Individual performance effects of multiple team-membership in research and development

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Master thesis:

Individual performance effects of multiple team-membership in research and development

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Preface

The master thesis in front of you is the final product of the master program “Business Administration” at the University of Twente. The focus of this thesis is on the effect of Multiple Team Membership (MTM) on individual performance, which is very interesting and increasingly important in practice. This brings forth the need for more insights in this concept.

When I first discussed the effect of multiple team membership on individual performance with my supervisor, dr. Matthias de Visser, it seemed like a pretty straight forward topic. Boy was I wrong, talk about a mayor understatement! The effects of multiple team memberships on individual performance are rather complex and are influenced by each level of the organization. The complexity of the subject at hand only served to increase my interest in the concept. As such, I genuinely hope future research will further our understanding of MTM and its effects on individual performance and the organization as a whole. Although studying MTM was more challenging than expected and conducting this study itself was not easy, the process was very rewarding and made everything worthwhile.

Even though I was the one who put in the work, I could not have done it on my own. When I started my master program at the University of Twente I was very determined to achieve the best results. Personal losses however made me lose my way and lose my focus. It was during this time that dr. de Visser kept guiding me and supporting me in finishing my thesis. Although this took a long while, he kept supporting me even when I was not as productive as I should have been. Thanks to his continued support, I managed to find the courage and will to finish writing my thesis. For this I will be forever grateful. I also enjoyed the sessions we had regarding my thesis as it provided me with new insights and energy to continue my research. I also would like to thank dr. Ehrenhard for his feedback regarding earlier versions of this thesis. Secondly, I want to thank my family who always supported me and will continue to support me in the future. I also want to take the time to thank two of my friends, Martin Odink and Ferdi van Benthem, for their support and the interesting discussions I’ve had with them. Lastly, I would like to thank the most important person in my life, my wife Jolien Snijder, who helped me during the hard times and who continues to be a source of inspiration for me. Know that I love you.

I hope reading this master thesis will make you as enthusiastic as I am for the concept of multiple team membership.

Maikel Snijder

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Abstract

Working in teams can be considered a standard within New Product Development (NPD) and R&D (O'Leary et al., 2011). In most cases employees will be involved in multiple teams simultaneously. The involvement of employees in multiple teams is called multiple team membership (MTM) and more research needs to be done on this concept due to its growing importance. The aim of this research is to add to the fast growing body of literature on MTM. This research focused on the relation between MTM and performance on the individual level. It was expected that MTM positive effects performance because it enables knowledge sharing between teams. Negative effects of MTM on individual performance were also expected due to the strain it puts on a individual's cognitive abilities due to it dividing the individual's attention and due to switching costs between projects. MTM influences all levels of the organization, so it also affects the team level (Hackman, 2003). The relation of performance on the individual and team level was also tested to provide insights on the connection between the levels. To test the expectations this research used a cross-sectional research design applying the use of a survey to gather data related to the variables. The data was gathered from one company and consisted of 18 surveys that were used in the sample. Due to the small sample size, a regression analysis could not be performed and thus the results of this study cannot be generalized. As such, the results can only be used as drivers for future research. The results overall did not show a significant correlation between MTM and individual performance. However the data suggested that the variables are connected and may moderate each other's effect on individual performance. Further research should be done on this potentially moderation effect. The data showed that there is a significant correlation between individual performance and team performance, which also provides a suggestion for future research focusing on the relation of the organizational levels in a MTM setting. Overall it was concluded that MTM is a concept with high complexity which possesses multiple questions and possibilities for future research.

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1 Introduction

Product innovation is recognized as a vital source of competitive advantage (Salomo, Weise, Gemünden, 2007). Innovation is achieved through the process of New Product Development (NPD) (Baregheh, Rowley, Sambrook, 2009; Rothaermel & Deeds, 2004). NPD is executed in multidisciplinary teams during the NPD process (Olson, Walker, Ruekert, Bonner, 2001; Bertolotti, Mattarelli, Vignoli & Macri, 2015). On this subject multiple studies have been conducted to identify the effects of certain personal characteristics on team performance (Ancona & Caldwell, 1992; Hulsheger, Anderson, Salgado , 2009; de Visser, Faems, Visscher, de Weerd-Nederhof, 2014). Research also showed that members of NPD-project teams are simultaneously active in multiple teams (Milgrom & Roberts, 1992; Wheelright & Clark, 1992). According to O'leary, Mortensen & Woolley (2011) almost 95% of the knowledge workers are members of multiple teams for different projects simultaneously. There is no fixed number for the amount of simultaneous projects that can occur in an organization and the amount of teams an individual can be a member of differs tremendously per person, from 2 to 12 and onward (Zika-Viktorsson, Sundtröm & Engwall, 2006).

Organizations involved with innovative work rapidly adopt the concept of working in multiple projects simultaneously (Chan, 2014). This means that more employees will be members of two or more teams within a given period of time. O'leary et al. (2011) named this concept "Multiple Team Membership" or "MTM" for short. Due to the high amount of MTM within R&D and NPD, it becomes increasingly important to understand more about the concept and its effects. The dynamics of MTM generate both positive and negative consequences for performance (Bertolotti et al., 2015; Pluut, Flestea & Curseu, 2014). Previous research has confirmed the existence of both positive and negative effects of MTM on performance, and suggests that MTM provides learning opportunities but also provides coordination challenges which increase the workload (Matthews et al., 2012; O'leary et al., 2011; Zika et al., 2006; Leroy, 2009). Handling multiple projects simultaneously enables the sharing of knowledge, best practices, and other resources between teams, but also provides strains on time allocation and attention allocation between the teams and will result in an overload of demands. Although this way of working is becoming more and more important and adopted in NPD, our knowledge and insight in regards to the effects of MTM on performance is rather limited (O'leary et al., 2011; Bertolotti et al., 2015). More research on the topic of MTM and performance is therefore needed.

In their review regarding team effectiveness Mathieu, Mynard, Rapp & Gilson (2008) described that performance is determent by antecedents on three levels: the organizational level, the team level, and the individual level. The advantages and drawbacks of MTM differ for each level. At the organizational level MTM shows many advantages as it enables efficient use of resources, provides teams with a greater diversity of knowledge, and demands efficiency due to the limited time available (O'leary et al., 2011). At the individual level, however, it shows some drawbacks, such as the exponential increase of workload and switching cost between project which cause inefficiency and puts strain on the individual (Zika et al., 2006; Leroy, 2009).

Although recent research acknowledges these negative effects, most studies on MTM focus on the organizational and team level, leaving out the aforementioned negative effects on the individual level (Mathieu et al., 2008; Schmidt & Dolis, 2009; Matthews et al., 2012). Therefore there is a growing interest on insights regarding the individual level and MTM. MTM may, for example, influence the experience and behaviors of individuals (Mortensen, Woolley and O'leary, 2007).

Thus it is important to provide insights on the challenges and opportunities brought on by MTM and how these could influence the individual job performance. Previous studies mostly focused on the psychological and cognitive influences of MTM and assumed that these influence the performance of the individual. The link between these psychological and cognitive influences and MTM however was not or limited empirically tested (Pluut et al., 2014; Zika et al., 2006; O'leary et al., 2011). What's more, due to the three levels influencing each other, the link between MTM and performance can be considered very complex (O'leary et al., 2011). Despite the growing interest in MTM, previously research on MTM was mainly conducted in settings in which multiple team membership occurred noncontemporary, instead of in settings in which multiple team membership occurred simultaneously, which, nowadays, is more often the case in current practice (Mathieu et al., 2008). As such, further research on MTM in multiple team memberships occurring simultaneously is needed.

As of 2015, only a few studies empirically tested the relationship between MTM and performance in a NPD setting (Bertolotti et al., 2015; Maynard, Gilson & Mathieu, 2012). Chan (2014) also concluded that empirical research is limited in this area. This thesis strives to close this gap in MTM literature, which is becoming increasingly relevant due to MTM slowly becoming the common way of working within NPD and R&D (Cummings & Haas, 2012; Pluut et al., 2014).

Most prior studies mostly focused on the team level and its effects (Bertolotti et al., 2015; Mortensen, 2014). I however suggest that these effects start at the individual level and that the effects are influenced by the number of projects one is simultaneously active in. As such, this thesis will also contribute to the existing literature by providing insights on the effects of the individual level, in MTM, on performance. Due to the complexity of all three levels, the interconnectivity of their effect on performance and the aforementioned gap, I choose to focus on the more overlooked level, the individual level. By doing so I strive to provide more insights on this level and its effects on performance and reduce the overall complexity of this subject. I also strive to further our understanding on the connectivity of all three levels, as very little is known about the interconnectivity of the levels (Hackman, 2003). As such, this research will globally test if there is a correlation between performance at the individual level and team level, to see if any of the effects in place at the individual performance level could subsequent change the overall performance of the team.

1.1 Research question

All in all, this research strives to provide further insights on the relationship between MTM and individual performance. Secondly, it also strives to test the relationship between performance on the individual level and team level within a MTM setting. More specifically, the goal is to clarify and test the relationship between characteristics of MTM and performance. The characteristics included in this study: the number of MTM, the variance of the type of project and the extent of interdependence of the team members within the project.

In order to achieve the aforementioned goal, the following research question was posited:

What are the effects of multiple team membership on individual performance and how does multiple team membership affect team performance?

In order to answer this question, hypotheses were formalized and tested using a data set gathered via a survey within the R&D department of a manufacturing company.

2 Theoretical framework

This theoretic framework contains the key theories and constructs on MTM, its effects on the performance of an individual and the relationship between the individuals' performance and team performance as a whole. This chapter starts off by defining the constructs team membership and individual performance. Subsequently, a description of multiple team memberships will be provided as will insights on its relation with performance. Lastly, the individual and team level will be discussed. The hypotheses tested in this study will also be introduced in this section.

Relevant literature on these topics has been found using dedicated scientific databases, such as Scopus and Google Scholar. Appendix A provides an overview of the search terms used.

2.1 Team-membership

Kozlowski & Bell (2013) provide the following general definition regarding teams:

''Teams are composed of two or more individuals, who exist to perform organizationally relevant tasks, share one or more common goals, exhibit task interdependencies, interact socially, maintain and manage boundaries, and are embedded in an organizational context that sets boundaries, constrains the team, and influences exchanges with other units in the broader entity.''(Kozlowski & Bell, 2013).

This definition encompasses what a team is, however what is more important for teams active in NPD.

In their research Hollenbeck, Beersma, and Schouten (2012) mention multiple types of teams based on their findings in literature. These types were categorized based on three dimensions. In their list of taxonomies, two types mentions innovation or improvements by new ideas and therefore relate the most to NPD. These taxonomies are the following:

- Project/development teams: teams that consist of professionals who collaborate on projects with (mostly) complex and unique outputs. These teams focus more on innovation, have broad autonomy, and an extended team life span (Sundstrom, de Meuse, Futrell, 1990).
- Project teams: Teams that produce one-time outputs which involve a considerable amount of knowledge, judgement, and expertise. The project team performance may be an improvement or a radical new idea. To achieve this, the team consist mostly of members from different disciplines and functional units (Cohen & Bailey, 1997).

Hollenbeck et al.'s more NPD specific descriptions do match with the general description provides by Kozlowski & Bell (2013). For this reason Kozlowski & Bell's definition will be used in this research.

2.2 Individual performance

Project performance is widely discussed in literature (Bonner, Ruekert, and Walker, 2002; Hoegl, Weinkauf, and Gemuenden, 2004; Olson et al., 2001). De Visser et al. (2014) define project performance as the extent to which a team is able to meet established project objectives. As a team consist of individuals, project performance can be seen from the individual and team level (Peterson, 2007; Katz & Allen, 1985). Performance at the individual level affects the team performance and the organization of the team may affect the individual performance (Han & Williams, 2008; Gibson, 2001). Individual performance may vary between team members leading to reconfigurations of the team's work in order to achieve the objectives of the project as a team (Han & Williams, 2008).

Job performance is applicable at the individual level and it encompasses the contributions of an individual towards the goals of a team (Motowidlo, Borman & Schmit, 1997). Regarding job performance a distinction is made between task performance and contextual performance (Motowidlo & van Scotter, 1994). Task performance describes how the individual performs his/her tasks and meets his/her work goals. Task performance focusses on measuring individual performance. Contextual performance encompasses behavior that go beyond the prescribed work goals that support the organization, focusing on the broader organizational environment (Motowidlo et al., 1997). Contextual performance focuses more on how an individual cooperates with others. Seeing as this study focusses on the individual's performance, task performance seems to be the better fit for measuring individual performance. This research does not take into account the characteristics of the organization, as it is expected that this would increase complexity tremendously. This decision can be considered a limitation of this research.

Task performance is affected by task knowledge, task skills, and task habits. Task knowledge is knowledge about the work that needs to be done and is shaped by the cognitive ability of an individual. Task skill is the skill of applying the knowledge and performing the work. Task habits are the patterns of behavior of people which may either facilitate or interfere with their performance depending on how they are applied to the current task (Motowidlo et al., 1997). All three directly influence the task of the individual and thus his/her performance. For this reason individual performance is defined in this research as task performance.

2.3 MTM & Performance

As mentioned before, previous research has posited the existence of both positive and negative effects of MTM on performance. O'leary et al. (2011) suggest that the positive effects will be achieved at an intermediate level of MTM, however if the level becomes too low or high MTM will result in negative effects on performance

At intermediate levels of MTM, teams gain higher productivity because their members are prompted to develop better team work practices, to pay more attention to the way they allocate their time, and to focus on what's important so that work is done more efficiently. Very low MTM, on the contrary, does not force team members to engage in these virtuous processes because they are endowed with enough resources and time to complete their tasks and do not search for new ways of improving their efficiency. Very high levels of MTM tax team members' attention and cognitive resources too much, leading to reduced productivity (Bertolotti et al., 2015) and could potentially lead to misalignment; causing employees to misprioritize, which negatively influences other individual's work efficiency due to interdependencies within a project (O'leary et al. 2011; Chan, 2014). I will try to provide insights on the relationship between MTM and performance using several theories. Firstly by focusing on how individuals acquire and share knowledge in an MTM setting and how this could influence their performance. Secondly by focusing on theories regarding attention and the way attention is management between projects and tasks. Lastly by discussing the concept of transactive memory and the role of interdependence in team work.

2.3.1 Knowledge acquisition & attention

Knowledge acquisition theory focusses on the varied ways individuals acquire knowledge. A network, which is created by MTM, provides a chance to acquire knowledge which can be used elsewhere (Cross & Cummings, 2004; Reagans & McEvily, 2003). It facilitates the acquisition and absorption of knowledge. If the knowledge is more divers , for example acquired from different departments or hierarchical levels, it is more likely that one can see a problem from multiple perspectives. As such, diverse sets of knowledge positively influences the performance of an individual (Kwon & Adler, 2014). Regarding innovative work, it has especially shown its worth as these connections provide a greater diversity in perspectives and expertise, perhaps resulting in a more innovative solution (Cross & Cummings, 2004). This implies that working in multiple teams strengthens innovative behavior, which can be considered an important resource within NPD and therefor positively influences performance (Zellmer-Bruhn, 2003; Lin, 2017; Kwon & Adler, 2014). This is supported by the research of Cummings & Haas (2012) and Chan (2014), as both studies show that MTM is positively related to performance in knowledge intensive settings. The different and new views are unique sources for ideas which drive innovative thinking. To fully grasp the merits of the knowledge sharing, team members need time to discuss, reflect, and experiment with the acquired knowledge (Bresman, 2010). This may not always be possible because of the high workload and pressure secondary to a MTM setting, which could limit the positive influence on performance. A workload which is too high will leave less time for knowledge sharing (Zika et al., 2006).

Although MTM provides a valuable knowledge resource for NPD, it also provides a constraint. MTM demands employees to allocate their attention among multiple projects (O'leary et al., 2011). Attention also suffers from interruptions caused by, for example, switching to another project, as such affecting the cognitive state of a person (Altmann & Gray, 2008). The ability to focus one's attention is an indicator for performance (Bailey & Konstan, 2006). Knowledge intensive work, as is NPD, can be considered complex. Complex tasks demand a sufficient amount of time and attention to the project (Speier, Vessey & Valacich, 2003). Although MTM demands people to perform tasks simultaneously in several teams, this is impossible because of the attention (focus) needed for each task. This indicates that individuals are not evenly active on the several task simultaneously and need to divide their attention sequentially. This asks for a transition between the projects to meet deadlines. Research showed that switching from an unfinished project does not end one's cognitions about the project, and therefore one's attention is not fully dedicated to the project at hand (Johnson, Chang & Lord, 2006; Marsh, Hicks & Brink, 1998). This concept is named "attention residue" by Leroy (2009). Attention residue is an antecedent (negative) of focus and as focus is needed in regard to perform, the higher the degree of attention residue the more it will negatively affect the performance (Leroy, 2009; Kanfer & Ackerman, 1989; Altmann & Gray, 2008). The research of Leroy (2009) also showed that finishing a task does not mean one is not thinking about the task anymore. When a project is finished people are still processing information about the task and have the need to evaluate for future projects. This is in line with knowledge acquisition theories which describe the need for project members to learn and share knowledge, however this opportunity is not always provided due to work pressure or mismatching schedules (Bertolotti et al., 2015).

The limited availability of time will narrow down the individual's attention to the key tasks, making them less concerned with different aspects as improving the quality (Cummings & Haas, 2012). If team members are not able to devote enough time to a project it may negatively influence the end result of the team.
Not only the time allocated for a project possess a potential problem, the number of projects an individual participates in at the same time may also cause problems. If the number of projects increases and the demands matching these projects, the individual might be exceeding his/her limits. This will lead them to abandon certain goals to achieve other goals, negatively influencing several projects (Zika et al., 2006; Schmidt & Dolis, 2009). The amount of time an individual spends with a team could also affect his/her performance, for if the employee has not spend a significant amount of time with a team, he/she may not be feel part of the team, and thus may not be fully engage with the teams task, damaging his/her effectiveness (O'leary et al., 2011).

Research by LePine, Podskakoff & LePine (2005) empirically showed that the time and attention challenges described above negatively influence performance. An increase in MTM may therefore strain the time and attention one has even more, negatively affecting the individual's job performance. This is due to several reasons: the individual has to cope with more tasks and interdependencies within more different projects. This requires an individual to adjust to each new team and task resulting in high switching costs (O'leary et al., 2011; Leroy, 2009). Secondly, the amount of time one has to spend for projects needs to be divided between more projects (Mortensen et al., 2007). This may cause differences in the way each project is prioritized by each team member, and could lead to putting an individual having to put in extra work due to a colleague's absence.

This could cause an overload and could force employees to focus more on “getting it done”, instead of focusing on the quality of the work. This in turn could negatively influences performance (Zika et al., 2006; O’leary et al., 2011).

Due to the time constraint that are inherent to MTM, an individual is less able to focus and thus focusses less attention on a certain task. MTM also incorporates switching costs between projects which draw even more from an individual’s attention, limiting their cognitive capacity even further, lowering their job performance overall. Although MTM may also provide positive effects like knowledge sharing and rapid learning, these effect only occur under certain conditions. These conditions, collectively called the intermediate level of MTM, are not yet determined and defined (Bertolotti et al., 2015; O’leary et al., 2011). This implies that the negative effects will be always applicable, for this reason I expect that there is a negative relation between the number of MTM and individual performance. This leads to the following hypothesis:

H1: *MTM negatively affects individual performance when the number of MTM increases*

2.3.2 Transactive memory

“A transactive memory system is a collective memory system for encoding , storing retrieving, and communicating group knowledge” (Lewis, Lange & Gillis, 2005, p.581). It coordinates knowledge and expertise within a group (Wegner & Raymond, 1991) and is a general indication of performance (Lewis, 2004; Mortensen, 2014). An MTM setting provides the opportunity to work with a great diversity of colleagues on different projects simultaneously, enabling the transfer of knowledge through the transactive memory system (Tasselli, Kilduff & Menges, 2015; O’leary et al., 2011; Bertolotti et al., 2015). Performance in general is enhanced by reducing the time an individual might spend searching for knowledge as it already is present in the team (Austin, 2003). Within a MTM setting individuals are responsible for coordinating multiple collaborations, tasks, and prioritize these collaborations and tasks based on own judgement (Matthews et al., 2012). To fully grasp the merits of transactive memory, each member has to focus on the same tasks in each project so that they are recognized as experts on this task by others. As a result, the team consists of individual specialists who as a team possess all the required knowledge. Matthews et al. (2012) expected that a high amount of projects would lead to an overload, which would hinder the team’s ability to share knowledge due to having too little time, ultimately negatively influencing the team’s performance. , This however was not the case. Teams turned out to divide the tasks to the people who had most experience with a certain type of task so he/she could do it quicker than others; i.e. transactive memory. Zika et al.(2006) state that as the type of project is familiar, there will be a certain level of task resemblance. Task resemblance makes it possible for individuals to apply certain experiences and routines to the project, which could lead to an increase of the performance. However, projects and tasks not always resemble project/tasks performed earlier. In Bertolotti et al. (2015) study, one of the participants stated that if the types of projects in the portfolio differ too much, it is almost impossible to perform in a MTM setting. This indicates that a difference between the type of projects in the portfolio could negatively influence the performance in a MTM setting.

Mortensen (2014) empirically tested the relationship between membership model divergence, i.e. who are assumed to be part of the team by each member, and the team's performance. They also took into account the interaction between the team members. Their results show that the relationship between membership model diverse and the team's performance is mediated by the effectiveness of the transactive memory system. In this research I want to add to their study by testing if a direct connection exists between transactive memory and performance. Similarities between projects are almost a necessity in a MTM setting seeing as this makes it possible to apply transactive memory between the projects, if the tasks and type of projects are similar to each other. If the type of project shows limited variance individuals will be able to use knowledge and experience from one project on another, i.e. the individual's portfolio is homogeneous, positively influencing the performance. When the variance between the project and the portfolio is considered more heterogenous, the positive effects will diminish and additional effort is required from the individual, which increases the workload and as such could negatively influence performance due to the additional cognitive strain caused by task switching (Leroy, 2009; Mortensens, 2014; O'leary., 2011). This leads to the following hypothesis:

H2: *The extent of an individual's portfolio heterogeneity negatively affects individual performance*

2.3.3 Interdependencies

Interdependence within teams is a requirement for the development of transactive memory (Wegner et al., 1991) and is considered an antecedent of performance (Champion, Medsket & Higgs, 1993). It provides the need for sharing knowledge in order to achieve the best performance for each task. Interdependence, however, also creates the need for coordination between members and tasks. If coordination is lacking, interdependence within the project will have negative effects (Brandon & Hollingshead, 2004). For example, when one team member's output is the input for another team member work and the first team member did not finish his/her work on time, this affects the performance of the other team member, ultimately affecting the performance of the team as a whole.

Seeing as Kozlowski & Bell (2013) state that a team consist of certain individuals who depend on each other to perform their tasks to achieve the team goals (Shea & Guzzo, 1987; Champion, Papper & Medsker, 1996), interdependencies are inherent in teamwork (Van der Vegt & Van de Vliert, 2002). The degree to which the individual tasks depend on each other is called task interdependency and influences both individual and team performance (Slocum & Sims, 1980; Saavedra, Earley & van Dyne, 1993; Langfred, 2005). Although many forms and types of interdependency are described in literature (Langfred, 2005) the most common used definition is that of Kiggundu (1981) which describes it as the connectedness of jobs in such a way that the performance of one depends on the performance of the other. In their review of literature regarding interdependencies Van der Vegt & Van de Vliert (2002) state that *"team members are task interdependent when they must share materials, information, or expertise"* (p.50). This implies that task interdependence is always applicable. Task interdependence may however differ greatly between tasks and teams.

Within task interdependence two constructs are mentioned: Structural and Behavioral interdependence (Wageman et al., 2012). Structural interdependence is the extent of interaction required for the project as determined by the organization. Although the organization in theory should determine the interdependence necessary, the current practice is that team members themselves are responsible for the allocation of subtasks and determining how they should be performed (Ramamoorthy & Flood, 2004; Wageman & Gordon, 2005). As such, the interdependence is determined by the team and may vary greatly between teams. This increases the strain from task switching and increases the individual's workload as coordination of the independent tasks will be added to one's work (O'leary et al., 2011; Zika et al., 2006). Structural interdependence is mentioned in literature as one of the most important constructs for performance (Wageman, Gardner & Mortensen, 2012). Although the organization can provide a structure that implies a degree of collaboration, it does not force the members to work together. Collaboration depends on the willingness of the individual members to do so. This represents behavioral interdependence and can differ among team members (Wageman et al., 2012). The level of interdependency is therefore dependent on the values of the team members. For example, shared norms have shown to be an important design feature for successful working together when there is no leader or manager for the team. As the values between members show more variance and structural interdependency is becoming more and more the responsibility of the team, individuals will focus more on tasks they prefer. In regard to the time allocation challenges, this may lead to someone neglecting a task in favor of another influencing the entire projects performance negatively due to the interdependencies (Bertolotti et al., 2015).

Although interdependence is needed for knowledge sharing, the time constraint within MTM and freedom of choice of each individual suggests that interdependence will mostly have a negative effect on performance, as the attention needs to be divided and member will tend to choose their own priority which may conflict with each other's priority. Misprioritizing could therefore effect all other projects a person is involved in (O'leary et al., 2011). In that case the individual performance of the team members is affected for that project. For this reason I expect that the extent of interdependency within a project negatively influences performance. This leads to the following hypothesis:

H3: *The extent of interdependencies within the project negatively affects individual performance*

2.3.4 Individual vs team level

A team should consist of at least 2 or more individuals to be classified as a team, according to Kozlowski's & Bell's definition. As MTM affects the individual members of the team, it also affects the team as a whole. In the case of interdependence a distinction is made between task interdependence at the individual level and outcome interdependence at the team level (Van der Vegt & Van de Vliert, 2002). As previously described, task interdependence pertains to the operational work of the team members. Outcome interdependence focusses more on the goals which need to be achieved by the team i.e. the purpose and mission of the team. For this reason it is important for a team to have a clear goal that results in a clear set of tasks. A MTM setting may provide difficulties in the goal setting activities due to absence of some members or that they're less focused due to the high amount of workload (Matthews et al., 2012). This influences the coordination of interdependent tasks as the goals and tasks are less clear within the team and/or people are not fully active in the project (O'leary et al., 2011; Zika et al., 2006).

However, the individual learning effects and possibilities of knowledge sharing may provide a stronger positive effect at the team level (Gibson, 2001). Han & Williams (2008) tested this effect and found that the individual results extended towards the pooled team results. Shin, Kim, Lee and Brian (2012) as well as Tims, Bakker, Derks & van Rhenen (2013) all found a connection between the individual level performance and the team level performance. As such, one would expect a connection between the individual level performance and the team level performance in a MTM setting. Given the complexity of and challenges posited by a MTM setting, this connection should be tested within a MTM setting as well. This leads to the following hypothesis:

H4: *The individual performance of team members positively relates to the team performance.*

2.4 Research model

The hypotheses mentioned above led to the following research model for this research:

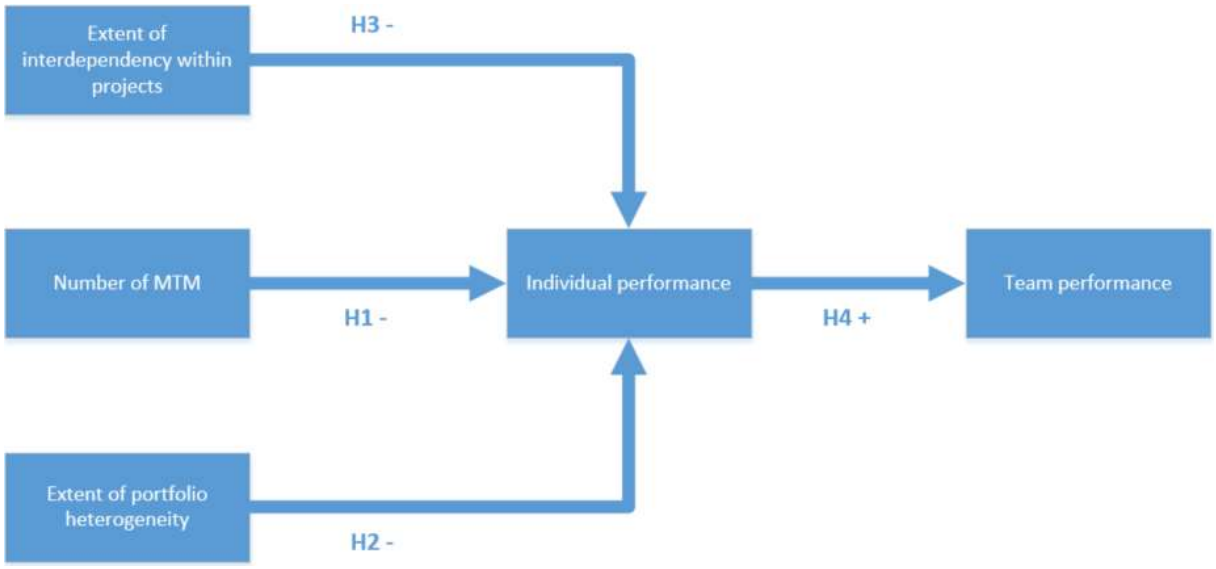

Figure 1. Research model

3 Methodology

3.1 Sample

In order to test the hypotheses data regarding NPD projects is needed. Information on the individual level (number of projects, type of projects, interdependency within a project, individual performance) and team level (project performance) is not available in public databases. As such, data on these subjects had to be acquired. Due to the importance of MTM in NPD, data on these subjects from manufacturing firms with a R&D department was preferred. Both my personal network and desk research were applied in finding suitable organizations, which were then contacted regarding participation. Although the subject was deemed interesting by many organizations, in the end, just one company decided to participate in this research. This organization is located in the Netherlands and is active in the specialized cable connectivity industry. The organization has about 400 employees.
The company provided project documentation on their (NPD) projects over the period 2015-2017. An overall project sheet was obtained in which all of the projects were numbered based on the type of project. For example, NPD projects had the label RD attached to their number. Using the company's labelling of its projects, a selection was made by filtering using the label "RD". Based on the time-accounting data within the provided documentation only projects with more than 100 working hours were researched further in detail.
Each project should be handled by a team and not by an individual on his/her own. The time-accounting data was reviewed to determine which projects were handled by a of minimum of 2 individuals whom were active within the project based on a reasonable amount of working hours. This resulted in an initial sample of 20 project. Due the various reasons (such as maternity leave), it was not possible to obtain information from all of the individuals who worked on these projects. As such, 14 projects were included in the initial sample and surveys were sent to the employees that participated in these projects. More information on the surveys will be provided in chapter 3.2.

3.2 Data collection

The data was collected via a survey that was sent to the employees that participated in these projects. This survey consisted of two parts. In the first part, team members were asked questions about their personal backgrounds and characteristics. In the second part, team members were asked to provide information about each NPD project in which they had been involved. To help the respondents, clear information was provided on which particular projects they had to provide information based on the time accounting information. An example of the survey can be found in Appendix B. In total 18 employees were provided with survey lists for the projects they were active in.

Of the 18 employees, 12 filled in the surveys. According to Post (2012), only teams where more than two thirds of the accounted time is filled in should be part of the final sample. Due to this, 7 projects had to be excluded from the final sample, resulting in a final sample of 7 projects. For these 7 projects, 18 surveys were received from 7 different employees. Of the respondents, 86% were male and 14% female and all (100%) worked for the R&D department of the company. The average age of the participants was 48 years. The oldest respondent was 60 years old and the youngest 31 years old. In regards to educational background the sample population was quite diverse. Most of the participants had a MBO education (3 employees; approximately 43% of the total sample), the other educational levels (Havo, HBO, WO, PHD) were each represented in the sample by one employee.

Due to the limited response the dataset can be considered rather small. Seeing as a regression analyses requires a minimum of 50 items to provide an accurate estimation (Green, 1991; Maas & Hox, 2005), a regression analyses was not feasible. Due to the explorative nature of this research and the lack of a regression analyses, the results of this research can only be used as a motivator for future research on this subject. The collected data will be analyzed via Scatterplots in Microsoft Excel.

3.3 Measures

In this chapter, the variables used in this study will be discussed, starting with the dependent variable.

3.3.1 Dependent variable

The dependent variable is project performance on the individual and team level. In this research the following two categories are used:

- Team performance
- Individual performance

Team performance

Team project performance is defined as the extent in which team is able to meet project objectives (de Visser et al., 2014). To measure project performance the scale applied by de Visser et al.(2014) is used. The scale consisted of five items referring to:

1. Project success
2. Achievement of the project goals
3. Output quality
4. Team satisfaction about the project performance
5. Top management satisfaction about project progress

The surveys will be filled in by individual team members providing scores from their perspective regarding the performance of the team. This solely shows how an individual views the team's performance. In their research on team performance Katz & Allen (1985) used the average score for items which were provided by several team members. This research uses the same approach as Katz & Allen for measuring the team's performance.

Individual performance

The individual performance score shows how the individual views his/her performance. Job performance relies mostly on the concept of task performance, which upholds the accomplishments of duties and tasks as described (Viswevaran & Ones, 2000). Task performance is seen as the focus for measuring individual performance. The measurements should show to what extent the individual is able to achieve the predetermined tasks goals why handling multiple projects. Koopmans et al. (2011) and Viswevaran & Ones (2000) provide a detailed description of task performance.
As measurement for task performance Viswesvaran, Schmidt & ones (2005) provided 9 dimensions of job performance including task performance. As this provides a more detailed view it does not provide specific questions or scale to apply. However Koopmans et al. (2012) developed and tested a specific questionnaire based on the four dimensions in Koopmans et al. (2011) also including task performance. An overview of the questions is shown in the appendix C.

Although this article provides a clear list of item the journal in which it is published and the low number of citations do question the quality of the items. The research of Becker et al. (1996) measures job performance, is published in a well-known journal and has a decent number of citations. Becker et al. (1996) measures job performance with the following six items, first 1 to 3 on a never-always scale and 4-6 on a unsatisfactory to extremely satisfactory:

- Completed work in a timely and effective manner
- Performed high quality work
- Completed tasks in an unsatisfactory manner
- Quality of work
- Quantity of work
- Overall performance

These items show much overlap with the items of Koopmans et al. (2012) which validates the quality of the items. Based on the items in the literature described above the following questions will be applied in the questionnaire (appendix B) with a 5-point scale (strongly disagree-strongly agree).

1. I rate the overall quality of my work as very high
2. I completed work in a timely and effective manner
3. I completed tasks in a satisfactory manner
4. I kept in mind the results that I had to achieve in my work

3.3.2 Independent variable

The following variables influence the dependent variable and can be considered independent variable:

- Number of MTM
- The heterogeneity of the project portfolio
- Interdependencies

Number of MTM

The number of MTM pertains to the number of projects an individual is active in at the same time. This information is derived from the received time accounting information. Only projects in which the individual were substantially active (> 50 hours) were included in the research sample.

The heterogeneity of the project portfolio

This measure pertains to the difference between the general project type of the portfolio and the focal project i.e. pertains to the extent of variance between these two.
In order to determine the variance the projects need to be categorized. In NPD and R&D, most projects can either be classified as exploitative or explorative (March, 1991). March (1991) defined explorative projects using the following terms: search, variation, risk taking, experimentation, play, flexibility, discovery and innovation. March uses the following terms to describe exploitation projects: refinement, choice, production, efficiency, selection, implementation and execution. In line with March's 1991 article, this study classifies the projects in its research sample as either explorative or exploitative.

No consensus was reached in regards to a definition for both of these terms (Gupta, Smith & Shalley, 2006). In general exploration can be defined as the search for new knowledge and alternatives and exploitation focusses on exploiting the current knowledge and the improving the application thereof (March, 1991; Gupta, Smith & Shalley, 2006; Vermeulen & Barkema, 2001). To prevent ambiguity in regards to these terms, the respondents were provided with a short description of each of the categories:

- Explorative activities such as the development of new products or large adjustments to current products
- Exploitative activities such as improving a current product for production or efficiency purposes.

The projects were scored with a 5-point Likert scale (1 = Explorative, 5=Exploitative). The participants were asked to score their project as either explorative or exploitative, using the aforementioned Likert scale and the average score on this question was calculated for their portfolio. This average represents the general type of the portfolio and thus the type the respondent is most active in. This average score is compared with the individual scores for the projects in the sample. The difference between these two scores represents the variance between the portfolio and the focal project. The higher the difference the more heterogenous the individual project portfolio.

<u>The extend of interdependencies in the project</u>

To measure task interdependence the items from van der Vegt, Emans & van de Vliert (1999) are adopted. The items are mentioned below and measured with a 5-point Likert scale (1=strongly disagree, 5=strongly agree):

- My own performance depends on receiving information and advice from my colleague
- I depend on my colleague's work for materials and/or requisites that I need to do my job
- I depend on my colleague's work for help and support that I need to do my job
- I depend on my colleague's in order to be able to do my work well
- My job performance is strongly affected by my colleague's job performance

4 Results

The results of the analyses will be described in this section. First, the characteristics of the data and the descriptive statistics regarding the variables will be described. Second, the results for the hypotheses will be given.

4.1 Descriptive statistics

Table 1 shows the descriptive statistics and correlations for all variables used in this research. As mentioned earlier, not enough data was gathered for a regression analysis. Due to this, the significance of the correlation was not determined using a P-value and other methods regarding the quality of the sample were not conducted. The results therefore can only be used as driver for future research.

				Correlation				
	Variable	Mean	SD	1	2	3	4	5
1	Individual performance	3,99	0,83					
2	Number of MTM	5,28	2,23	-0,13				
3	Portfolio heterogeneity	0,86	0,57	-0,30	-0,13			
4	Interdependence	3,52	1,15	-0,20	0,41	-0,08		
5	Team performance	3,83	1,05	0,73	-0,16	-0,04	0,02	

Table 1: Descriptive statistics

In interpreting the correlation values, the following guidelines for the strength of the correlation were used (Taylor, 1990): When r is =< 0,35 the correlation is considered weak. Values between 0,36 and 0,67 represent a modest correlation and scores >= 0,68 are considered high/strong correlations. In general most correlations shown can be considered weak with the exception of two. The first exception is the correlation between individual and team performance (r=0,73). Due to its value it can be considered strong, which indicates that an individual most likely considers his/her own performance to be in line with the team's performance. The second exception, pertaining to the correlation between the number of MTM and interdependence, shows a modest correlation (r=0,41).

4.2 Multiple team membership and individual project performance

Figure 2 contains a scatterplot showing the scores on individual performance and the number of MTM of each individual in the sample.

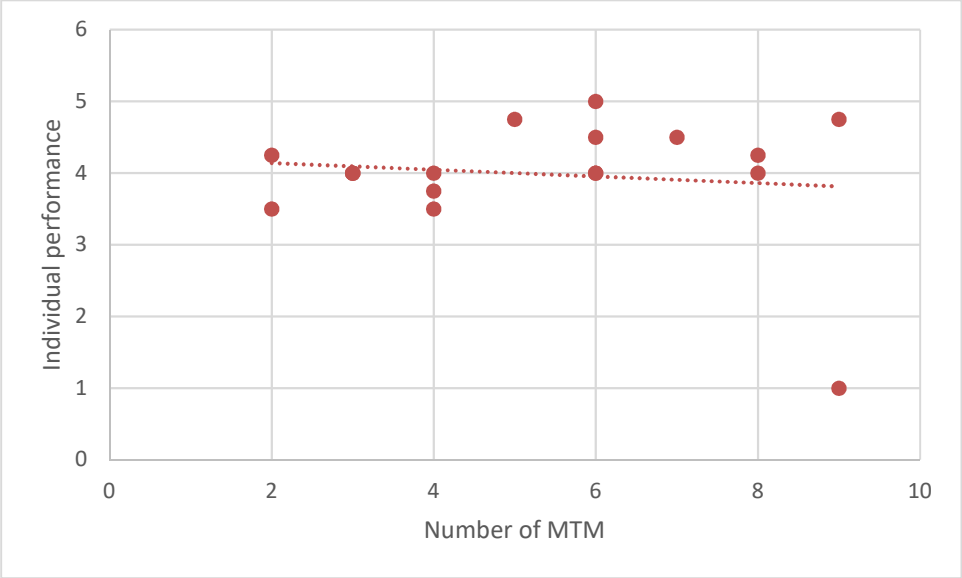

Figure 2: Individual performance and number of MTM

As can be seen in table 1 the mean score for individual performance is almost 4, which is quite high given that the score is based on a scale ranging from 1 to 5. H1 predicted that an increase in the number of MTM would result in a decrease of individual performance due to the increasing cognitive strain. The r (-0,13) supports this claim, although the correlation can be considered weak. The scatterplot, however, shows that one score is very different from the other scores and can be considered an outlier. This individual (the outlier) represents 9 projects and scores his/her individual performance with a 1, thus varying more than the standard deviation from the mean. As the reason is unclear for this outlier it is unwise to deleted it from the sample total, however I chose to check the correlation without the outlier as advised by De Veaux, Velleman, and Bock (2012). When this item is deleted from the sample the scatterplot changes into the following:

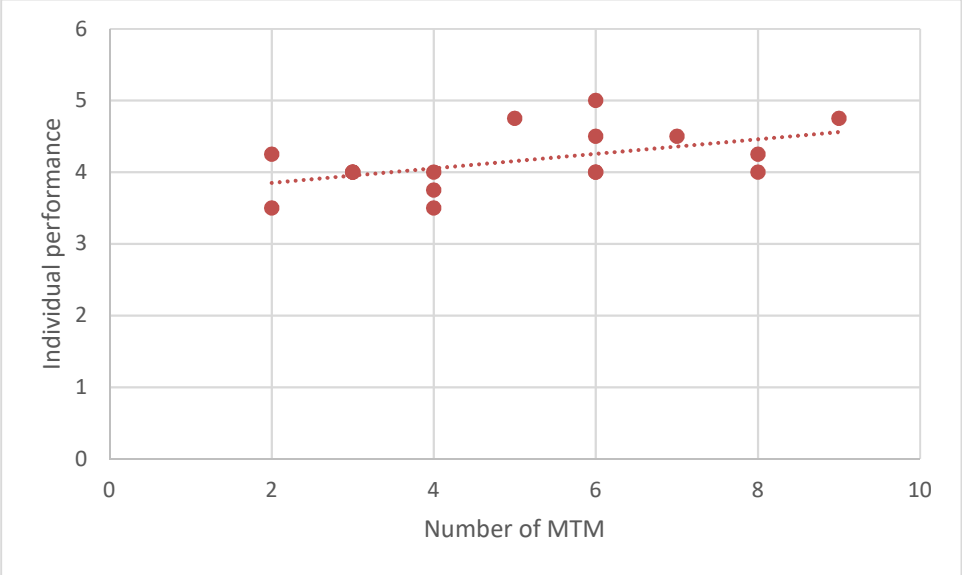

Figure 3: Performance and MTM without outlier

With an r-value of 0,52 the correlation can be considered stronger. This shows an increase in performance with an increase in projects. As such, the evidence above does not support H1.

4.3 Portfolio heterogeneity and individual performance

The second hypothesis predicted a negative effect on individual performance when the variance between the types of projects is high i.e. portfolio heterogeneity. Figure 4 provides a scatterplot showing the extent of heterogeneity between the characteristic of an individual's portfolio (exploitative vs. explorative) and the focal project and the individual's performance.

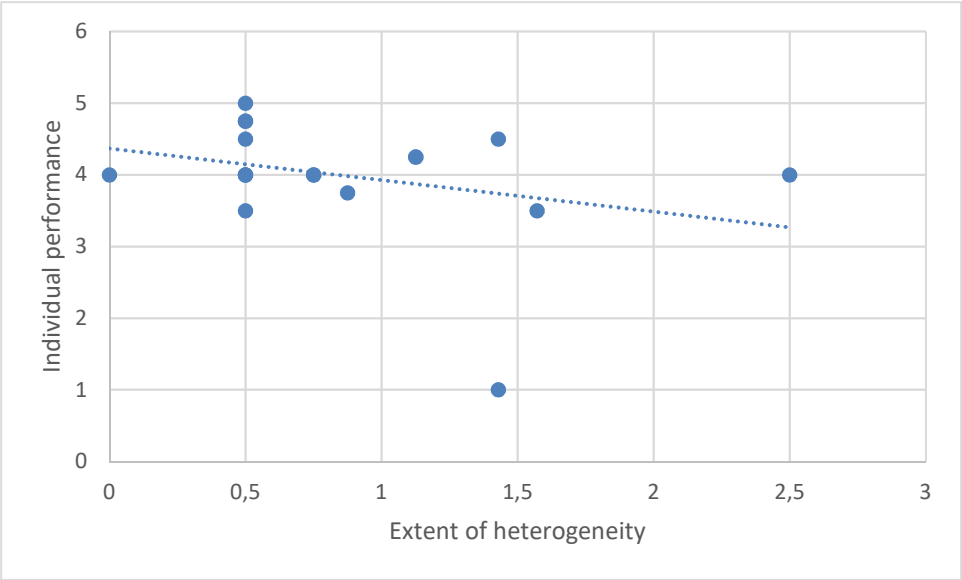

Figure 4: Extent of heterogeneity and individual performance

The scatterplot shows that an increase of variance results in lower individual performance, thus H2 is supported. It is curious that both the items with the highest (2,5) and lowest variance (0) have the same individual performance (4). Although this may be nullified with a larger data set, it is something that could be taken into account in future research regarding this correlation. Perhaps more characteristics of the project or individual can provide more insights. The mean regarding the variance was quite low (0,86) combined with the average performance of 4 this connection may also support the statement that a homogeneous portfolio results in a better individual performance. More insights in the companies decisions in regards to the limited variance shown between the projects may prove to be an interesting subject for future research. Removing the outlier (individual performance score = 1) does not change the results for this hypothesis. It lowers the r from -0,30 to -0,19.

4.4 Interdependency and individual performance

H3 predicted a negative impact from the extent of interdependency on individual performance. This effect shows in the scatterplot below (figure 5). Looking at the scatterplot the hypothesis is supported (r= -0,20). However in this case the outlier goes beyond the standard deviation value for both variables.

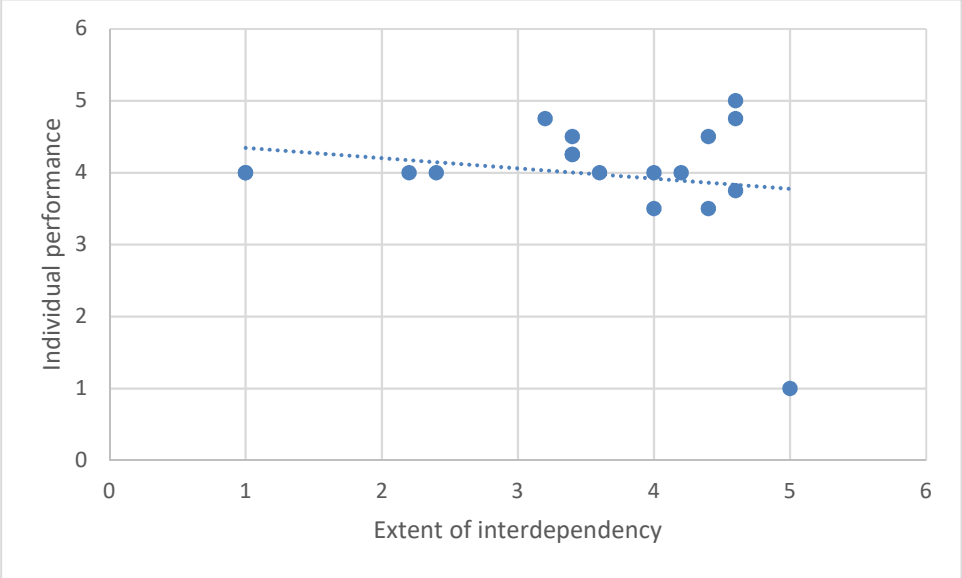

Figure 5: Interdependency and individual performance

When omitting the outlier, the correlation and scatterplot change drastically. The correlation turns positive (r- 0,16) which means that the performance increases when the extent of interdependency increases, which is not expected based on theory. Figure 6 shows the scatterplot without the outlier.

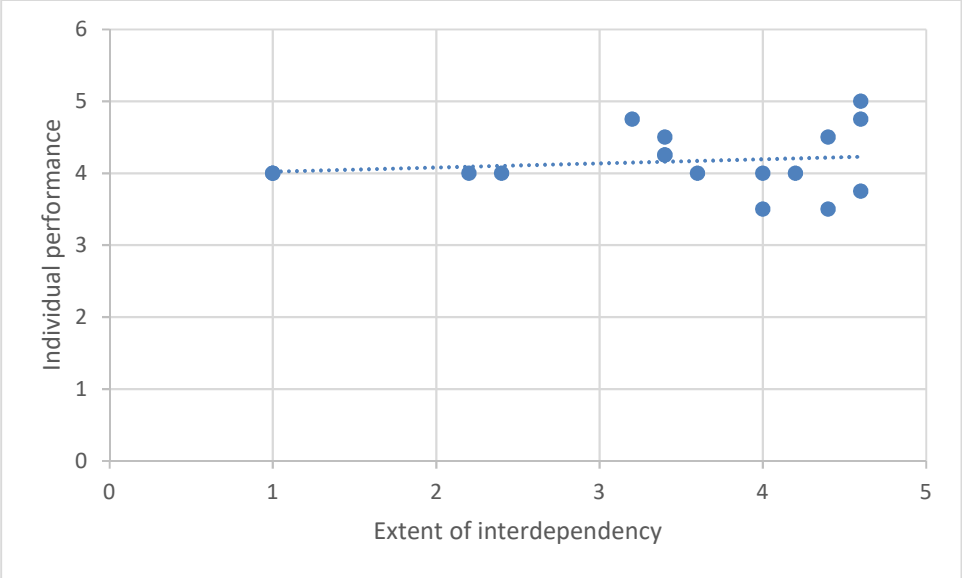

Figure 6: Interdependence vs performance without outlier

Based on the finding H3 is not supported. Possibly interdependence provides positive effects which were not expected based on theory.

4.5 Individual and team performance

Hypothesis 4 predicted that the individual performance of a team member positively effects the team performance. Figure 7 shows the correlation between the scores provided by each respondent in regards to their individual performance and team's performance. Given the strong correlation (r= 0,73) the evidence apparently supports hypothesis 4.

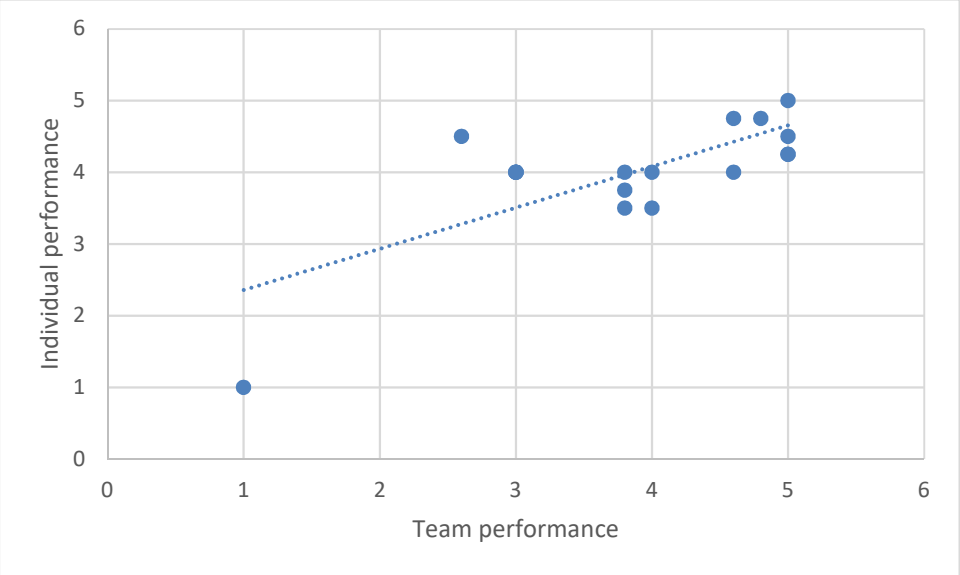

Figure 7. Individual and team performance (individual level)

However for this hypothesis we need to also take into account the average scores for the project. Figure 8 shows the average scores for the individual and team performance for each of the projects.

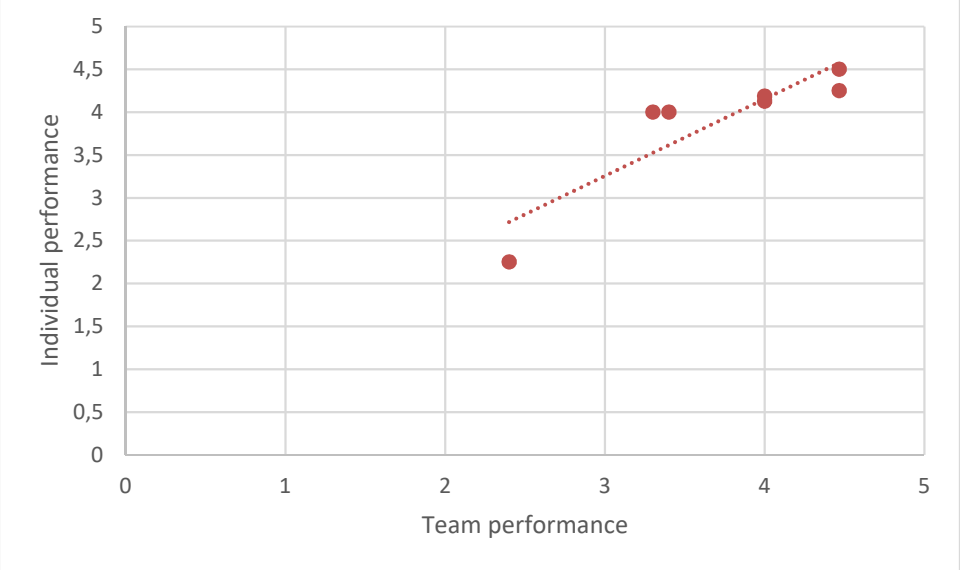

Figure 8: Individual and team performance (project level)

Figure 8 shows an even stronger correlation (r= 0,89). Once again the evidence seems to support H4.. This could indicated that individual differences are leveled out at the team level and could mitigate the effects of MTM on the individual level.

5 Discussion

Working in teams can be considered a standard within New Product Development (NPD) and R&D, resulting in employees who are active in more than one project simultaneously. This means that an employee needs to share his/her time, effort, and attention between different project teams. Working in teams also provides learning opportunities and ways of working more efficiently. Due to the increasing importance of multiple team memberships, the need for knowing its effect increases. As such, more research needs to be done on MTM, especially in regards to how it influences an organization on different levels. The study aimed to provide insights on the relationship between multiple team membership and job performance at the individual level. This was done by testing the relationship between three characteristics of MTM and individual performance. Additionally, the relationship between individual and team performance is also tested. In this paper, due to previous research, a negative effect of MTM on individual performance was expected; heterogeneity of the project portfolio was expected to negatively affect individual performance; interdependency in projects was expected to negatively affect individual performance; and a positive relationship between the individual performance and team performance was expected. The following section highlights the key findings of this study as well as the theoretical and practical implications. The limitations of this study will be discussed in chapter 5.2.

5.1 Key findings & theoretical implications

Previous research has confirmed the existence of both positive and negative effects of MTM on performance. Both are applicable depending of the level of MTM. At an intermediate level the positive effects should be applicable and otherwise MTM will mostly provide negative effects (O'leary et al., 2011; Bertolotti et al., 2015). The negative effects are mostly the results of cognitive strain, which is inherent to MTM, and this strain also limits the possibility of positive effects. For this reason the first hypothesis predicted that the number of MTM would negatively affect performance. This hypothesis was rejected, which may indicate that the positive effects on MTM are more common than expected upfront. To better interpret the results, a more clear definition for an intermediate level of MTM is needed. For example this data showed that on average employees were active in 5,28 projects, the data from Bertolotti et al. (2015) found an average of 8,92 projects. At this moment it not clear if 5 can be considered low or 9 high and if the intermediate level is in between.

The second hypothesis involved the positive effect of knowledge transfer which can be applicable in a MTM setting (O'leary et al., 2011;Bertolotti et al., 2015). If the projects are similar to each other it is expected that work can be done more efficiently. The hypothesis was supported by the data. This could imply that the learning effects of MTM are stronger than the negative effects, which could provide an explanation for the results of hypothesis 1. Possibly an moderating effect is active between the negative and positive effects. Also the role of structure of the organization may be of importance for these positive results as the SD is low, which indicates that the organization may be unconsciously placing the employees on the right projects for the best results in a MTM setting.

A characteristic of a team is that the members depend on each other which creates interdependency. Interdependency limits one's freedom in making choices because of the obligation to the other depending team members. However theory shows that these obligations are determined by the team themselves and easily abended if needed (Brandon & Hollingshead, 2004; Bertolotti et al., 2015). This led to the third hypothesis expecting that an increase in the extent of interdependency will negatively influence the performance. This hypothesis was, surprisingly, not supported and even implies the opposite effect. It is unclear why there was not a correlation shown in the data. Most likely it is due to the limited data. Interdependency is needed for team members to share knowledge and grasps one of the benefits of MTM. The data showed a modest positive correlation between interdependence and the number of MTM. Perhaps it could be the case that if the different projects have similar characteristics, a high extent of interdependence isn't considered as a hinder but increase the efficient way of working greatly between the team members.

The last hypothesis differs from the other hypotheses in that it focusses on team performance instead of on individual performance. Literature was lacking in regards to the connection between the different organization levels: individual, team, and organization. For this reason the fourth hypothesis tested whether there is a relationship between individual performance and team performance. This hypothesis was supported by the data. This outcome is in line with existing theory, however the interaction between the different levels should be researched more in future research. In order to do so, it might be prudent to also gather data on the performance of the team and the individuals from the ones in charge of the project (such as department managers), for this research solely gathered data from individual employees within a project.

5.2 Practical implications

First of all, this research provides insights on the complexity of the concept of MTM and incorporating individuals and team across the organization. When the organization is active with MTM or want to be, it is important to keep this complexity in mind when making decisions.

Organizations should keep in mind that, despite the fact that no significant correlation was found between the amount of MTM and individual performance, increasing the number of MTM could result in lower individual performances, perhaps even hindering organization's performance as a whole. As such, it could be prudent to limit MTM to a certain amount and make sure that an adequate amount of staff is on hand. However, despite the dangers and negative effects associated with MTM, MTM also some positive effects which, when adequately employed, could give the organization a competitive advantage. As of now, it remains unclear what the turning point for MTM is (meaning that is unclear when the negative effects are more abundant than the positive effects), so companies should closely monitor individual and team performance when applying MTM in practice.

In regards to performance, the evidence in this study shows that a correlation exists between the heterogeneity of the projects and the individual's performance. This implies that organization should structure MTM in such a way that employees are working on similar projects in order to increase efficiency and thus increase performance. This means that employees should not be given complete authority in deciding which tasks to perform and that it might prove prudent not to allow employees

to set their own priorities for these may not be in line with those of other team members, which could potentially hinder team performance as a whole.

This study also found that the extent of interdependence correlates with the number of MTM. No correlation between the extent of interdependencies and individual performance was found. Despite this fact, it might be prudent for organizations to be aware of the existence of a correlation between the extent of interdependence and the number of MTM when deciding which employees should have multiple team membership due to their individual characteristics.

The correlation between the individual level and team level shows that performance at the team level can be higher than the individual level when the right team is put together. For organization this implies that putting together a balanced team with a good fit based on individual strengths and performance may lead to higher results. The individual level therefore needs to be taken into account when forming a team for a project

5.3 Limitations and future research

Although this research provided some interesting insights on the concept of MTM, this study has several limitations that need to be taken into account when performing future research.

The largest limitation of this study is the small sample size. Although the data was gathered thoroughly and time accounting data was used as “hard” data, the eventual amount of data received in the form of 18 questionnaires is too limited to do a regression analysis. As such, this study has an explorative character and the insights provided by this study hopefully lead to future research in specific area’s of MTM. A larger sample size would enable a regression analysis, strengthening the studies overall validity.

The sample also consistent of data from one company, in order to increase generalizability, future research should try to gather data from multiple companies. The way data was gathered in this study however proved to be quite time consuming, perhaps too time consuming seeing as companies were reluctant to participate in this study. An important aspect of this study, the time accounting data, also proved quite difficult to acquire seeing as most companies were rather reluctant about sharing this data. As such, other less time consuming methods for gathering data should be considered for future research.

There are also limitation to this study caused by the questionnaire and the way it was acquired. Firstly, it is important to mention that each individual filled in their own scores including individual and team performance. This means that the results are based on one view with its own perception and interests. To provide a more objective score regarding performance, the questionnaire should be filled in by the manager, the one responsible for the projects, and perhaps the team members in regards to the performance of the individual.
A second limitation is the fact that the questionnaire has been filled in by the team members and that individual differences between the team members were not taken into account. As such, variables regarding one’s experience, education, or current employment level are not taken into account but may provide interesting insights on the team dynamic especially regarding interdependence. The same may be applicable for personal characteristics.

The organization can take measures to support the MTM setting, for example by providing employees with similar projects and task enabling knowledge transfer with positive effects. These measures at the organizational level were not taken into account in this research as it focused on the individual level. However more insight on how the different levels interact with each other is needed. As this research attempted to support a connection between the individual level and team level, future research should pursue this even further, while also taking the organization level into account.

Lastly, the results of this research are surprising and indicate that there is a connection between the independent variable of this study (Number of MTM, the heterogeneity of projects , and interdependence). As this research did not test this effect, it provides an opportunity for future research.

I hope that the findings of this study will encourage potential research in the above mentioned directions.

5.4 Conclusion

The goal of this research was to contribute to the MTM literature by determining the effect of MTM on performance on the individual level and how the performance at the individual level correlates with performance at the team level. This led to the following research question:

What are the effects of multiple team membership on individual performance and how does multiple team membership affect team performance?

Using limited data gathered via a questionnaire several hypotheses were tested. The data mostly showed no significant correlations, which could be due to the limited data set. Given the explorative nature of this study, the results may still prove interesting for future research. A negative effect of MTM on individual performance was expected, however the data showed otherwise, indicating that the positive effects of MTM are more applicable/stronger than the negative effects. The second hypothesis expected a decrease in performance when projects within a portfolio showed less similarities is supported. As knowledge transfer is an important advantage of MTM, similarities between projects increases the positive effect of MTM on performance. The third hypothesis tested was not supported. The data showed an increase of performance with an increase of interdependence within a project. It may be the case that similarities between projects reduce the effect of interdependence to the point that it is not considered a hinderance. The last hypothesis supported the relationship between individual and team performance. Which shows there is a connection between the two levels within the organization and indicates that measures on each level of the organization influences the other levels.

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7 Appendix

Appendix A Search terms theoretical framework
Appendix B Example questionnaire multiple projects
Appendix C Items Koopmans et al. (2012)

7.1 A: Search terms theoretical framework

Search terms	
new product development performance	team project performance
new product development performance team	standardized project management
new product development performance team diversity	measuring difference between projects
team characteristics new product development	development measuring scale
team characteristics innovation	measuring scale individual performance
project team characteristics	task interdependence pooled sequential reciprocal
project team characteristics performance	project task interdependence pooled sequential reciprocal
project team workload	measuring project task interdependence
project team workload new product development	task interdependence in projects
team member workload project performance	project task resemblance
project performance	team project performance
individual project performance	individual and team level
antecedents of project performance	antecedents of multiple team membership
multiteam systems	multiple team membership
attention theory	switching costs

7.2 B: Example questionnaire multiple projects

General information

Name:
Age:
Gender:
Education (highest):
Date employed at organization:
Department:
Occupation:

Personal characteristics

Below we list some personality characteristics.
Please circle the number next to each statement that best represents your degree of disagreement or agreement (where 1=Strongly Disagree; 4=Neutral; 7=Strongly Agree; and numbers between represent the varying degrees).

		1	2	3	4	5	6	7
1	I like to rely on my intuitive impressions	☐	☐	☐	☐	☐	☐	☐
2	Using my gut feeling usually works well for me in figuring out problems in my life	☐	☐	☐	☐	☐	☐	☐
3	I believe in trusting my hunches	☐	☐	☐	☐	☐	☐	☐
4	Intuition can be a very useful way to solve problems	☐	☐	☐	☐	☐	☐	☐
5	I often go by my instincts when deciding on a course of action	☐	☐	☐	☐	☐	☐	☐
6	I try to avoid situations that require thinking in depth about something	☐	☐	☐	☐	☐	☐	☐
7	I enjoy solving problems that require hard thinking	☐	☐	☐	☐	☐	☐	☐
8	I am much better at figuring things out logically than most people	☐	☐	☐	☐	☐	☐	☐
9	I have a logical mind	☐	☐	☐	☐	☐	☐	☐
10	I don't reason well under pressure	☐	☐	☐	☐	☐	☐	☐

Project activities
From 2015-2017 you participated in a number of projects.
How was the total amount of project time allocated to the next two types of activities?

Explorative activities such as the development of new products or large adjustments to current products
Exploitative activities such as improving a current product for production or efficiency purposes

		1	2	3	4	5	
RDXXXXXX	Explorative	☐	☐	☐	☐	☐	Exploitative
RDXXXXXX	Explorative	☐	☐	☐	☐	☐	Exploitative
RDXXXXXX	Explorative	☐	☐	☐	☐	☐	Exploitative
RDXXXXXX	Explorative	☐	☐	☐	☐	☐	Exploitative

Projectnumber: XXXXXX **Projectname: XXXXXXXXXX** **Project start date: XX-XX-XX**

The following questions regard this specific project.

Cooperation

1	Did collaboration take place with other			☐ Yes			☐ No	
	departments within the framework of this this project?			1	2	3	4	5
	If yes, how intense was this collaboration?	Very intensive	☐	☐	☐	☐	☐	Not intensive
2	Did collaboration take place with other			☐ Yes			☐ No	
	companies /organizations within the framework project?			1	2	3	4	5
	If yes, how intensive was this collaboration?	Very intensive	☐	☐	☐	☐	☐	Not intensive

Interdependency

The following questions regard this specific project.

3		Strongly disagree	1	2	3	4	5	Strongly agree
4	My own performance depends on receiving information		☐	☐	☐	☐	☐	
	I depend on my teammembers work for materials and/or requisites		☐	☐	☐	☐	☐	
5	that I need to do my job							
	I depend on my teammembers work for help and support		☐	☐	☐	☐	☐	
6	that I need to do my job							
7	I depend on my teammembers in order to be able to do my work well		☐	☐	☐	☐	☐	
	My job performance is strongly affected by my		☐	☐	☐	☐	☐	
	teammembers job performance							

Overall project performance

8	Going by the status of the project,	Strongly disagree	1	2	3	4	5	Strongly agree
9	it can be regarded as successful		☐	☐	☐	☐	☐	
10	all project goals have been achieved		☐	☐	☐	☐	☐	
11	the output of the project is of high quality		☐	☐	☐	☐	☐	
12	the team, which is responsible for this project, is satisfied with its performance		☐	☐	☐	☐	☐	
	our top management can be fully satisfied with the progress of this project		☐	☐	☐	☐	☐	

Operational project performance

13	Going by the status of the project,	Strongly disagree	1	2	3	4	5	Strongly agree
14	the project expenditures are on budget		☐	☐	☐	☐	☐	
15	the project duration is on schedule		☐	☐	☐	☐	☐	
	the project meets quality specifications		☐	☐	☐	☐	☐	

Individual project performance

16	The following questions regard this specific project.							
17		Strongly disagree	1	2	3	4	5	Strongly agree
18	I rate the overall quality of my work as very high		☐	☐	☐	☐	☐	
19	I completed work in a timely and effective manner		☐	☐	☐	☐	☐	
	I completed tasks in a satisfactory manner		☐	☐	☐	☐	☐	
	I kept in mind the results that I had to achieve in my work		☐	☐	☐	☐	☐	

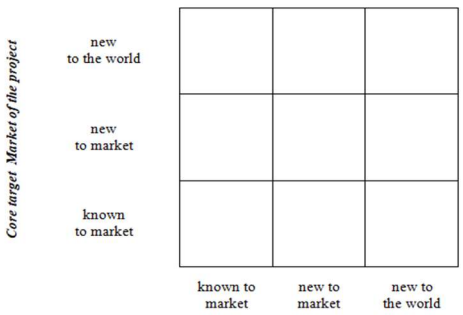
20 **Individual project time**

How was your individual project time allocated to
the following project phases in this project?

Ideation	(0-100)	.....%
Investigation	(0-100)	.....%
Development	(0-100)	.....%
Testing and validation	(0-100)	.....%
Production and market launch	(0-100)	.....%
		100%

21 **Project typeification**

Where would you position this particular project in the matrix?
Mark the position of the project with X in the matrix below



Thank you for your participation

7.3 C: Items Koopmans et al. (2012)

Item	Question	Rating (0-4)
TP1	How do you rate thequality of your ownwork in the past 3months?	insufficient – very good
TP2	Compared to last year, I judge thequality of my work in the past 3months to be…	much worse –much better
TP3	How often was the quality of yourwork below what it should havebeen in the past 3 months?	never – often
TP4	How do you rate the quantity of yourown work in the past 3 months?	insufficient –very good
TP5	Compared to last year, I judge thequantity of my work in the last 3months to be…	much worse –much better
TP6	How often was the quantity of yourwork less than it should have been inthe past 3 months?	never – often
TP7	I managed to plan my work so that itwas done on time.	seldom – always
TP8	I worked towards the endresult of my work.	seldom – always
TP9	I kept in mind the resultsthat I had to achieve in mywork.	seldom – always
TP10	I had trouble settingpriorities in my work.	seldom – always
TP11	I was able to separatemain issues from sideissues at work.	seldom – always
TP12	I was able to perform mywork well with minimaltime and effort.	seldom – always
TP13	It took me longer tocomplete my work tasksthan intended.	seldom – always