159	NM
68	IFALT	=~ IFCONSTR_2	I	0.19274683	-0.0366416	0.5163	-0.0354849	0.5	FALSE	TRUE	NM	0.08346	-0.1739220	0.100659	-0.1684317	0.0974618	NM
69	IFALT	=~ IFCONSTR_3	I	0.00512487	0.0046649	0.4026	0.0057929	0.5	FALSE	TRUE	NM	0.06516	-0.1025186	0.111348	-0.1273092	0.1388951	NM
70	IFALT	=~ IFCONSTR_4	I	0.14862368	-0.0258494	0.4152	-0.0311281	0.5	FALSE	TRUE	NM	0.06705	-0.1361388	0.094440	-0.1630395	0.1016833	NM
71	IFALT	=~ IFTOL_1	I	0.07287630	0.0280606	0.4411	0.0323408	0.5	FALSE	TRUE	NM	0.10720	-0.147321	0.202520	-0.1670515	0.2326525	NM
72	IFALT	=~ IFTOL_2	I	0.3095435	0.0262003	0.4874	0.0697674	0.5	FALSE	TRUE	NM	0.11908	-0.1296167	0.226127	-0.1329561	0.268899	NM
73	IFALT	=~ IFTOL_3	I	0.00964862	-0.0133774	0.5626	-0.0118899	0.5	FALSE	TRUE	NM	0.13619	-0.2373860	0.210631	-0.2109996	0.1872109	NM
74	IFALT	=~ IFTOL_4	I	0.45034681	-0.0732165	0.4450	-0.0822635	0.5	FALSE	TRUE	NM	0.10910	-0.2526745	0.106241	-0.2338961	0.1193691	NM
75	IFCONSC	=~ IFALT_1	I	0.11609494	-0.0296214	0.5424	-0.0277037	0.5	FALSE	TRUE	NM	0.08694	-0.1726183	0.113375	-0.1591120	0.1045045	NM
76	IFCONSC	=~ IFALT_2	I	0.48468977	0.0585791	0.5239	0.0555880	0.5	FALSE	TRUE	NM	0.08411	-0.0797927	0.196909	-0.0761492	0.1879172	NM
77	IFCONSC	=~ IFALT_3	I	0.29653451	0.0432623	0.4929	0.0438861	0.5	FALSE	TRUE	NM	0.07945	-0.0874148	0.173939	-0.0886751	0.1764473	NM
78	IFCONSC	=~ IFALT_4	I	1.02315247	-0.0796108	0.4866	-0.0818072	0.5	FALSE	TRUE	NM	0.07870	-0.2899608	0.049847	-0.2148370	0.0512225	NM
79	IFCONSC	=~ IFCONSTR_1	I	1.00717235	-0.0649926	0.4482	-0.0725010	0.5	FALSE	TRUE	NM	0.06476	-0.1715147	0.041529	-0.1402329	0.0463272	NM
80	IFCONSC	=~ IFCONSTR_2	I	0.082121372	-0.0215036	0.5163	-0.068248	0.5	FALSE	TRUE	NM	0.07504	-0.1449188	0.01911	-0.1407438	0.0986943	NM
81	IFCONSC	=~ IFCONSTR_3	I	0.65757761	0.0475598	0.4026	0.0590569	0.5	FALSE	TRUE	NM	0.05865	-0.048975	0.14402	-0.0607742	0.0788480	NM
82	IFCONSC	=~ IFCONSTR_4	I	0.25781073	0.0360337	0.4152	0.0366245	0.5	FALSE	TRUE	NM	0.05990	-0.0681113	0.128939	-0.0820202	0.1552601	NM
83	IFCONSC	=~ IFTOL_1	I	7.97899302	0.1988577	0.4411	0.2253956	0.5	TRUE	TRUE	EPCNMF	0.07040	0.0830612	0.314654	0.0941538	0.358454	NM
84	IFCONSC	=~ IFTOL_2	I	1.009377	-0.0968245	0.4874	-0.0788037	0.5	FALSE	TRUE	NM	0.07667	-0.2029390	0.049290	-0.2081454	0.0505599	NM
85	IFCONSC	=~ IFTOL_3	I	0.4371126	0.0308439	0.5626	-0.0520569	0.5	FALSE	TRUE	NM	0.06559	-0.20428352	0.087145	-0.2181565	0.0705458	NM
86	IFCONSC	=~ IFTOL_4	I	0.33941805	-0.0408439	0.4550	-0.04058908	0.5	FALSE	TRUE	NM	0.07011	-0.1715147	0.0704471	-0.1754559	0.0836735	NM
87	IFCONSTR	=~ IFALT_1	I	0.13794923	-0.0333336	0.5424	-0.04058908	0.5	FALSE	TRUE	NM	0.08975	-0.1809552	0.141288	-0.1667966	0.1054547	NM
88	IFCONSTR	=~ IFALT_2	I	2.60028187	0.1401609	0.5239	0.1337608	0.5	FALSE	TRUE	NM	0.06992	-0.2831305	0.00369	-0.2702020	0.0268605	NM
89	IFCONSTR	=~ IFALT_3	I	2.31042950	0.1233794	0.4929	-0.151569	0.5	FALSE	TRUE	NM	0.08117	-0.1010135	0.256880	-0.1079796	0.268934	NM
90	IFCONSTR	=~ IFALT_4	I	0.7501268	-0.02325716	0.4866	0.07110	0.5	FALSE	TRUE	NM	0.08032	-0.065240	0.201691	-0.05472736	0.2072556	NM
91	IFCONSTR	=~ IFCONSC_1	I	0.68515347	-0.0632326	0.5267	-0.0600260	0.5	FALSE	TRUE	NM	0.07639	-0.1888860	0.063421	-0.1793763	0.085554	NM
92	IFCONSTR	=~ IFCONSC_2	I	1.73911112	0.0945399	0.4860	0.0972534	0.5	FALSE	TRUE	NM	0.07169	-0.2233776	0.212457	-0.2040486	0.2185555	NM
93	IFCONSTR	=~ IFCONSC_3	I	4.81688280	-0.1752244	0.5504	-0.1591897	0.5	TRUE	TRUE	EPCNMF	0.07984	-0.3065468	-0.043902	-0.2784849	0.0398846	NM
94	IFCONSTR	=~ IFCONSC_4	I	3.31915662	0.1153721	0.4356	0.1224201	0.5	FALSE	TRUE	NM	0.06333	-0.0132099	0.219537	-0.0129652	0.2519750	NM
95	IFCONSTR	=~ IFTOL_1	I	0.02612886	0.0182090	0.4411	0.0206390	0.5	FALSE	TRUE	NM	0.11265	-0.1670816	0.202500	-0.1893789	0.2306570	NM
96	IFCONSTR	=~ IFTOL_2	I	0.09364783	-0.0385074	0.4874	-0.0394995	0.5	FALSE	TRUE	NM	0.12583	-0.2454847	0.168470	-0.2518092	0.1728102	NM
97	IFCONSTR	=~ IFTOL_3	I	0.32662461	0.0820666	0.5626	0.072888	0.5	FALSE	TRUE	NM	0.14349	-0.1540149	0.318028	-0.1368899	0.2826658	NM
98	IFCONSTR	=~ IFTOL_4	I	0.11789758	-0.0396070	0.4450	-0.0445010	0.5	FALSE	TRUE	NM	0.11535	-0.2293417	0.150128	-0.2576802	0.1686781	NM
99	IFTOL	=~ IFALT_1	I	2.5314545	-0.2151988	0.5424	-0.1983609	0.5	FALSE	TRUE	NM	0.13526	-0.4376745	0.087277	-0.4034293	0.0067975	NM
100	IFTOL	=~ IFALT_2	I	3.29236528	-0.2384123	0.5239	-0.2275258	0.5	FALSE	TRUE	NM	0.13139	-0.4545355	-0.022289	-0.4337805	-0.0212711	NM
101	IFTOL	=~ IFALT_3	I	5.05423763	0.2669010	0.4929	0.2707492	0.5	TRUE	TRUE	EPC 0.0716200	0.462177	0.0726573	0.4688414	NM		
102	IFTOL	=~ IFALT_4	I	2.9335174	0.2066029	0.4866	0.2061373	0.5	FALSE	TRUE	NM	0.11712	0.0079529	0.393253	0.004723	0.4041024	NM
103	IFTOL	=~ IFCONSC_1	I	0.04717362	-0.0229238	0.5267	-0.0217613	0.5	FALSE	TRUE	NM	0.08018	-0.1808061	0.108959	-0.1469556	0.1034331	NM
104	IFTOL	=~ IFCONSC_2	I	0.1959446	0.030821	0.4860	0.0340317	0.5	FALSE	TRUE	NM	0.07474	-0.0889500	0.156014	-0.0924286	0.1604923	NM
105	IFTOL	=~ IFCONSC_3	I	2.22095403	-0.1246770	0.5504	-0.1132678	0.5	FALSE	TRUE	NM	0.08331	-0.2622849	0.012931	-0.2382834	0.0117477	NM
106	IFTOL	=~ IFCONSC_4	I	1.76515286	0.0884949	0.4356	0.1015711	0.5	FALSE	TRUE	NM	0.06661	-0.060659	0.198058	-0.0241785	0.2273719	NM
107	IFTOL	=~ IFCONSTR_1	I	0.47016961	0.0774548	0.4842	0.0865145	0.5	FALSE	TRUE	NM	0.11310	-0.1084862	0.263598	-0.1210193	0.2940483	NM
108	IFTOL	=~ IFCONSTR_2	I	0.5461111	-0.055135	0.5453	-0.0649883	0.5	FALSE	TRUE	NM	0.12925	-0.3081076	0.17081	-0.2985303	0.133847	NM
109	IFTOL	=~ IFCONSTR_3	I	0.04563499	-0.0215026	0.4026	-0.0267022	0.5	FALSE	TRUE	NM	0.10066	-0.1876077	0.144063	-0.2323055	0.1788991	NM
110	IFTOL	=~ IFCONSTR_4	I	0.04966950	0.0234885	0.4152	0.0282850	0.5	FALSE	TRUE	NM	0.10539	-0.1498670	0.196844	-0.1804710	0.2370411	NM



## Appendix G

### Heatmap of inter-item residual correlations - R output

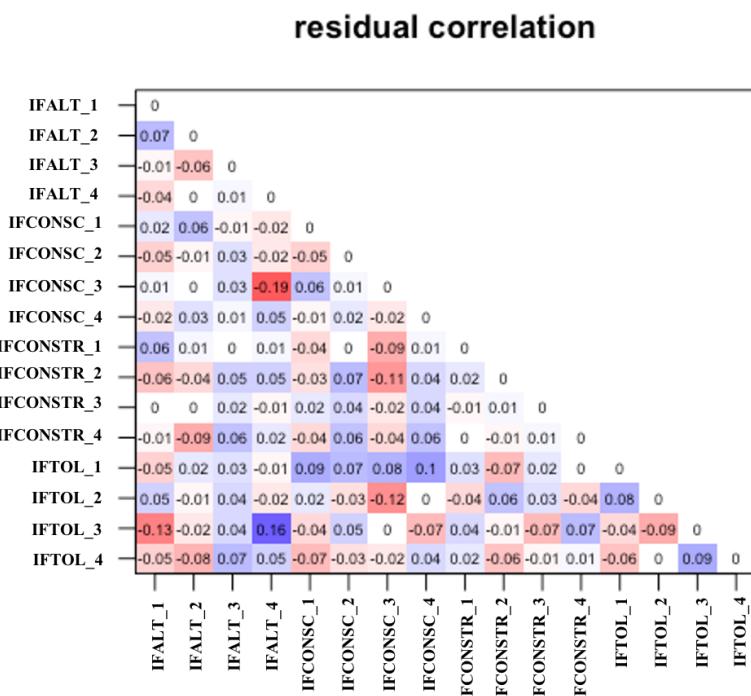


Fig. G.1 Heatmap of inter-item residual correlations



# Appendix H

## Research Excel file

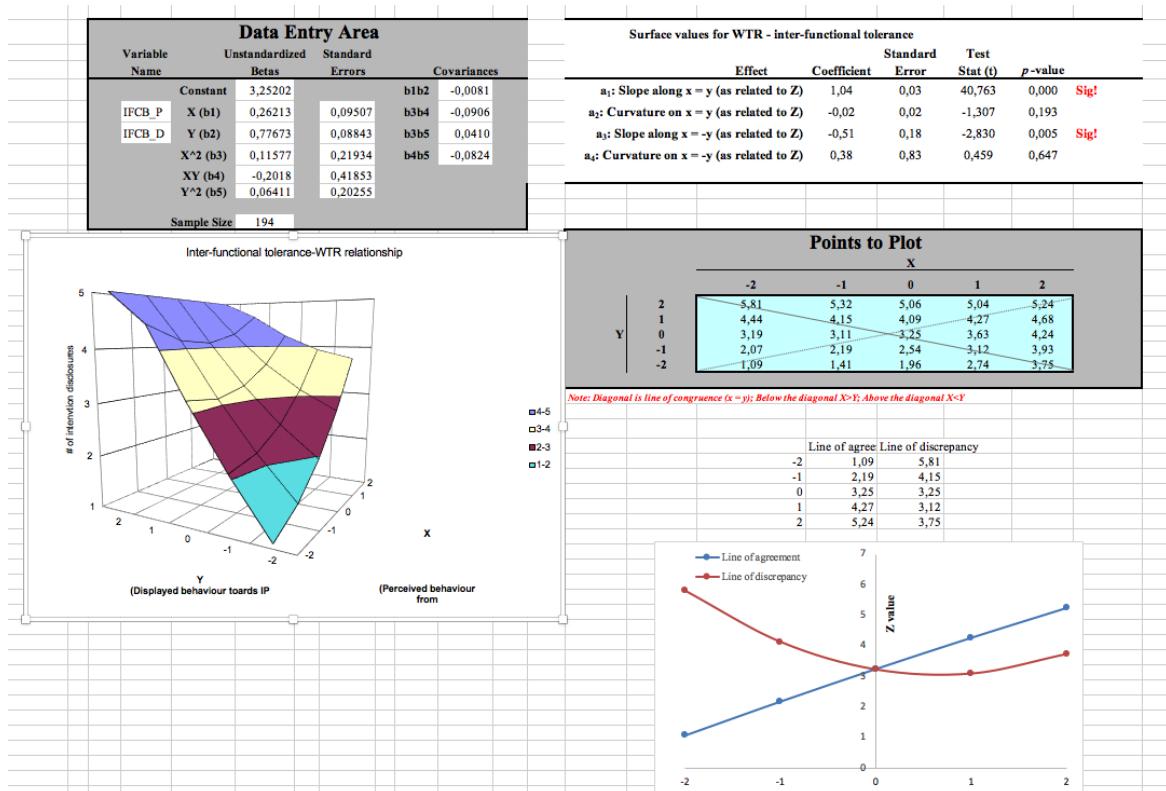


Fig. H.1 Research Excel file - used to plot 3D and 2D plot and calculate surface values, z values and significance levels



# Appendix I

## Hierarchical regressions

Table I.1 Results of hierarchical regression for inter-functional altruism-POSI relationship

<b>Outcome variable: POSI</b>			
<b>Variables:</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
OrgSizelog	-0.22*	-0.11	-0.08
Manufacturing	0.17*	0.07	0.06
Aviation	-0.13	-0.11	-0.10
Automotive	-0.09	0.08	0.06
Machine engineering	0.15	0.13	0.11
Electrical engineering	0.15	0.11	0.11
Optics Technology	0.05	0.03	0.03
Software	0.05	0.01	0.01
AvgHierarchy	-0.04	-0.01	-0.01
Education	-0.10	-0.06	-0.02
Working_experience	0.19*	0.13	0.09
PerceivedAlt		0.59***	0.67***
DisplayedAlt		0.44***	0.66***
PerceivedAlt*DisplayedAlt			0.33**
R <sup>2</sup>	0.19*	0.64***	0.67***
Δ R <sup>2</sup>		0.45***	0.03*

N=194, \*\*\*p < 0.001, \*\*p < 0.01, \*p < 0.05

Table I.2 Results of hierarchical regression for inter-functional conscientiousness-POSI relationship

**Outcome variable: POSI**

<b>Variables:</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
OrgSizelog	-0.22*	-0.11	-0.06
Manufacturing	0.17*	0.05	0.05
Aviation	-0.13	-0.13	-0.11
Automotive	-0.09	0.08	0.08
Machine engineering	0.15	0.12	0.09
Electrical engineering	0.15	0.08	0.09
Optics Technology	0.05	0.04	0.05
Software	0.05	0.07	0.03
AvgHierarchy	-0.04	-0.01	0.00
Education	-0.10	-0.03	-0.01
Working_experience	0.19*	0.14	0.13
PerceivedConsc		0.54***	0.64***
DisplayedConsc		0.46***	0.63***
PerceivedConsc*DisplayedConsc			0.43**
<i>R</i> <sup>2</sup>	0.19*	*	0.67***
$\Delta R^2$		0.44***	0.01*

N=194, \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

Table I.3 Results of hierarchical regression for inter-functional constructiveness-POSI relationship

<b>Outcome variable:</b> POSI		<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
<b>Variables:</b>				
OrgSizelog		-0.22*	-0.14	-0.10
Manufacturing		0.17*	0.09	0.09
Aviation		-0.13	-0.11	-0.14
Automotive		-0.09	0.11	0.08
Machine engineering		0.15	0.15	0.14
Electrical engineering		0.15	0.08	0.06
Optics Technology		0.05	0.03	0.04
Software		0.05	0.00	0.03
AvgHierarchy		-0.04	-0.04	-0.06
Education		-0.10	-0.10	-0.08
Working_experience		0.19*	0.14	0.11
PerceivedConstr			0.55***	0.62***
DisplayedConstr			0.45***	0.65***
PerceivedConstr*DisplayedConstr				0.36**
$R^2$	0.19*	0.59***	0.63***	
$\Delta R^2$		0.46***	0.04*	

N=194, \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$

Table I.4 Results of hierarchical regression for inter-functional tolerance-POSI relationship

<b>Outcome variable: POSI</b>			
<b>Variables:</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
OrgSizelog	-0.22*	-0.15	-0.12
Manufacturing	0.17*	0.09	0.08
Aviation	-0.13	-0.14	-0.10
Automotive	-0.09	0.08	0.06
Machine engineering	0.15	0.13	0.10
Electrical engineering	0.15	0.09	0.13
Optics Technology	0.05	0.06	0.06
Software	0.05	0.01	0.00
AvgHierarchy	-0.04	-0.06	-0.08
Education	-0.10	-0.09	-0.06
Working_experience	0.19*	0.14	0.11
PerceivedTol		0.58***	0.68***
DisplayedTol		0.51***	0.53***
PerceivedTol*DisplayedTol			0.40**
$R^2$	0.19*	0.61***	0.65***
$\Delta R^2$		0.50***	0.04*

N=194, \*\*\* $p < 0.001$ , \*\* $p < 0.01$ , \* $p < 0.05$

## **Appendix J**

### **Perceived organisational support for innovation measures- full item list**

Table J.1 POSI items- adopted from (Yuan and Woodman, 2010)

<b>Full IFCB item list</b>	
<b>Q1</b>	Creativity is encouraged here.
<b>Q2</b>	Our ability to function creatively is respected by the leadership.
<b>Q3</b>	Around here, people are allowed to try to solve the same problems in different ways.
<b>Q4</b>	The main function of members in this organisation is to follow orders which come down through channels.
<b>Q5</b>	Around here, a person can get in a lot of trouble being different.
<b>Q6</b>	This organisation can be described as flexible and continually adapting to change.
<b>Q7</b>	A person can't do things that are too different around here without provoking anger.
<b>Q8</b>	The best way to get along in this organisation is to think the way the rest of the group does.
<b>Q9</b>	People around here are expected to deal with problems in the same way.
<b>Q10</b>	This organisation is open and responsive to change.
<b>Q11</b>	The people in charge around here usually get credit for others' ideas.
<b>Q12</b>	In this organisation, we tend to stick to tried and true ways.
<b>Q13</b>	This place seems to be more concerned with the status quo than with changes.



## Appendix K

### Perceived IFCB and displayed IFCB - full item list

Table K.1 Perceived IFCB: R&D employees' perception of IFCB from IP colleagues;  
Displayed IFCB: R&D employees' displayed IFCB towards IP colleagues

Full IFCB item list	
<b>PerceivedALT</b>	I get support from my IP colleagues in order to solve problems.
<b>PerceivedALT</b>	I get support from my colleagues in order to learn a new skill.
<b>PerceivedALT</b>	When there is an urgent need for a specific skillset, I just approach the help of my colleagues from the IP department and get their support.
<b>PerceivedALT</b>	IP colleagues teach me skills and share their knowledge with me to be able to improve business decisions and outcomes.
<b>DisplayedALT</b>	I support my IP colleagues in order to solve problems.
<b>DisplayedALT</b>	I support my IP colleagues in order to teach them a skill.
<b>DisplayedALT</b>	When there is an urgent need for a specific skillset, I just approach my IP colleagues to offer my support.
<b>DisplayedALT</b>	I teach IP colleagues my skills and share knowledge with them to be able to improve business decisions and outcomes.
<b>PerceivedConsc</b>	When dealing with the me, IP colleagues go above the requested support to be able to help
<b>PerceivedConsc</b>	IP colleagues sometimes volunteer their departments' resources (including their own time) to lighten up the my workload.
<b>PerceivedConsc</b>	When IP colleagues deal with a request from me, they deliver additional information to support my request.
<b>PerceivedConsc</b>	IP colleagues follow up with the me regarding the outcome/status of their support/involvement.
<b>DisplayedConsc</b>	When dealing with my IP colleagues, I go above the requested support to be able to help.

*Continued on next page*

### Full IFCB item list

<b>DisplayedConsc</b>	I sometimes volunteer my departments' resources (including my own time) to lighten up IP colleagues' workload.
<b>DisplayedConsc</b>	When I deal with a request from my IP colleagues, I deliver additional information to support the request.
<b>DisplayedConsc</b>	I follow up with my IP colleagues regarding the outcome/status of my support/involvement.
<b>PerceivedConstr</b>	IP colleagues proactively forward information related to my department to me and my colleagues.
<b>PerceivedConstr</b>	IP colleagues actively advocate for more resources and budget regarding my department in case of need.
<b>PerceivedConstr</b>	IP colleagues meet me during e.g. lunch time to exchange information to smoothen collaboration.
<b>PerceivedConstr</b>	IP colleagues introduce relevant people and resources to the me in order to increase my performance.
<b>DisplayedConstr</b>	I proactively forward information related to the IP department to my IP colleagues.
<b>DisplayedConstr</b>	I actively advocate for more resources and budget regarding the IP department and colleagues in case of need.
<b>DisplayedConstr</b>	I meet my IP colleagues during e.g. lunch time to exchange information to smoothen collaboration.
<b>DisplayedConstr</b>	I introduce relevant people and resources to IP colleagues in order to increase their performance.
<b>PerceivedTol</b>	IP colleagues accept when I do not stick rigidly to the deliverables prescribed by the process without any consequences.
<b>PerceivedTol</b>	IP colleagues do not immediately escalate any cross- functional inconvenience with me to a higher level of responsibility.
<b>PerceivedTol</b>	IP colleagues accept late information sharing by me without any retribution.
<b>PerceivedTol</b>	IP colleagues comply with my internal processes even though it slow down their process.
<b>DisplayedTol</b>	I accept when my IP colleagues do not stick rigidly to deliverables prescribed by the process without any consequences.
<b>DisplayedTol</b>	I do not immediately escalate any cross- functional inconvenience with my IP colleagues to a higher level of responsibility.
<b>DisplayedTol</b>	I accept late information sharing by my IP colleagues without any retribution.
<b>DisplayedTol</b>	I comply with my IP colleagues' internal processes even though they slows down my own process.

# Appendix L

## Systematic literature review - search terms

1. *Cross-functional integration in R&D*: (Title (“Cross-functional integration” OR “Cross-functional collaboration” OR “functional integration” OR “functional collaboration” OR “cross-functional alignment” OR “integration” OR “Collaboration” OR “integrat\*”) AND (“R&D” OR “NPD” OR “NPI” OR “new product development” OR “research and development” OR “research&development” OR “technology development” OR “fuzzy-front-end” OR “front-end innovation ”)) - **1264 hits**
2. *Cross-functional integration in IP*: (Title (“Cross-functional integration” OR “Cross-functional collaboration” OR “functional integration” OR “functional collaboration” OR “cross-functional alignment” OR “integration” OR “Collaboration” OR “integrati\*”) AND (“IP” OR “intellectual property” OR “IP” OR “intellectual property management” OR “IPR” OR “intellectual property rights”)) - **549 hits**
3. (1) AND (2): cross-functional integration of R&D and IP during the innovation process – **468 hits**
4. *Citizenship behaviour*: (Title (“organisational behavio\*” OR “organisational citizenship” OR “citizenship” OR “interorganisational citizenship” OR “OCB” OR “ICB”)) - **129 hits**
5. (1) AND (4): citizenship behaviours during the innovation process – **31 hits**

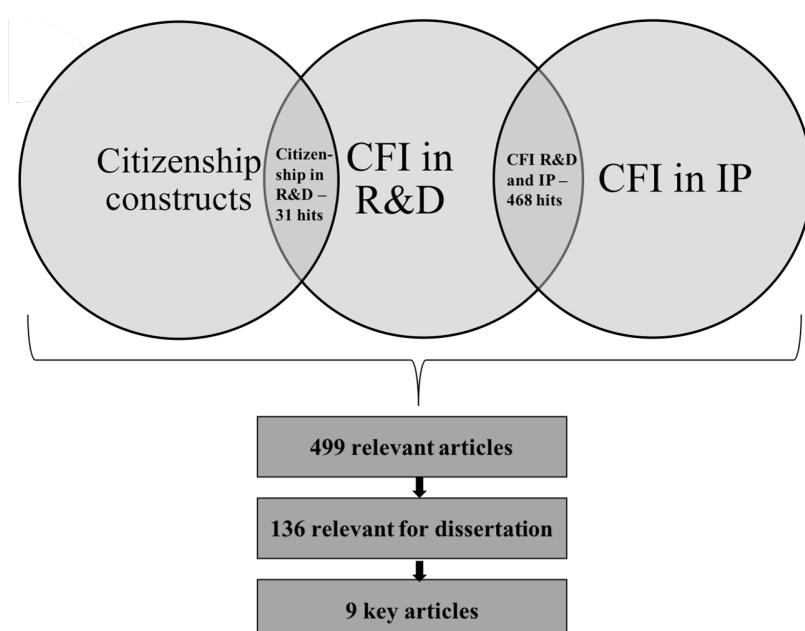


Fig. L.1 Summary of systematic literature review - 499 articles relevant based on title only.  
136 relevant for this dissertation after manual screening of abstract and contribution

# Appendix M

## Adjusted CFA results

Table M.1 Adjusted CFA loadings of IFCB items

Latent construct	Item	Estimate	Std.Err	z-value	p-value	std.all
IFALT	IFALT1	0.742	0.071	10.454	0	0.684
IFALT	IFALT2	0.705	0.070	10.114	0	0.673
IFALT	IFALT3	0.595	0.073	8.188	0	0.603
IFALT	IFALT4	0.539	0.073	7.340	0	0.554
IFTOL	IFTOL1	0.689	0.071	9.710	0	0.654
IFTOL	IFTOL2	0.537	0.077	6.941	0	0.553
IFTOL	IFTOL3	0.707	0.072	9.846	0	0.642
IFTOL	IFTOL4	0.613	0.058	10.636	0	0.704
IFLOY	IFLOY1	0.533	0.055	9.734	0	0.626
IFLOY	IFLOY2	0.558	0.063	8.833	0	0.640
IFLOY	IFLOY4	0.589	0.063	9.354	0	0.655
IFCONSC	IFCONSC1	0.588	0.061	9.656	0	0.656
IFCONSC	IFCONSC2	0.656	0.071	9.299	0	0.635
IFCONSC	IFCONSC3	0.497	0.064	7.787	0	0.618
IFCONSC	IFCONSC4	0.593	0.057	10.490	0	0.714
IFCONMP	IFCONMP1	0.581	0.057	10.159	0	0.698
IFCONMP	IFCONMP2	0.497	0.062	8.017	0	0.549
IFCONMP	IFCONMP3	0.603	0.049	12.265	0	0.711
IFCONSTR	IFCONSTR1	0.485	0.062	7.883	0	0.550
IFCONSTR	IFCONSTR2	0.652	0.057	11.445	0	0.668
IFCONSTR	IFCONSTR3	0.630	0.069	9.172	0	0.560
IFCONSTR	IFCONSTR4	0.598	0.060	9.853	0	0.661
IFADV	IFADV	0.587	0.057	10.265	0	0.653
IFADV	IFADV	0.561	0.057	9.880	0	0.602
IFADV	IFADV	0.471	0.062	7.619	0	0.522
IFADV	IFADV	0.549	0.058	9.523	0	0.634

Table M.2 Adjusted CFA covariance matrix

	<b>IFALT</b>	<b>IFTOL</b>	<b>IFLOY</b>	<b>IFCONSC</b>	<b>IFCOMP</b>	<b>IFCONSTR</b>	<b>IFADV</b>
<b>IFALT</b>							
<b>IFTOL</b>	0.458						
<b>IFLOY</b>	0.699	0.471					
<b>IFCONSC</b>	0.482	0.378	0.824				
<b>IFCOMP</b>	0.584	0.371	0.878	0.863			
<b>IFCONSTR</b>	0.720	0.429	0.908	0.735	0.859		
<b>IFADV</b>	0.649	0.352	0.909	0.804	0.887	0.953	

## Appendix N

### 5 factor CFA results and covariance matrix

Table N.1 5-factor CFA and covariance matrix

Latent construct	Item	Estimate	Std.Err	z-value	p-value	std.all
IFALT	IFALT1	0.729	0.073	10.045	0	0.672
IFALT	IFALT2	0.721	0.069	10.474	0	0.688
IFALT	IFALT3	0.579	0.075	7.734	0	0.587
IFALT	IFALT4	0.554	0.073	7.566	0	0.569
IFTOL	IFTOL1	0.701	0.070	10.018	0	0.666
IFTOL	IFTOL2	0.536	0.078	6.901	0	0.551
IFTOL	IFTOL3	0.714	0.072	9.899	0	0.649
IFTOL	IFTOL4	0.601	0.059	10.272	0	0.590
IFCONSC	IFCONSC1	0.601	0.063	9.506	0	0.670
IFCONSC	IFCONSC2	0.677	0.068	9.915	0	0.656
IFCONSC	IFCONSC3	0.493	0.063	7.875	0	0.612
IFCONSC	IFCONSC4	0.572	0.057	10.008	0	0.689
IFCONSTR	IFCONSTR1	0.475	0.060	7.881	0	0.538
IFCONSTR	IFCONSTR2	0.645	0.057	11.300	0	0.661
IFCONSTR	IFCONSTR3	0.652	0.069	9.489	0	0.580
IFCONSTR	IFCONSTR4	0.589	0.060	9.897	0	0.662
IFADV	IFADV	0.603	0.059	10.243	0	0.670
IFADV	IFADV	0.543	0.062	8.931	0	0.682
IFADV	IFADV	0.488	0.062	7.907	0	0.541
IFADV	IFADV	0.533	0.059	9.008	0	0.616

	<b>IFALT</b>	<b>IFTOL</b>	<b>IFCONSC</b>	<b>IFCONSTR</b>
<b>IFALT</b>				
<b>IFTOL</b>	0.457			
<b>IFCONSC</b>	0.481	0.371		
<b>IFCONSTR</b>	0.720	0.426	0.736	
<b>IFADV</b>	0.649	0.343	0.806	0.955

# Appendix O

## Inter-item correlation CFA R&D respondents

Table O.1 Inter-construct correlation - CFA R&D respondents

	PALT	DALT	PCONSC	DCONSC	PCONSTR	DCONSTR	PTOL	DTOL
PALT	1							
DALT	0.12	1						
PCONSC	0.32	0.11	1					
DCONSC	0.09	0.41	0.15	1				
PCONSTR	0.28	0.14	0.22	0.10	1			
DCONSTR	0.11	0.44	0.11	0.33	0.16	1		
PTOL	0.36	0.08	0.45	0.07	0.25	0.07	1	
DTOL	0.11	0.16	0.10	0.22	0.11	0.19	0.13	1



# Appendix P

## Regression parameter altruism

Regression Parameter

Variable Name	Variable	Unstandardized Betas	Standard Errors	Covariances	
	Constant	2,937618		b1b2	-9,54E-04
Perceived	X (b1)	0,428562	0,030075	b3b4	-3,51E-02
Displayed	Y (b2)	-0,010002	0,032454	b3b5	1,95E-02
	X^2 (b3)	0,309282	0,12551	b4b5	-4,47E-02
	XY (b4)	-0,644285	0,281881		
	Y^2 (b5)	0,372887	0,159803		

Sample Size 194

Fig. P.1 Regression parameter altruism



# Appendix Q

## Regression parameter constructiveness

Regression Parameter

Variable Name	Variable	Unstandardized Betas	Standard Errors	Covariances	
	Constant	3,030333		b1b2	-8,83E-04
Perceived	X (b1)	0,332186	0,032749	b3b4	-0,056156564
Displayed	Y (b2)	0,147061	0,027661	b3b5	0,02487198
	X^2 (b3)	0,579345	0,177718	b4b5	-0,045264546
	XY (b4)	-1,050553	0,317851		
	Y^2 (b5)	0,484975	0,143289		

Sample Size 194

Fig. Q.1 Regression parameter constructiveness



# Appendix R

## Regression parameter conscientiousness

Regression Parameter

Variable Name	Variable	Unstandardized Betas	Standard Errors	Covariances	
	Constant	2,881557		b1b2	-0,00366538
Perceived	X (b1)	0,286562	0,057646	b3b4	-0,07838629
Displayed	Y (b2)	0,247235	0,065639	b3b5	0,04010257
	X^2 (b3)	-0,388616	0,194499	b4b5	-0,08655437
	XY (b4)	0,663946	0,40708		
	Y^2 (b5)	-0,210532	0,215142		
Sample Size	194				

Fig. R.1 Regression parameter conscientiousness



# Appendix S

## Regression parameter tolerance

Regression Parameter

Variable Name	Variable Name	Unstandardized Betas	Standard Errors	Covariances	
Perceived Displayed	Constant	2,9251247		b1b2	-1,18E-03
	X (b1)	0,3210867	0,0362869	b3b4	-1,32E-02
	Y (b2)	0,2491726	0,0337518	b3b5	5,97E-03
	X^2 (b3)	-0,0003135	0,0837167	b4b5	-1,20E-02
	XY (b4)	0,0274621	0,1597456		
	Y^2 (b5)	-0,0276005	0,0773105		

Sample Size      194

Fig. S.1 Regression parameter tolerance

