Exploring the moderating effect of task interdependence on the relationship between team autonomy and team effectiveness

Master Thesis Organisation Studies – Tilburg University

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“All for one and one for all”
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Abstract

For many organisations it is an ongoing process to adjust the level of autonomy they grant to their teams. Not all teams are able to handle the amount of autonomy which is granted to them. Langfred (2000) has indicated that not all teams are able to effectively deal with their level of autonomy because it is not in balance with the task interdependence. He conducted a research based on a survey in which he indicated a moderating effect of task interdependence on the relationship between team autonomy and team effectiveness. His results show that autonomy has a positive effect on team effectiveness when a team has high task interdependence but that autonomy is something that should be avoided in groups with low task interdependence.

This research builds upon the study which was executed by Langfred in 2000. The aim of this research is to explore the mechanisms of the moderating effect on the relationship between team autonomy and team effectiveness that was found by Langfred (2000). Therefore the following research question is set up:

What are the causal mechanisms behind the moderating effect of task interdependences on the relationship between team autonomy and team effectiveness?

This research is conducted in a part of the production department in the organisation of DuPont, Dordrecht. First, a survey is set out under the employees of the production teams. Accordingly, a selection of teams is made which participate in the second part of the research: individual interviews and group interviews.

The results of the survey show that there is no significant moderating effect of task interdependence on the relationship between team autonomy and team effectiveness. However, it does indicate a positive correlation. The results from the interviews indicate that four mechanisms of task interdependence have a moderating effect on the relationship between team autonomy and team effectiveness. Those mechanisms are the intensity of communication, helping colleagues, usage of each other’s knowledge and being aware of problems in the team. When these mechanisms, or a number of them, are present in an autonomous team, this team does not have to spend much extra time in working autonomously.

Keywords: task interdependence, team autonomy & team effectiveness
Preface

Social innovation... Team adaption... Team autonomy... Diversity... Cooperation...

The options for finding a research topic were unlimited. However, time was not. Choices had to be made and a proposal had to be written. After long discussions and complex brainstorm sessions, the decision was made. Team autonomy: that will be the central concept for my research. The choices which have followed on this one have not been as difficult to take.

I have very much enjoyed working on my master thesis. I appreciate the contact I had with the research organisation and they have given me much freedom to execute my research. I would like to thank the participants of DuPont, Dordrecht for their time and motivation. Although it might be little, I hope my research can be of use to them.

Rob, I would like to thank you for your motivation and supervision. Even though the highly complex brainstorm maps about your and my thoughts were sometimes difficult to understand, they have been of great inspiration. I hope you like the end result!

Furthermore, I would like to thank Inge Bongers for her critical feedback and Alex, Karen and Elske for showing interest in mine and each other’s work. IVA Beleidsonderzoek & Advies, the organisation where I have done my traineeship, has been the basis for my graduation year. Even though, my colleagues were not directly involved in my research, it has been nice to discuss my progress with them and receive tips and tricks from experienced professionals.

Of course, my family and friends must also be thanked for their support and shoulder pets. To conclude, Stefan, thank you for your loving support. I will return you the favour this semester and hopefully, it will lead to a beautiful journey this spring.

Rikie de Veer
January 2012
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1. Introduction

1.1 Problem statement

It has been a trend in the last decades for managers to implement autonomous self-managing teams to improve quality, productivity and the quality of work life in order to respond to competitive challenges (Cohen & Ledford, 1994). However, instead of blindly implementing autonomous teams, organisations better find a balance between, on the one hand, the extent to which they grant their employees to work autonomously and, on the other hand, control the amount of work freedom.

During the rise of the concept of autonomy at work, it was predominately looked at from an individual point of view since work used to be organized around individuals. In recent history though, a trend developed in which organisations are becoming more team focused instead of individual minded (Kozlowski et al., 1999). This trend is still developing and therefore it is more interesting for organisations and scientists to research phenomena, such as autonomy, on a team level base instead of on an individual base. This newer perspective takes into account different features that could influence autonomy and how autonomy influences other organisational aspects such as team effectiveness.

Langfred (2000) has indicated that multiple researchers found proof that autonomy has significant performance benefits (Cohen & Ledford, 1994; Cohen et al., 1996; Cotton, 1993; Macy & Izumi, 1993), and that other researchers found negative effects between team autonomy and team effectiveness (Kim and Lee, 1995; Cohen and Bailey, 1997; Smith and Comer, 1994; Wageman, 1997). According to Langfred (2000), the contrasting findings of those researchers indicate that there must be moderating variables that influence the relationship between autonomy and effectiveness in teams. Because a growing number of organisations worldwide are giving more autonomy to teams to increase effectiveness (Langfred, 2000 & 2005), it is important to identify possible moderating variables to guarantee a continued design of effective teams.

In his paper, Langfred (2000) zoomed in on the moderating effect of task interdependence and found a significant effect between team autonomy and team effectiveness, moderated by task interdependence within a team. His results show that autonomy has a positive effect on team effectiveness when a team has high task interdependence but that autonomy is something that should be avoided in groups with low task interdependence (see figure 1). Besides Langfred (2000), there are two more papers which indicate the moderating effect of task interdependence (Langfred, 2000 & 2005 and Liden, Wayne & Bradway, 1997).
The conclusions of these studies are primarily based on quantitative data, focussed on the generalisability of the data and not on revealing the mechanisms behind the relationship. All three studies are based on a survey and Langfred (2000) and Liden et al. (1997) have held interviews with the group manager of the participating teams. However, none of the researchers have spoken with the team members that participated in the surveys. Therefore, none of the authors have been able to draw conclusions on the causal mechanisms that explain the moderating effect of task interdependence.

The lack of knowledge about the mechanisms that explain the moderating effect of task interdependence on the relationship of team autonomy and team effectiveness might affect organisational decisions negatively. When not having a proper understanding of the possible effects of task interdependence, granting a team with a high level of autonomy might have negative effects on team effectiveness (Liden et al., 1997).

### 1.2 Research goal & question

This research focuses on the model of Langfred (2000) in which task interdependence moderates the relationship between team autonomy and team effectiveness. The objective of this research is to explore the mechanisms of the moderating effect of task interdependence on the relationship between team autonomy and team effectiveness that was found by Langfred (2000). Thereby, this research aims to be an important contribution to the existing literature, because it is the first study that researches the underlying mechanisms behind the relationships between team autonomy, task interdependence and team effectiveness. Up until now, researchers only have made hypothesis about the mechanisms but lack have not made an attempt to undertake empirical research to test them.

The following research question is derived from the research goal:

*What are the causal mechanisms behind the moderating effect of task interdependencies on the relationship between team autonomy and team effectiveness?*

### 1.3 Relevance

This research will, in the first place, provide qualitative, in-depth knowledge about the moderating effect of task-interdependence on team autonomy and effectiveness and will build upon the research findings of quantitative research done about this relationship (Langfred, 2000 & 2005 and Liden et al. 1997). These authors included many different types of teams in their research, which forced them to measure the variables on a rather general level. This research focuses merely on production teams which will give the researcher the possibility to go into more detail when comparing the level of variables in the teams.

This research will provide the reader with in-depth knowledge about the relationships between the variables that could help to understand why teams work as they do. This can be valuable information for managers who would like to invest in autonomously working teams. An organisation might make an effort to invest in the
autonomy of teams without considering the effect of task interdependence. Under the wrong circumstances, an organisation might grant a team with a high(er) level of autonomy and expect an increase in effectiveness. However, when not having an optimal level of task interdependence in the team, the increased level of team autonomy may not be improving the team’s effectiveness and might even be harmful to it (Liden et al., 1997).
2. Theoretical background

This chapter presents the theoretical background on which the research is based. As mentioned in section 1.2 (research goal and question), this research is focused on the model of Langfred (2000) and aims to explore the underlying mechanisms of the moderating effect of task interdependence on the relationship between team autonomy and team effectiveness. Therefore, his work is an important input for this theoretical framework. However, to prevent a narrow minded scope on the literature, the author elaborates on his work by using the work of other authors who have touched upon (one of) the research subjects.

The first section presents the dependent variable of this research, team effectiveness. Accordingly, section two and three present the independent variable team autonomy and the moderating variable task interdependence respectively. The last section elaborates on what is known about the relationships between these variables until now.

2.1 Team effectiveness

Team effectiveness is a broad term which entails many different aspects and is researched in many different ways (e.g. Cohen and Ledford, 1994, Singh and Muncherij, 2007 & Langfred, 2005). In his article, Langfred (2000) describes team effectiveness as ‘the accuracy of work and the overall performance of group operations (p. 61)’. He makes no further attempt to describe the concept in more detail, leaving that up to the operationalisation of this study. It is chosen to elaborate on the concept of team effectiveness in more detail in order to be more accurate in creating measurements.

While elaborating on team effectiveness it is taken into account that it is applicable to production teams, the units of observation and analysis of this research. Langfred (2000) executed his research in more types of teams and therefore claims not to have elaborated on the subject in more detail.

The definition of team effectiveness given by Langfred (2000) consists of two aspects, the first being the accuracy of work and the second being the overall performance of group operations. According to the interpretation of the author, by ‘accuracy of work’ Langfred (2000) refers to the efficiency by which the work in the team is done, interpreting team effectiveness as a process variable. The ‘overall performance of group operations’ most likely reflects the quality of the performance by the team, referring to team effectiveness as an outcome variable. The outcome interpretation of Langfred’s definition of team effectiveness could otherwise be referred to as team performance. In other words, he regards team effectiveness to be a process of work as well as an outcome of work.

Langfred (2000) does not describe the indicators of the accuracy of work and the overall performance of group operations. However, to be able to research on what aspects (indicators) of team effectiveness team autonomy and task interdependence have an (indirect moderating) effect, the concept of team effectiveness must be described in more detail. The indicators that make up team effectiveness in this research are the team functions that Singh and Muncherij (2007) used for the description of team effectiveness. They describe team
effectiveness by means of five team functions. Those functions can be categorised into the process and outcome approach of team effectiveness.

The three functions that reflect team effectiveness as an outcome variable are team objectives and integration, decision making and implementing decision. The two functions that make up team effectiveness as a process variable are meetings and team health. In section 3.3.2 it is described how these functions are used in this research. The operationalisation of all these team functions can be found in the operationalisation table on team effectiveness in appendix IV.

### 2.2 Team autonomy

Langfred (2000) does not provide a clear definition of the concept team autonomy. However, he mentions that the survey scale on team autonomy intended to measure *‘the amount of influence the group had in deciding work on a daily basis as well as the assignment of tasks’* (p. 61). The author wishes to get a more detailed understanding of the concept team autonomy. For this, the work of several authors has been taken into account to complement the work of Langfred (2000).

The wide variety of literature writes of multiple concepts describing autonomous working teams. Self-managing, self-regulating and self-organising teams are terms used by many scholars as synonyms for autonomous teams (Cummings, 1978). However, others claim that autonomy is a team characteristic within self-managing, -regulating or -organising teams (e.g. Cohen & Ledford, 1994; Millikin, Horn & Manz, 2010). This indicates the confusion that exists whether team autonomy has many. In this research, only team autonomy will be used to indicate the independent variable. However, in literature used for this research it may be presented under a different name. In such cases, the researcher has done thorough checks to make sure the specific article is referring to team autonomy as a synonym.

A good working definition of autonomy which covers several aspects is ‘the degree to which the task provides substantial freedom, independence, and discretion in scheduling the work and in determining the procedures to be used in carrying it out’ (Hackman & Oldham, 1980, p. 79). This definition is used to define team autonomy in this research. Additionally, team autonomy is concerned with how tasks are coordinated with other parts of the organisation (Steward, 2006). In other words, stating that a team operates autonomously means that it does so as a group within the organisation.

According to Cohen and Ledford (1994), an autonomous team is a team of independent individuals who are able to self-regulate their behaviour on their tasks. In their paper they describe that one of the most important features of an autonomous team is employee discretion over decisions such as task assignments, methods for carrying out the work and scheduling of activities.

Additionally, they mention that autonomous teams most often have members with a divers set of relevant skills and that it receives feedback on the team performances. Autonomous teams can either have a direct supervisor or not.
Langfred (2000) has stressed that team autonomy is a team-level construct and has no meaningful existence at the individual level. According to Steward (2006), autonomous teams are given a great deal of freedom to make decisions, plan work activities and adapt to changing internal and external conditions. Additionally, according to Cummings (1978), in autonomous teams all members have certain skills that are relevant to the group and members have been assigned different tasks. He states that autonomy within teams is attained by empowering a group of workers with high information and decision making authority in order for them to experience a high level of self-determination.

According to Liden et al. (1997), theory suggests that group autonomy and group control over decisions increases intrinsic motivation of the team members, which in its turn results in high performance (Hackman, 1977; Pearce and Ravlin, 1987 in Liden et al., 1997). Langfred (2000) suggests that besides the above named explanation that team autonomy allows members to exploit unique task-related knowledge of information which is available to them (Klein, 1991; Latham, Winters,& Locke, 1994 in Langfred, 2000). Additionally, Langfred (2000) states that when the costs outweigh the benefits of granting a team with autonomy, or if the team cannot take advantage of the autonomy as a coherent team, then autonomy could have a negative effect on team effectiveness. In other words, there must be a good balance between the level of autonomy, costs and other conditions of the team. As mentioned in the problem statement, the level of task interdependence within the team is such a condition. Section 2.4 will elaborate on this moderating variable.

### 2.3 The effect of team autonomy on team effectiveness

Team autonomy has been proven to have a positive effect on team effectiveness in many studies (Cohen and Ledford, 1994). In their paper, Cohen and Ledford (1994) give two important explanations why autonomous teams have a positive effect on team effectiveness and contribute to the quality of life of work of the team members. Firstly, autonomous teams provide members with self-regulation over changing conditions by which the team is confronted. They state that autonomous teams encourage self-regulation by means of cognitive and behavioural mechanisms, by for example, goal setting. Secondly, the way work activities and organisational designs are organised in autonomous teams are motivating for members because the high task variety, identity, autonomy, significance and feedback encourage internal work motivation. This motivation leads to a level of performance and satisfaction.

### 2.4 Task interdependence

Task interdependence within a team is the extent to which team members have to interact with each other in order to complete their tasks (Shea & Guzzo, 1987 in Langfred, 2000). Most teams are composed as such because the tasks or responsibilities of members are somehow interdependent and differ from other units (Cummings, 1978). However, there can be a variance in the degree to which members are task interdependent on each other. According to Langfred (2000), the degree to which a team is task interdependent is determined...
by the organisation’s task technology, indicating that task interdependence is a structural feature of work. Structural work features causing that a team could be more or less task interdependent include whether the members have to use the same (technical) materials, knowledge, information, space etcetera.

Task interdependences ranges from low levels, indicating that team members rather function as individuals, to moderate, where interaction is taking place to some extent, and high where intensive interactions and relationships take place (Steward, 2006). Community building aspects are a major benefit of high levels of task interdependence. Advantages of low levels of task interdependence include efficiency and creative problem solving by individuals (Wageman, 1995 in Steward, 2006).

2.5 The moderating effect of task interdependence

Task interdependence is a structural constraint on the ability of team members to successfully complete their tasks (Langfred, 2000). It is often found to influence team effectiveness and performance indirectly by moderating the effect of other variables on team effectiveness (Cummings, 1978; Janz, 1997; Langfred, 2000; Langfred, 2005; Langfred & Shanley, 2001; Liden et al., 1997). The next two paragraphs will present the hypotheses that Langfred (2000) proposed on the moderating effect of task interdependence. It should be noted that Langfred never found empirical proof to test the hypotheses he made.

In a team with a high level of task interdependence and close coordination, members are more likely to be aware of problems in the team, compared to teams where members perform working activities more independently. An example of being aware of problems in the team mentioned by Langfred (2000) is social loafing. In a team that requires close coordination, undesirable social problems such as social loafing will become more evident to team members. Additionally, he hypothesises that teams with a high degree of task interdependence which are given autonomy can benefit of ‘the unique process-related knowledge held by group members’ (p. 57). Furthermore, when a task interdependent team is given a great deal of autonomy, it may behave stricter and harsher on its members than it would behave on (higher) hierarchical management. He suggests that a high task interdependent team will be better able to operate efficiently as a coherent group compared to a team in which members work rather independently and will therefore better be able to handle a situation which requires coherent group actions. Finally, he proposes that teams with a high degree of internal control that are granted with autonomy can take more advantage of the team-level autonomy than teams with members who work independently of one another. He suggests that this can be explained by the fact that the high task interdependent team requires little or no additional interaction because this interaction of information sharing and shared decision making already exists. It should be noted that none of the above assumptions and hypotheses have ever been empirically tested by Langfred.

When granting a team with a low level of task interdependence a high degree of autonomy, members will need to spend more time in planning, coordinating and decision making. This implies that they can spend less time on their individual tasks and thereby a process loss arises. In other words, granting autonomy to a low task interdependent team can result in dysfunctional performance loss. Additionally, Langfred (2000) proposes that
teams in which members work independently will not easily be able to coordinate their activities with one another to accomplish a group task. Then the group action will not be coherent and is not likely to be efficient and effective. This indicates the opposite of high task interdependent team performing a coherent group action.

Langfred (2000) has posed the above mentioned hypotheses on teams with high and low task interdependence and found a significant moderating effect. However, as mentioned before, he has not empirically tested these hypotheses. Besides Langfred, Liden et al. (1997) make an attempt to briefly reveal the causal mechanisms of the relationships between team autonomy, task interdependence and team effectiveness that explain that a low level of task interdependence, combined with a high level of autonomy might have a negative effect on team effectiveness. They argue that team members may find it time-consuming and ineffective when they have to reach group-consensus on decisions that may be dealt with more effectively on an individual level or by small groups within the team. On the other hand Liden et al. (1997) suggest that when a group lacks autonomy they may lose valuable time in waiting for approval of managers before they can make decisions (Klein, 1991 in Liden et al., 1997).

2.6 Conceptual model

This section presents the conceptual model that was set up based on the theory presented in this chapter. The model includes the variables from the research question and the dimensions which make up these variables.
3. Methodology

3.1 Research design

This research has a comparative design, using a multiple-case study approach based on both qualitative and quantitative research. A comparative design is chosen, because it is the aim of this research to search for explanations for similarities and differences among varying teams caused by the variables of this study (Bryman, 2008). A multiple-case approach is used, because it allows the researcher to focus on a few cases in more detail by which the researcher gains a greater awareness and a deeper understanding of the relationships between the variables (Bryman, 2008).

In this research, seven cases, teams as such, are explored in greater detail to reveal the causal mechanisms that explain the relationships between the variables. The teams are selected based on the variance on the level of team autonomy and task interdependence.

The unit of analysis in this research are teams and the unit of observation are individuals and documents. Since teams are composed of individuals, they will be the main resource of information for this study. This indicates that all variables will be researched on the perceptions of people. For example, the level of team autonomy will be indicated based on the perception of the team members. Additionally, when possible, the information gained from team members and managers is supported by documentation on achievement on team goals.

3.2 Data collection

This research project is conducted within the organisation of DuPont, Dordrecht1. The organisation is selected based on the possibilities within the researchers’ network. The researcher was given clearance to execute the research, as proposed in the research proposal, within the production department. DuPont is considered to be an optimal organisation for this research, because the production department consists of several business units which differ on several aspects. The manager of human resources indicated, based on organisation policy and the nature of working activities, that the teams in the different business units have different levels of autonomy and task interdependence. 114 team members, coming from 25 teams divided over five business units participated in the survey. In the qualitative part of the research, 7 teams of 4 business units participated.

In the results (section 4.2), a more detailed overview of DuPont and the participating business units is presented.

The research is divided in two parts, part 1 consists of a survey set out in teams in the participating part of the production department and had the aim to select teams that will be used in the second part of the research. Part 2 will include a qualitative study to research the underlying mechanisms of the relationships between the variables of this study.

1 From now on referred to as DuPont.
variables. The second part of the research is the part on which the objectives and research question is focussed. Both parts are described in more detail below.

3.2.1 Part 1: survey

Part one of the research consists of a survey to determine the presence and nature of the relationship between team autonomy and team effectiveness moderated by task interdependence. Testing the model of Langfred (2000) was required before researching it in a qualitative manner because one cannot assume the presence of the by him founded relationships in a different setting with different teams.

The survey was distributed among a population of around 300 employees in the production department. The employees who received an invitation to participate are all part of a production shift. The following functions make up a production shift: manager improvement (if applicable), team lead(s) and operators. The survey is distributed digitally via www.thesistools.com and team members received a general invitation through e-mail, send out by the ‘continues improvement lead manager’ of DuPont. The survey was launched in the end of July 2011 and stayed online until all the interviews with the managers improvement / team leads were finished. In these interviews the preliminary results were discussed. To enlarge the response, all managers improvement / team leads that were interviewed individually were asked to remind their team members to fill in the survey online. In one team it was possible to distribute the survey in printed version. Since the survey was launched during the summer holiday and therefore had a low response rate it was necessary to send out several reminders through e-mail. September and October were special maintenance months in which all production employees have more working activities compared to normal months. In order to be able to finish the maintenance activities in time production managers could not ask their employees to participate in the research. The total number of respondents is 114, divided over 25 teams in 5 business units. The following table presents an overview of the total number of participants per selected team (the total number of respondents is 114, of which 45 in the teams which are selected to participate in the second part of the research).

<table>
<thead>
<tr>
<th>Team</th>
<th>Total nr. team members</th>
<th>Nr. Respondents questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>7</td>
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<td>3</td>
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<tr>
<td>6</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>55</td>
<td>45 (82%)</td>
</tr>
</tbody>
</table>

Table 1: overview of number and percentage of respondents survey in selected teams, compared to total population.

The survey consists of a few general questions about the business unit and team that the respondent works for, and the three scales which measure the variables. The introduction to the survey is written by the researcher. The e-mail to invite the respondents is written by the ‘continues improvement lead manager’.

The scales used by Langfred (2000) to measure the 3 variables were not used for this research because the exact items were not available to the researcher. Moreover, Langfred only used 3 items to measure team autonomy and for team effectiveness and task interdependence 2 items each. It is in the opinion of the author of this research that more items per variable are needed for building a proper understanding of the level of the variables in the teams. The scales that were used for this research are
described in section 3.3. All scales have been proven to have a good Cronbach’s Alpha (reliability rate) in past research. The survey is assessed by the supervisor of this research and a professional researcher. Moreover, it has been checked by the ‘continues improvement lead manager’ to judge the applicability of the questions to the production employees of DuPont. Only a minor alteration was made in that meeting, being that team ‘autonomy’ was changed to ‘self-steering’. The final survey can be found in appendix I.

3.2.2 Part 2: in-depth research

The qualitative methods semi-structured individual Interviews, in-depth group interviews and a document study were applied to research the underlying mechanisms that explain the nature of the relationships between the variables. An explanation of how the teams and persons that were interviewed were selected can be found in section 3.4.

Semi-structured individual Interviews:

The second part of this research, the qualitative part in which in-depth data was collected, started with interviewing the managers improvement or team lead of the selected teams. Semi-structured interviewing is a method which is used very often to collect in-depth data on the relationships between variables (Boeije, 2008). 5 out of 7 teams have a manager improvement, a hierarchical leader of the team. The other 2 teams (team 4 and 6) do not have a manager improvement, only a team lead, in that case the interview was held with the team lead.

The managers improvement/team leads were interviewed for multiple reasons. First, it gave the researcher the possibility to discuss the preliminary results of the survey. The results were preliminary because the survey was still online when the interviews were held. However, by far most of the respondents (114 in total) had already filled in the survey before the first interview started. In the analysis of the (preliminary and final) results of the survey the moderating effect of task interdependence did appear not to be significant. Given the fact that Langfred (2000) did find a significant effect, the insignificant effect that was founded in this research was rather surprising. By discussing the results of the team with the managers improvement / team leads, the author intended to check the representativeness of the results in order to search for measurement errors in the scales of the survey. To illustrate, the author considered the possibility that the task interdependence items were interpreted differently by the multiple teams.

Second, by interviewing the managers improvement / team lead, the researcher wanted to gain a detailed understanding of the working activities of the team. This was done in order to properly prepare for the group interviews and gain an insight into the level of team autonomy, task interdependence and team effectiveness within the team. The manager’s / leader’s perception of the variables was considered important, because managers are less distorted compared to the self-serving perception of team members (Langfred, 2000). Moreover, they are better trained and sometimes educated to assess the variables, especially team effectiveness / performance (Langfred, 2000). Third, it was necessary to speak to the managers improvement / team leads because they could possibly provide the researcher with documented information on team goals.
Those documents were used briefly to enlarge the understanding of the level of team effectiveness. However, those documents were found not to be of any value to this research, because they were not set up on team level, were highly complex to understand and/or were not up to date.

All the interviews were anonymous and respondents were guaranteed that the information given would be treated confidentially to stimulate them to be more open. The interviews were recorded. The interview protocol was constructed based on the literature study that was done. The interview protocol can be found in appendix II.

**In depth group interviews:**

After having interviewed the manager improvement / team lead, a group interview with the team members was held. It was the goal to have as many members of the team present with a minimum of 4 participants per interview. The following table presents an overview of the total number of participants per team.

<table>
<thead>
<tr>
<th>Team</th>
<th>Total nr. team members</th>
<th>Nr. participants in group interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>7</td>
<td>3</td>
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<tr>
<td>2.</td>
<td>7</td>
<td>4</td>
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<tr>
<td>3.</td>
<td>8</td>
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<td>5.</td>
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<td>6.</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>55</strong></td>
<td><strong>27 (49%)</strong></td>
</tr>
</tbody>
</table>

Table 2: overview of number and percentage of respondents group interviews, compared to total population of the 7 teams.

The main goal of the group interviews was to get an insight in how the team members work together. The researcher chose to hold group interviews, instead of the proposed individual interviews, with the team members because the group dynamics would be more visible compared to holding individual interviews. Moreover, during the group interviews participants could elaborate on each others’ answers and pose extra or counter arguments. A disadvantage of holding group interviews is the fact that participants may be less open as they would be in an individual interview. Another disadvantage of holding group interviews is that participants may lean on one or a few dominant participants and agree with everything they say instead of thinking for themselves. In this research, it was expected that the benefits would outweigh the disadvantages. Therefore, group interviews instead of individual interviews were held.

The interviews were recorded. All interviews were anonymous and the participants were told that the information would not go to their manager improvement / team lead. It was stressed that participants should be open towards the researcher and each other. The interview protocol for the group interviews was constructed based on the literature that was studied for this research and the data that was collected during the interviews with the managers improvement / team leads. The interview protocol can be found in appendix III.

### 3.3 Measurements

This section describes the measurement of the concepts team autonomy, team effectiveness and task interdependence and how they were used in the survey, interviews with managers improvement / team leads.
and in the group interviews. The operationalisation table of the concepts supports this section in more detail and can be found in appendix IV.

### 3.3.1 Team autonomy

The survey scales for all concepts are based on existing scales that have proven to measure the variables of this research accurately. To measure team autonomy, Langfred’s (2005) scale was used, which is adapted from Breaugh’s (1985) individual autonomy scale and is composed of 8 items. The Dutch version of this scale adapted from Ramaker (2007) was used, in his research. The scale had a Cronbach’s Alpha of .85. Example items of the scale are “Our team is free to determine how the work should be executed” and “Our team has control over planning the work activities”. A seven-point likert scale is applicable ranging from “strongly disagree” to “strongly agree”. In this research the scale had a reliability score of .82.

The two dimensions that make up the concept of team autonomy are the degree to which the working tasks and organisation provides substantial freedom in scheduling the work and determining and working with procedures. The former one includes the indicators of setting up team goals and setting up staff planning. The latter dimension is about setting up and working with working methods. The indicators working methods and procedures might cause some obscurity. In this research, procedures contain written protocols and regulations whereas working methods is about the working standards and habits of the team. To illustrate, in a procedure it can be stated that an employee is free to determine his own working method to solve a disturbance.

In the interviews with the managers improvement / team leads, the focus was on how much the team is involved in setting up procedures and goals and how much freedom they have in setting up the planning. Example questions are: ‘How are team goals set up?’ ‘What are the (dis)advantages of having the level of autonomy they have?’ ‘Is the current level of autonomy in the team constraining/stimulating for members to execute their tasks?’

In the group interviews the focus was on how free the team acts in setting up and working with working methods. Additionally, in the group interviews questions focus on how the team sets up goals (or does not) and how they make the planning in more detail. Example questions are: ‘How free are you in determining your working methods?’ ‘How much do you work by following procedures?’ ‘How do you solve technical / social problems?’

### 3.3.2 Team effectiveness

In the survey team effectiveness was measured by means of the scale of Van Woerkom and Croon (2009). Originally this scale consisted of 17 items. However, not all items seemed relevant to this research. Therefore, only the items regarding effectiveness and quality were adapted, thereby the scale was applied as it was done by van Beek (2011). The items of the scale are in written in the Dutch language. The Cronbach’s Alpha yielded in his study was .94. This scale also applied a seven-point likert scale ranging from “strongly disagree” to...
“strongly agree”. Example items of the scale are “Our team accomplishes goals” and “The way the team works guarantees good quality of the performances”. The Cronbach’s Alpha found in this research is .84.

As mentioned in the theoretical background, Langfred’s (2000) definition of team effectiveness contains two dimensions: overall performance of group operations and the accuracy of work. The five functions of Singh and Muncherij (2007) are used as the indicators which make up the two dimensions. Team objectives and integration, implementing decisions and decision making represent the overall performance of group operations. Healthy climate and working methods represent the accuracy of work.

The questions that are set up for the two types of interviews embody the five functions of team effectiveness as designed by Singh and Muncherij (2007). In both the individual interviews and the group interviews managers improvement / team leads / members are asked about their impression on what the five functions look like in the team. Example questions that are: ‘To what extend does the team achieve goals?’ ‘Does the team receive internal complaints, if so, what kind?’ ‘Do members respect each other?’ ‘How are meetings held, are they effective?’ After having held the interview with the manager improvement / team lead and members of a team, it should be possible to determine how effective a team is.

3.3.3 Task interdependence

Task interdependence was measured with the 5 item scale of van der Vegt and Janssen (2003). Example items are “I have a one-person job; it is not necessary for me to coordinate or cooperate with others” and “I have to communicate regularly with colleagues about work-related issues”. The same likert scale that was used by van der Vegt and Janssen (2003) was used for this research, being a seven-point likert scale ranging from “strongly disagree” to “strongly agree”. This scale was translated from English by the author of this research, verified by a professional researcher. The reliability score of this scale in this research is .78.

The definition of task interdependence used in this research is the extent to which members have to interact with each other in order to complete their tasks (Shea and Guzzo, 1997 in Langfred 2000). The dimensions which determine the level of task interdependence are the interdependence of work activities and the level of interaction between members. The level of task interdependence is determined by structural work features, which are indicated by how interdependent work activities are and the level of interaction between members.

The managers improvement / team leads were asked to describe how much team members communicate and how they can reach each other. Another example question in the individual interviews is whether the managers improvement / team leads think members have an individual job. An example question in the group interviews to determine the how task interdependent the work activities of the members are: ‘which activities do you do individually, and how much time do you spend on them?’ ‘How well can you tune your working activities together?’
The managers improvement / team leads were asked whether they think the level of communicating, cooperation and interaction is on an appropriate level given the working activities of the members. To the members, mostly the same questions that were asked in the individual interviews were asked with additional questions like ‘when do you decide to ask help of a colleague, and how often?’ ‘Do you feel it takes unnecessary extra time to discuss a problem with colleagues or does the investment pay off?’ ‘Is it possible to free-ride on the successes of a fellow member?’ The additional questions asked to team members are directed to get to know very specific examples of task interdependence.

3.4 Sampling strategy

The selection for the population among which the survey was distributed was set up by DoPont. Five business units were selected to participate in the research, because of practical implications such as time constraint and the preference of the HR manager to research the chosen business units. After this selection, all the production shifts of the participating business units were invited to participate.

Based on the results of part one of the research, the survey, seven cases were selected for the in-depth research. Those cases have been selected based on their average score on team autonomy and task interdependence. The teams which made up the most wide spread scores on these two variables were selected. Moreover, a minimum of 4 respondents per team was demanded. Originally, a 100% response rate was demanded. However, due to the small number of respondents the researcher chose to accept a minimum of 4. The following selection was made based on the above described criteria.

<table>
<thead>
<tr>
<th>Team</th>
<th>Team autonomy</th>
<th>Task interdependence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>3.</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>4.</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>7.</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 3: selection teams for part 2 based on level team autonomy and task interdependence

7 was the maximum number of teams to be selected, based on the fact that no other team fitted in the pattern of high and low scores on the independent variables or did not reach the minimum of 4 respondents. Selecting the proper teams was rather difficult since there was not much dispersal between the average scores of the teams. All teams scored in the higher segments of the scale from 1 to 7 (based on the likert scales of the survey). The classification of high and low scores was made based on the dispersal of the scores. All scores below 5 would be labelled as low, and all above 5 would be labelled as high. This classification should be considered to be relative because all scores were above 4.04.
3.5 Data analysis

3.5.1 Data analysis part 1: survey

All data from the survey was gathered in SPSS. First, the average score on each variable per team was made up based on the individual scores of the team members. As mentioned, those average scores were used for the selection of teams for the second part of the research. Second, a regression analysis on an individual level of the scores and on a group is done in order to judge the significance of the researched relationships. To conclude, a variance analysis is done in order to judge the coherence of the scores within groups and scores between teams.

3.5.2 Data analysis part 2: interviews

All the interviews are recorded and transcripted accordingly. The transcripts and tape recordings of the interviews can be requested for with the researcher. The transcripts of the interviews are very detailed, with the literal texts of the respondents. This is done to be able to search for nuances in the data between different teams. This resulted in a rich data set of numerous pages. In order to structure the data and be able to analyse it accordingly, a coding scheme was set up. This coding scheme was set up based on the content of the interview protocols, literature and data of the interviews. The following table presents an impression of the coding scheme:

<table>
<thead>
<tr>
<th>Concept</th>
<th>Code</th>
<th>Text</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team autonomy</td>
<td>Making staff planning</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Determining working methods</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task interdependence</td>
<td>Receiving information, instructions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communication team members</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team effectiveness</td>
<td>Achievement team / business unit goals</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Respect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct effect team autonomy – team effectiveness</td>
<td>Open coding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderating effect task interdependence</td>
<td>Open coding</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Per team a data matrix was set up. As can be seen, the three variables and two relationships are included as concepts. First, selective coding was applied by marking phrases of text in the transcripts in the colour of the different core concepts. While doing this, the researcher had an open minded attitude and made an effort not to be too selective in leaving phrases out. Accordingly, those marked phrases were pasted behind the applicable code under the heading of ‘text’. This gave the researcher the possibility to get a clear overview of all the data on a specific subject. In the results column the data was summarised and translated in English. It should be noted that coding, summarising and translating the data are an interpretation of the data by the author. In order to write the results as transparent as possible, it is indicated how the author got the data. This is done by phrases such as ‘the MI states ...’ or ‘members feel that ...’.
In the second part of the results chapter a holistic description of each indicator is given by presenting the results arrived from the data matrix. A holistic overview per indicator is considered needed because in the search the mechanisms that behind the relationships between the variables all data could be of importance.

3.5.3 Control variable

Group size: the minimum of group members in a team is 4, as has been the minimum in Langfred’s (2000) research. According to Langfred (2000), group size has a considerable effect on group performance and was therefore his (only) control variable.

3.6 Research quality indicators

This research contains three different research methods, indicating data triangulation to sustain the credibility of this research. For example, the results of the survey are discussed with the managers improvement / team leads and the researcher has two possibilities to research the teams trough the individual interviews and group interviews.

The outcome of the survey analysis can be generalised to the population that was invited for this research. The findings generated in the second part of the research are transferable to other teams within the production department of DuPont. However, it should be noted that the main objective of this study is to gain insight in the nature of the relationships that were researched and not the generalisation of the findings.

To sustain the dependability of this study the procedures are thoroughly documented in a methodological section and by making use of existing measurement scales in the survey, interview protocols and the coding frame.

Within one team several members are asked for their perception about the variables. This guarantees the confirmability of the study because it becomes apparent to the researcher when the perceptions are contradicting. In such case, the researcher anticipated on the differences.
4. Results

This chapter presents the results of the survey analysis (section 4.1) and the results of the in depth (group) interviews that were held with the managers improvement, team leads and team members (section 4.2). Section 4.2 begins with a thorough introduction on the business units of DuPont that participated in this research. This introduction is needed for the reader to understand the results of the qualitative part of this research.

4.1 Results part 1: survey

114 respondents, divided over 25 teams in 5 business units, have filled in the questionnaire. This section presents the results of the questionnaire. The table below gives an overview of the team averages and the number of participants in the survey and interviews of the teams which have been selected for the second part of the research.

<table>
<thead>
<tr>
<th>Team</th>
<th>Team autonomy</th>
<th>Task interdependence</th>
<th>Team effectiveness</th>
<th>Nr. team members</th>
<th>Nr. Respondents questionnaire</th>
<th>Nr. Participants group interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>4.04</td>
<td>4.78</td>
<td>4.52</td>
<td>7</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>4.39</td>
<td>5.10</td>
<td>4.74</td>
<td>7</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>3.90</td>
<td>6.15</td>
<td>4.33</td>
<td>8</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>5.32</td>
<td>4.66</td>
<td>5.14</td>
<td>8</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>5.84</td>
<td>4.83</td>
<td>5.28</td>
<td>10</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>5.60</td>
<td>6.40</td>
<td>5.53</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>7.</td>
<td>5.30</td>
<td>5.35</td>
<td>5.22</td>
<td>8</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4: average scores on variables per team and number of participants

**Individual level - significance direct effect team autonomy and moderating effect task interdependence:**

Analysed on an individual level of 114 respondents, team autonomy correlates positively with team effectiveness (.365) at a significance level of .001. Task interdependence correlates positively with relationship between team autonomy and team effectiveness (.178) at a significance level of .109, indicating that the moderating effect of task interdependence is not statistically significant.

<table>
<thead>
<tr>
<th>Effect on individual level</th>
<th>Standardised correlation coefficient</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct effect TA</td>
<td>.365</td>
<td>.001</td>
</tr>
<tr>
<td>Moderating effect TI on TA-TE</td>
<td>.178</td>
<td>.109</td>
</tr>
</tbody>
</table>

Table 5: correlations and significance effects individual level

**Team level significance direct effect team autonomy and moderating effect task interdependence:**

Analysed on team level including the total of 25 teams which have responded to the survey, team autonomy correlates positively with team effectiveness (.584) at a significance level of .010. Task interdependence
correlates positively with relationship between team autonomy and team effectiveness (.151) at a significance level of .474, indicating that the moderating effect of task interdependence is not statistically significant.

<table>
<thead>
<tr>
<th>Effect on team level</th>
<th>Standardised correlation coefficient</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct effect TA</td>
<td>.584</td>
<td>.010</td>
</tr>
<tr>
<td>Moderating effect TI on TA-TE</td>
<td>.151</td>
<td>.474</td>
</tr>
</tbody>
</table>

Table 6: correlations and significance effects team level

**Standard deviations per team and variable (ANOVA)**

The table below presents the standard deviations of the scores within the teams. There are a few notable standard deviation scores. In team 4, both the deviation score for team autonomy and task interdependence is rather large, and in team 2, the deviation score for task interdependence is rather high, indicating that the minimum and maximum mean individual scores on the variable differ quite much. These rather large variances in means in the team 4 and 2 cannot be explained by relating them to the role of the members. For example, it cannot be said that the team leads / managers improvement scored differently than the rest of the members causing the means to go up or down much. Probably, the variance can be explained by the different interpretation of the level of the variables. For example, one member might consider his team to be very autonomous based on his experience, while another member might have work experience in another organisation where the level of autonomy was lower, causing him to have a difference reference frame.

<table>
<thead>
<tr>
<th>Team</th>
<th>Std. Deviation team autonomy</th>
<th>N team autonomy</th>
<th>Std. Deviation task interdependence</th>
<th>N task interdependence</th>
<th>Std. Deviation team effectiveness</th>
<th>N team effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.57</td>
<td>7</td>
<td>.88</td>
<td>7</td>
<td>.59</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>.80</td>
<td>10</td>
<td>1.33</td>
<td>10</td>
<td>.70</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>.72</td>
<td>4</td>
<td>.62</td>
<td>4</td>
<td>.31</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1.17</td>
<td>7</td>
<td>1.29</td>
<td>7</td>
<td>.79</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>.85</td>
<td>7</td>
<td>.72</td>
<td>7</td>
<td>.49</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>.36</td>
<td>6</td>
<td>.51</td>
<td>6</td>
<td>.52</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>.22</td>
<td>4</td>
<td>.90</td>
<td>4</td>
<td>.63</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>1.01</td>
<td>45</td>
<td>1.12</td>
<td>45</td>
<td>.69</td>
<td>39²</td>
</tr>
</tbody>
</table>

Table 7: standard deviations per team

As can be seen in the table below, both the standard deviations of team autonomy and task interdependence are significant (smaller than .05), indicating that the means of the selected teams differ statistically significant from each other. The differences between the means of team effectiveness do not differ statistically significant, indicating that the researcher cannot rule out coincidence in the difference between the means of the teams.

² Due to a mistake in setting out the survey, there was a lower response in the scale of team effectiveness.
Table 8: significance standard deviations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Significance between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team autonomy</td>
<td>.000</td>
</tr>
<tr>
<td>Task interdependence</td>
<td>.025</td>
</tr>
<tr>
<td>Team effectiveness</td>
<td>.076</td>
</tr>
</tbody>
</table>

4.2 Intermezzo between part 1 and part 2

As stated in the method section, this research builds upon the research of Langfred (2000). The survey was set out in order to determine the presence of the direct and moderating effect between the variables as presented in the conceptual model. Testing the model was required before researching it in a qualitative manner because one cannot assume the presence of the found relationships in the research of Langfred (2000) in a different setting with different teams. The results show that the direct effect of team autonomy is statistically significant. However, the moderating effect of task interdependence has not been proven statistically significant, which is striking with the results of the research of Langfred (2000), where the moderating effect did prove to be significant. The researcher of this study has chosen to continue to execute part 2 of the research as was written down in the method section. An important reason for this decision is that the second part of the research can still reveal interesting knowledge on the moderating effect of task interdependence. Even though not statistically significant, task interdependence correlates positively with the relationship between team autonomy and team effectiveness and the researcher still regards it of interest to investigate this effect. As such, it is still interesting to research why the moderating effect was not proven statistically significant.

4.3 Results part 2: individual - and group interviews

Before presenting the results per team it is important to have a clear overview of some organisational aspects in which the production teams of DuPont Dordrecht operate. Therefore, this section starts by presenting this overview.

The 114 respondents of the survey work in 25 teams spread over 5 business units. Each business unit is responsible for producing one product, or for one process in producing a product. In one business unit there are 5 production shifts and a day shift. The day shifts are excluded from this research. The production teams work in shifts of 8 hours, night and day. Each team consists of 6 to 10 team members. Each team has a team lead (team leader). 5 out of the 7 teams which participated in the second part of the research have a manager improvement. This manager has no production working activities, however, he is responsible for the performances of the team. Besides that, his main responsibility is to guard safety during the working shifts of the team. This is necessary because the production teams work with chemicals in dangerous situations such as high floor levels, temperatures and pressures. In the teams that have a manager improvement, the team lead is a member of the team. In the two teams that do not have a manager improvement, the team lead rotates between the 5 teams in the business unit (those two teams are in the same business unit). In any case, team
eads are technical leaders whom operators can turn to for technical and working matters. The illustration below shows the hierarchical positions in a team.

The teams are made up of members with different roles, ranging from A1 to C2, A1 being the role of an operator with the lowest level of training (Vapro, diploma’s for operators) to C2 being the team lead. There are 8 roles in total. Additionally, it is possible for a team to have 1 or 2 contractors. Depending on the business unit the team members have different roles. Some business units require higher educational minima to work in than other business units.

Each business unit consists of a central control room (CCR) and an operating field, which could be indoors, outdoors or both. The physical distance between team members can be rather large.

DuPont is focussed on creating self-managing teams in the production department. Therefore, besides their production work activities, team members perform tasks to be self-managing. Examples are time management, quality control and safety. However, those tasks are different per team and business unit.

4.3.1 Results per indicator

In the tables in this section, the results from the individual interviews with the managers improvement / team leads are presented per variable and indicator.
Indicators team autonomy

Results

General level

Generally seen, members are of opinion that the organisation sets conditions so that the team can execute their work properly and safely. The team members are the specialists of the factory but management decides on important aspects in the process (e.g. temperatures of machines). The members are able to decide on less important aspects in the process themselves. Most teams regard it to be autonomous in terms of being allowed to make quick decisions for rather small problems. They can intervene without approval of a supervisor, with the exception of team 1 and 2, where the team leads take more important decisions for the team. In the area report most activities which must be done during a working shift are written down. Some teams feel restricted by the conditions which are set by the organisation whereas others still experience a relatively high level of autonomy. All members are of opinion that they are a well performing autonomous team.

Members, team leads and managers improvement have mentioned several disadvantages which they experience as autonomous teams. In several teams it was mentioned that a disadvantage of the high level of team autonomy is that members are confronted with making decisions over each other. For example, the time manager might have to tell a fellow member he cannot take a day off. A similar disadvantage of having a high level of autonomy is that members have to address each other about their behaviour. Moreover, having a high level of autonomy requires initiative of members themselves to work on their self-managing tasks properly. Most teams have no one to supervise them on executing their self-managing tasks. Another disadvantage of all teams having a high level of autonomy is that each team decides on conditions in the production process itself. For example, one team is of opinion that a certain temperature is appropriate while another team may prefer a higher or lower temperature. One of the managers improvement mentioned that DuPont is one of the most dangerous factories in Europe and therefore a team should not be too autonomous in which everyone can just do whatever they want or think is right.

On the other hand, in some teams with a high level of autonomy, things are picked up by members independently like small improvements, help each other to develop ideas, indicating an advantage of team autonomy. Moreover, team members think it is more fun to get more responsibility instead of someone telling you what to do. When the team achieves a success they will earn all credits for it. A manager improvement states that team autonomy stimulates to do more as a group instead of as an individual.

Setting up team goals

Goals are not set up on a team level but per business unit. Each team much contribute to achieve the team goals. Business unit goals concern for example production levels and safety. In each business unit, except for 1, a team of representatives is set up, including members from all teams. The influence that those teams have differs per business unit. In one business unit the representative team may set up goals which must be approved by management. In this business unit, members feel they have a fair amount of influence on the height of the goals. In other business units the team is consulted after the management has set up the goals and in yet another business unit the team and management set them up together. Teams from those business units experience their influence to be lesser, which is the majority of the teams.

Setting up work staff planning

All teams have one or two time managers and are responsible for making their own staff planning. The time managers make the weekly and long term staff planning, keeping track of over hours that are made, planning in extra people to fill up holes in the planning in case of sick leaves. Most teams handle a planning in which members rotate over the different places in the factory. All members have a role description which demands them to be able to work on all parts of their factory. However, most team have members who are an exception to this rule. Having too many members who are not all-round may cause problems for making a rotation scheme. In team 1 and 2, which are from the same business unit, the team leads are responsible for making the staff planning. They also determine which member works where. Compared to other teams, the team leads of team 1 and 2 have more authority over the staff planning compared to team leads in other teams.

Most teams do not experience difficulties with the staff planning. Sometimes, it is hard to plan the vacations of all members in such a way that they do not overlap too much. In one team members notice that lately, there are not enough people in the team to fill all positions.
In all business units, teams must follow an elaborate set of procedures in their work activities. As mentioned, the area report determines which activities must be executed during an 8 hour working shift. The teams can set priorities themselves about when, which activity is executed and by which member. For most activities procedures and protocols are set up to which members must comply. Most of the procedures and protocols must guarantee the safety of the employees. When there is more than 1 option to execute an activity, the members are free to determine which option is most suitable. Either individually, within the team, or with help of supporting staff such as an engineer, programmer or maintenance man. The extent to which teams are bounded by procedures is comparable, however, it is interpreted differently. In team 2 the members stated ‘we feel free in determining how we do our work, as long as the work is being done properly’. Whereas in team 6 members said that ‘we feel that the numerous procedures rule out the own interpretation of the operators’.

In most business units, procedures are set up by specialists and a team of operators, indicating that members have an influence on how they are set up. Procedures are reviewed every determined period (e.g. 3 years), in most business units, teams have an influence on this as well.

In most teams, members aim to try to solve technical problems themselves. For common problems procedures are set up or members are familiar enough with the problem to solve it without help. In most teams it is stated that it depends on the experience of the operator how much freedom is granted to decide what activities must be undertaken. Less experienced operators are required to consult a more experienced operator. In all teams members can call for supportive staff themselves, with the exception of team 2, where members must ask permission at their team leads or the men in the CCR. The team leads in team 2 do not want every operator to call whenever they regard it necessary in order to prevent an overload of phone-calls to supportive staff.

In case of a social problem, members can rely on their manager improvement for mediation in case they have one. In most teams members make an attempt to solve their own social problems within the team and only turn to their manager improvement if they do not manage. In a few teams, members turn to their team leads or manager improvement rather quickly.

All teams except for team 4 and 6 have a manager improvement. The managers improvement are not part of the team and do not participate in the production process. They must guarantee that all safety regulations are followed and take the lead in case of a safety issue. Additionally, as mentioned above, managers improvement can be addressed in case of a social conflict. In team 4 and 6, members turn to a manager improvement of another business unit in case they need his services. Even though managers improvement are hierarchically seen responsible for the actions of the team, all members feel that they are granted a great deal of freedom by their manager improvement.

All teams have 1 or 2 team leads. Team leads are technically responsible for the continuation of the production process. In most teams the team leads are part of the team, almost equal to any other member. They do not have more responsibilities, except for attending the meetings to receive and hand over the shift to other teams and the day shift team. Some team leads do not even want to be called as such. In all teams, team leads have a C role and thereby have a lot of knowledge of the production process, making them a logical point for asking questions by members. In team 1 and 2, the team leads have more authority and responsibilities compared to the other teams. Firstly, they took up the responsibility of making the short- and long term staff planning, giving them the power to decide which members works where. Additionally, they do not participate directly in the production process by occupying one of the working spots. They are supervising and controlling the team. Team leads in team 1 and 2 are more seen as hierarchical leaders compared to the team leads in the other teams.
All the members feel that they must function as a team in order to keep the production process going. No one has all the knowledge of the process, instead, the team has its own specialists on the different parts. Those specialists are called ATO’s (Assistance To Operations) and being an ATO is one of the self-managing tasks. Normal operators possess enough knowledge to keep the process going when there are no disturbances and are able to solve minor problems. In case of a more complex problem, an ATO is asked for assistance.

In all business units, the several parts of the production process are interconnected to each other, indicating that all parts must function properly in order to be able to produce the end product. This requires the members, who are divided over the process, to be interconnected as well.

In all teams members must execute individual activities during a normal work shift such as walking a patrol round, filling in reports or cleaning. They need their colleagues in case they require help because they do not know something or need physical assistance, for example, lifting materials. Moreover, in some business units members must back each other up when someone must leave his place to check something somewhere else or goes on a lunch break. The men in de CCR (central control room) often ask members to go check or fix something if they get an alarm, in such case, another member will observe that persons place for a while. In some business units members take responsibility for a part of the process in couples, indicating that they execute all activities in pairs.

In general the way the factories are organised, give the members the possibility to tune their working activities. In the beginning of each working shift a work division plan is made which indicates what everyone will be doing that shift. As mentioned, members can set their own priorities during a working shift. However, in all teams members must respond to alarms or requirements of the men in the CCR, this might cause other activities to be postponed or left out. Most teams have exactly the right number of members on shift to get all the work done. In the past teams were bigger, which made it harder to tune all the activities together.

All teams state that it might be possible to not work properly on the short term, but on the long term it will become visible when a member is lacking work commitment. On quiet days the lack of efforts and motivation can be camouflaged as long as the systems keep working. However, on busy days all members must work properly because the teams are not big enough for members to do nothing. Most members prefer that colleagues tell honestly when they have a bad day so they can anticipate by working a little harder. The teams are prepared to work harder when one of the members has a bad day to take the pressure of his shoulders because they all believe it is human to have a bad day.

In all teams, the conditions for social loafing are considered poor, indicating that free riding on the successes of fellow members is hardly possible. 5 out of 7 teams never noticed that anyone free road on the success of a colleague. Because of the decreased number of team members everyone has to be able to perform his work properly. If a member does not know enough, it becomes visible according to many members. On the other hand, in team 3 members state it is possible to ‘free ride’ on the success of a fellow member because they have the motto that when their team achieves a success, everyone gets the credits. Their bosses have no insight in who executes which work. It sometimes happens that a colleague ‘free rides’ on the success of a colleague. In team 5, when members are complemented with the success they do not always tell that they did not work on it, but their colleague did. However, these two examples regard very minor successes and do not imply that the member free-riding on that particular success is not achieving success of its own.

On average it takes around 5 to 6 years to be trained all-round in the business unit that a members works for. Because of the long training period not all members in the teams are all-round.
In all teams members are interacting in the forms of meeting, helping each other and making use of each other’s knowledge by sharing information. In all teams, except team 5, members, team leads and managers improvement are of opinion that there is enough interaction between the members. In team 5 the manager improvement is of opinion that there is not enough interaction between members and he mentioned several consequences of the low level of interaction. Members are less negative about the situation, however, they do recognise the problem to some extent. The situation will be described later on.

All the teams use a Getronics system to communicate with each other in the factory. For a field operator, the persons he communicates most with are his fellow operator in the part of process (when present), the persons in the CCR and the ATO’s. As states earlier, many parts are covered by two operators who execute working activities in pairs, making the two operators very dependent on each other. Secondly, the CCR receives all alarms and communicates them to the field operators, indicating that field operators receive information and activities of the CCR. In all business units the CCR is the central point of communication. Thirdly, in case of a disturbance which the operator cannot solve by himself, he will communicate to the specialist on that part of the process for help.

In most teams members are of opinion that when they need help, their colleagues are prepared to help them if they can. A problem which seems to occur in several teams is that some members are reluctant to ask for help when they need it because for example, they think they are capable to solve the problem themselves or are afraid to show any shortcomings. In team 1 and 2, members most often turn to their team leads for help because the other members are busy working on other parts of the factory. The team leads are their natural point to turn to for help. In the other teams members are less focussed on their team lead(s) for help. In all teams, members first try to solve a problem individually and do not ask for help right away when they do not regard it necessary. For minor or routine problems most members do not need to ask for help. Again, it depends on the experience of the team member how often he must ask for help or give help.

As mentioned earlier, all members are dependent on each other’s knowledge because no one knows everything. In case of a problem members might require each other’s knowledge. Besides, in several teams members discuss their work on quiet moments very often as well. In one team it was mentioned that members share their knowledge without fellow members having to ask for it. This implies a high level of knowledge sharing. Team 5 is an exception on this, because members do not share as much information with each other as members in the other teams do. The consequences of the low level of information sharing and communication are discussed in section 4.5 and the conclusion.

In all teams the manager improvement, team leads responded positively on the question how well team members are aware of problems, with the exception of team 5. The manager improvement of team 5 stated that not all members are capable to recognise problems and members do not communicate enough about the existence of problems. Due to the interconnected communication systems which the team use members can hear the problems which other team members may be faced with. Additionally, due to the interconnectedness of the production process, members can also notice problems in different parts of the factory because it affects their own part.
### Results

<table>
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<tr>
<th>Indicators team effectiveness</th>
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<td><strong>Team objectives and integration</strong></td>
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| As mentioned, production goals are set up on the level of the business unit, as such, teams must contribute to the total achievement of the goals. Most managers improvement or team leads are satisfied with the level of performance, however, most of them indicated that there is always room for improvement. Most managers improvement / team leads are of opinion that most problems are handled by the team themselves. The manager improvement of team 5 recognises that the team does not perform well enough.  

Of the managers improvement / team leads that are aware of the external complaints which come in, most of them are of opinion that their team does not receive too many, even though, most of them have the spirit that each external complaint is one too many. However, reasonably seen, they are satisfied with the small amount of external complaints they get. Some members indicated that sometimes they receive a complaint which is not their fault.  

Internal complaints mostly run through the managers improvement, or in case of team 4 and 6, through the team leads. In several teams, the researcher noticed that members very often think that the team which has shift before them is a bad shift and the team that comes after them is a good shift. Therefore, the opinion on internal complaints of members is somewhat blurred. Only team 5 seems to receive more internal complaints compared to the other group, mostly about work which has not been done or has not been done properly. |

<table>
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<tr>
<th><strong>Implementing decisions</strong></th>
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<td>In all teams members can deliver ideas to improve aspects in their working environment. For example, improvements in procedures, materials or cleaning tactics. DuPont has developed an idea delivering system which keeps track of whom proposed an idea. A group of specialists decides if the idea is feasible and organises the implementation of approved ideas. In all teams members have delivered ideas, some teams a lot, some less. The members itself are only involved in the implementation when they required by management.</td>
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<th><strong>Healthy climate</strong></th>
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| All members indicate that they have a pleasant working environment. However, during the interview the researcher noticed that in team 3 there are a few dominant persons who cause some tensions among team members.  

All members claimed that they respect each other, both on a professional and social basis. There is lots of laughter in the teams. In most teams members indicated that they trust all their fellow team members. However, they are aware of the strengths and weaknesses of their colleagues causing that they sometimes check on the less strong colleagues if they have done a good job. |

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<th><strong>Working methods</strong></th>
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| Meetings are held at the beginning of every shift in which current problems are discussed and a task division is made. Furthermore, most teams hold monthly meetings in which they discuss aspects like updates, safety issues, training options. When the teams hold a meeting during work time, not all of the members can be present the complete meeting because the factories must be occupied.  

In all teams members have the responsibility to execute self-regulating tasks, which are considered to be part of the job/role and feel like automation to the members. Members consider the self-regulating tasks important and needed for their autonomy. 'When you fall in the water you start moving to keep on floating' is what one of the members answered on the question whether members think that the self-managing tasks are helping them in being autonomous. In general, most members do not feel that it takes extra time to be autonomous because it is in their daily routine. For example, when a member needs an engineer to solve a problem, in 6 out of 7 teams they can make the call directly without permission. However, several teams complained that when it is busy they do not have enough time to work on their self-managing tasks. |
4.4 Results direct effect team autonomy – team effectiveness

This section presents the mechanisms of the direct effect of team autonomy on team effectiveness as they were found in the data derived from the individual and group interviews (presented in section 4.3), structured by means of the important indicators of team autonomy. The researcher has taken the freedom to draw conclusions on the mechanisms of the relationship between team autonomy and team effectiveness and present them in this chapter, because formally, they do not belong in the conclusion chapter since it is not part of the research question. However, it is necessary to present the mechanisms of this relationship in order to describe the mechanisms of the moderating variable task interdependence later on in this chapter.

The team autonomy results of the survey showed that all seven selected teams scored above the average of 3.5 (on a 7 point scale) with the lowest score of 3.9 and highest score of 5.8. In general it can be said that the teams are indeed rather autonomous, as the survey results indicate. However, none of the teams score extremely high (6 or higher). Important indicators that determine the level of team autonomy are making the staff planning, the involvement of setting up team goals, procedures to which they must comply, the decision making process to solve disturbances or other problems and setting priorities during a working shift, instructions which they receive from day shift and the responsibilities of their manager improvement and/or team lead. The levels of the indicators found and their effect on team effectiveness are described in the following paragraphs.

All teams are responsible for making their own staff planning, including planning which member works in what part of the factory, planning holidays and days off, salary administration and calling in extra staff in case of shortly noticed sick leaves. The positive effect of being in charge of making the staff planning on the effectiveness of the team is that the time managers know the members’ preferences, skills and knowledge in the team. With this understanding the time manager can make a more adequate planning compared to someone who is not part of the team and does not know the members as well.

The level of influence that teams have on setting goals varies. There are no goals set on team level, only on the level of the complete business units. In most business units there is a team with representatives of each team that is involved in setting up goals. These teams can influence the heights of the goals. However, the space for negotiation on the height of the goals differs per business unit. Team 4 and 6 have most influence because their representatives’ team can set up the goals and the management must approve of them afterwards. Team 1 and 2 feel they have little influence on the height of the goals. In one team members have no influences on the business goals and desire no influence on it. The effect of not having much influence on the height of the goals is that team members feel to have little control of being able to achieve them.

Most teams have a comparable level to which they determine their own working methods. In all business units, teams are bounded by many procedures. Those procedures make sure that all five teams which work in the business unit handle the same standards in the production process, such as temperatures and pressures. Because teams work with chemical and dangerous materials, they are obliged to work according to the
procedures for their own and others’ safety. The extent to which working methods are described in procedures varies among the teams. When team members feel bounded by procedures too much it has a negative effect on the teams’ effectiveness because they feel restricted to deliver their own input: ‘we feel we have to execute as it says in the procedures and do not have to think ourselves anymore’. Especially in the teams with higher educated members (most often B and C roles) they feel like their own initiatives ‘to do the right thing’ are taken away. The teams with less high educated members (team 1 and 2) seem to be less bothered by the restrictions of procedures. Another negative effect of having to comply with too many procedures which was mentioned is that it takes time to go through all the paperwork in order to finish an activity, for example, fixing a machine. However, members in all teams stress the importance of having procedures to guarantee their safety. All teams have the freedom to deliver ideas and propose improvements for the procedures. Whenever members have a choice which procedures to follow, they are free to decide which one they will use.

Most members indicate that they prefer to solve technical problems within the team. In all teams, members have the autonomy to decide which actions should be taken in order to solve a technical problem. When the members have the knowledge and skills they will try to solve the problem themselves. Only when they do not possess the right knowledge they can call for supportive staff such as an engineer, adjuster or maintenance man for help. Especially during the evening and night shift, when supporting staff is absent, teams get much freedom to take decisions. The positive effect of having a relatively high amount of freedom to solve technical problems is that it enlarges the knowledge which operators posses on the production process. Additionally, getting the responsibility to solve problems stimulates operators to do the best possible job. A manager improvement describes it as ‘when the team achieves a success they will earn all credits for it’.

Most teams indicate that they can set their own priorities during a working shift. All teams start their working shifts by holding a meeting in which the finishing team hands over the responsibility to the starting team. The team lead, and when applicable the manager improvement, day shift and supporting staff attend those meetings. In those meetings the day shift tells the team lead which activities must be done that working shift by presenting the area log. Afterwards, the team discusses the work which must be done during the shift. During those meetings the team can set their own priorities for working activities. The amount of freedom to set priorities is experienced differently in the teams. Again, the teams with more highly educated members feel less free to determine their own priorities. It did not become clear in the interviews how setting their own priorities helps a team to be effective.

The autonomy and responsibilities a team lead has in a group varies among the teams. In team 1 and 2, the team lead has more power over the team compared to the team leads in other teams, they also do not participate in the production process as the other team leads do. To illustrate, in team 1 and 2 the team leads are in charge of making a staff planning whereas in the other teams, this is done by a normal team member or two members. Moreover, in team 1 and 2 the team leads take more decisions for the team and members get more instructions of their team lead. In team 2, members cannot call for supportive staff without permission of
a team lead or a CCR man. These two teams, which are from the same business unit and are very comparable, have scored the lowest average levels of autonomy (together with team 3) in the survey.

An effect which occurs in autonomous teams that do not have an autonomously acting team lead on team effectiveness is that the responsibility to address team members on negative or deviant behaviour lies with all the members in the team. In all teams, with the exception of team 1 and 2, the team lead is considered equally autonomous as the other members in the team. In those teams, the responsibility to address behaviour lies with all members. In several teams, members and managers improvement indicated that members address or correct each other when necessary. However, in one of the teams the team lead stated that members do have difficulties to address fellow members: ‘when someone is not working hard during a busy shift there is not much preparedness to tell him to speed up by the members’. The team leads of team 1 and 2 seem to experience fewer difficulties to address team members. The difference in team autonomy compared with the other teams is that seen from an organisation wide perspective, the team is rather autonomous, but most of the autonomy is placed with the team leads, and not with the team as a whole. The consequence of having authoritative team leads in the teams is that members only accept comments or corrections from their team leads and not of other members.

In the teams where much autonomy is given to the team as a whole, opposite to the teams in which the team leads have much power over the members, the members seem to be better able to address each other on their behaviour than members in teams in which the team lead has much power. As such, members in the teams with a powerful team lead do not seem to accept it when a member addresses them or tells them what to do, whereas in more equalised teams members do accept this. In team 5, with the lowest level of team autonomy, no data was found that because their low level of task interdependence they are not properly able to address each other.

Of team 3 the results of the survey are striking with the results of the interviews. In the survey, the average score of the team is 3.9, which is the lowest score compared to other teams. Whereas, as can be read in the results of team 3, the members state that they regard themselves to be rather autonomous. The manager improvement also stresses that he regards the team to have a high level of autonomy. Because the team had a rather low response on the survey (4 out of 8) and because the interview results present detailed information on why the team regards itself to be rather autonomous, these results are considered more representative than the results of the survey.

4.5 Results moderating effect task interdependence

This section presents the results on the moderating effect of task interdependence that are derived from the team data presented in section 4.3 structured according to the two indicators of task interdependence, the interdependence of work activities and the level of interaction between team members. In this section,
connections between the variables are described in more detail. By describing the mechanisms of the relationships a first step is made to answer the research question in this section.

4.5.1 Interdependence of work activities

When comparing the indicator of interdependence of work activities based on the interviews, it can be stated that there is not much variance between the teams. In all the teams members state that they are very much depended on their colleagues to do their work properly. Many members indicate that not one operator has all the knowledge needed to keep the production process going, but as a team they do posses the knowledge which is required. Important aspects which determine the level of interdependence of working activities are the ability to tune work activities, the visibility of a lack of work commitment and the possibilities for social-loafing. The three aspects are described below.

In all the business units the production processes are divided in several interconnected parts. In order to be able to produce the end product, all the parts must be kept working. If one of the parts stop working, the other parts of the factory must be shut down eventually as well, because all business units work with a supply of raw materials which will pile up somewhere in the process in case of a disturbance. However, none of the production processes or working activities can be described as fully cyclic, meaning that members are responsible of their own part of the factory and in case of a minor disturbance in another part of the factory they can continue their activities in their part as long as they have materials (chemicals) in the process. The interdependence of production process parts does not moderate the relationship between team autonomy and team effectiveness.

In none of the teams members claimed to have problems with tuning their work activities on one another. The most important reason for this is that members discuss the work which must be done during the meeting at the beginning of every working shift. This allows the team to divide the tasks. Another explanation for members being able to tune their work activities is that even though they work on one production process, they all have their own responsibilities during a working shift which they can either execute individually or in pairs. Some members stressed that the people in the CCR must respond to alarms and problems ad-hoc more often, compared to members in the field, which makes it harder to tune their working activities. Based on the data, no moderating effect of being able to tune work activities on the relationship between team autonomy and team effectiveness has been found.

Most teams claimed that when a person is not working hard during a shift this will become visible, either by their behaviour or the delivered work of the person that lacks work commitment. On quiet days a lack of work commitment is less visible than on busy days. However, most members state that when they are required to work hard a whole team, everyone is committed to do so. Most members prefer that a person reports it when he is having a bad day and is not able or does not feel like working hard in order for the rest of the team to anticipate on it by for example taking up some work. The fact that a lack of work commitment will become
visible and that member discuss it openly indicates a high level of task interdependence. However, no proof has been found in the interviews that the visibility of a lack of work commitment has a moderating effect on the relationship between team autonomy and team effectiveness.

**In all the teams, there were members who state that the conditions for social-loafing are far from optimal.**

Most of the teams contain fewer members than they did in the past. The same amount of work must be done with fewer people, causing members to believe *‘that everyone has to be able to perform his work for a 100%’* (member in group interview team 1). Some members indicate that it might be possible to free ride on a small success of a member occasionally, but on the long run, all members must contribute equally. The poor conditions for social-loafing and the likelihood that it will become evident indicate a high level of task interdependence in the teams. However, it is not to be found to have a moderating effect on the relationship between team autonomy and team effectiveness.

### 4.5.2 Interaction between team members

Unlike the level of interdependence of work activities, the level of interaction between team members varies among the teams. The aspects which determine the level of task interdependence are the level of communication, the extent to which members help each other, how much instructions are needed, the extent to which members use each other knowledge and skills and the awareness of problems by team members. The results regarding these indicators and their possible moderating effect are described below.

Based on the data derived from the interviews with the manager improvement and the group interview with the members of team 5, this team has the lowest level of interaction between the members. Especially the manager improvement stressed that his team does not interact properly. The results of the survey indicate that team 5 has the last but second score (4.83). It is not possible to make a clear distinction between the teams to determine the team with the highest level of interaction, based on the data from the interviews.

**The nature of the working activities determines how intensive members should communicate.** However, it is up to the members of the team to actually determine the intensity. In other words, the intensity of communication must be in balance with the required level of communication. In team 3, 4, 6 and 7, communication appears to be most intense. In these teams, members seem to be able to estimate well when communication is required. In team 1 and 2 members seem to communicate less intensive with each other because all individual members communicate to the team leads more than they communicate with each other for example to ask questions, to organise something or to ask for help. In team 5 the level of intensity of communication is rather low because, according to the manager improvement, members are too concentrated on their own work and not on the work of others.

When members are used to communicating intensely with each other because their working activities require them to, it does not seem necessary to invest much time in working autonomously. This is indicated by the fact
that in several teams with intense communication members mentioned that being autonomous is automation to them. Many members do not believe it takes them extra time to be an autonomous team and some even mentioned that it saves time to be autonomous because it saves time in communicating separately with external people, with for example, an external staff planner. In the current situation, in which the teams have their own staff planner, members are very satisfied about the situation. Some members mentioned that their time manager knows their preferences for working days and spots. Logically, the staff planner knows this because he works with his fellow members. In several teams, members stated that it is easy for them to make their preferences knowable to the staff planners. For example, by telling them during work activities that they need a day off or checking out the planning board to plan their holidays.

Another example of how intense communication saves time in being autonomous is concerned with solving problems. All the teams have the autonomy to solve as much problems as possible by themselves and must only require help of supporting staff when they do not have the knowledge or skills to solve a problem. In teams with more intense communication, members seem to be better able to solve problems because their intense communication allows them to find the right help and input from the people who are needed, within a short time period. For example, in some teams members are aware of where their colleagues are due to using the Getronics system. Because they know where their fellow members are and what they are doing, they know which members, with the right knowledge and skills, is able to them to help out.

The opposite of the above example has also been found in the data. In team 1 and 2, communication among members is not as intense compared to team 3, 4, 6 and 7. As mentioned, members in team 1 and 2 turn to their team leads much more often instead of to their fellow members, indicating a lower level of communication between the members. For example, members do not always accept it when a fellow member tells them what to do whereas they do take orders / instructions from their team leads. The low level of communication among the team members costs time for the team lead because he must direct them. He basically is an extra object in the communication line between members, making the decision-making process longer. If a member tells the team lead he has a problem and then the team lead decides what to do next. Either solve the problem himself, tell the member who asked him what to do, ask someone in the team to help or ask help of supporting staff. Team leads indicated that this saves the member time but it takes them extra time.

In team 5, where the communication is not intense either, it was said that problems are not solved with the input of the required people. The manager improvement stated ‘I think it is incomprehensible that it possible that when a serious problem occurs, 2 or 3 might not hear of it until the next day’. This causes that the help of those 2 or 3 people cannot be used to solve a problem. According to the manager improvement, they miss out on 2 or 3 sets of hands that could have been useful. The low level of communication prevents the team members from executing their responsibility, in this case, solving a problem, in a quick and proper manner.

In all teams, members are of opinion that they are very willing to help colleagues and that when they need help, they will receive it. As mentioned earlier, solving as much technical problems within the team is an
important aspect of being autonomous. Most members indicate that they always try to solve small problems individually. However, for bigger problems they will turn to fellow members for help. Because no one has all the knowledge of the production process members ask for help quite often. When help is being asked for and offered, this will save time in solving problems.

In a few teams members or managers improvement state that it is not always easy for members to ask for help because it might show their shortcomings. In team 1 a team lead illustrated a consequence of not asking for help by saying that ‘sometimes a person can take 3 hours to find a solution to a problem instead of asking for help after trying out things for one hour’. In such cases, not asking or receiving help will take extra time if the person trying to solve the problem does not have the required knowledge or skills for it.

Members decide themselves whether they ask for help of colleagues, which might take time. However, members are willing to invest in asking for help in order to find a proper solution to a problem and executing it together with a colleague because the alternative is solving the problem individually which takes up even more time. The more time is spent to solve a problem, the higher the chance that the production process must be stopped.

Members also help each other in order to be able to execute their self-managing tasks, which give the teams an increased level of autonomy. However, self-managing tasks are only considered of secondary importance. Many team members feel that spending time on those tasks keeps them from their main responsibility: production. For many members it is hard to create time to work on their self-managing tasks. Because members are interdependent and mostly trained all-round they can help each other by taking up some work of their colleague in case someone must work on his self-managing tasks by taking over some tasks. Helping a colleague so that he can work on his self-managing tasks thus has a positive effect on working autonomously.

In all the teams, several members stated that they use the knowledge of their fellow members very often and it is considered very important by many members, team leads and managers improvement. By sharing each other’s knowledge for work related purposes members build up shared knowledge which is also used for working autonomously. Shared knowledge is beneficial for working autonomously because it speeds up the decision making process. For example, many members in one team can take a decision for the whole team because many members have similar knowledge (with the exception of specialist knowledge on a specific part of a part of the production process). With regard to the decision-making process on a team level, some members mentioned that they know when to discuss things, and when doing so, who they need to discuss it with.

None of the teams claimed that all members are aware of each problem that occurs. Most members are focused on their direct work environment, for example, their part of the factory. Trough the Getronics system members might hear of the problem in another part of the factory but decide not to pay attention to it if they are busy working on their own activities or if it is not up to them to help at that moment. In other words, most members seem to be capable of filtering the information which they receive about problems. When a problem
occurs in one of the parts in the factory, it is likely that members who do not work in that part also are aware of the problem because the problem might affect the other parts. Additionally, members mentioned that they hear of problems that other members have through the Getronics system or can physically see a member struggling with a problem. In a few teams it is mentioned that some members are more aware of problems than others, due to their experience and ability to recognise and define problems. In team 5, members and the manager improvement state that it happens rather often that members are not aware of technical problems in the shift, due to a lack of proper communication among the team members.

Based on the above described relationships between the variables, the following table has been set up. It includes which effects were found under the conditions of the level of team autonomy and task interdependence. The crosses indicate when proof was found for the existing of a moderating effect of a mechanism on a combination of varying levels of team autonomy and task interdependence.

<table>
<thead>
<tr>
<th>Mechanism</th>
<th>Effect high team autonomy &amp; high task interdependence</th>
<th>Effect high team autonomy &amp; low task interdependence</th>
<th>Effect low team autonomy &amp; high task interdependence</th>
<th>Effect low team autonomy &amp; low task interdependence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity communication</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Helping colleagues</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Using each other’s knowledge</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9: moderating effects per mechanism, per combination of varying levels of team autonomy and task interdependence
5. Conclusion

This research aimed to explore the mechanisms of the moderating effect on the relationship between team autonomy and team effectiveness that was found by Langfred (2000). After having reported the results on the survey and interviews, the research question can be answered.

What are the causal mechanisms behind the moderating effect of task interdependences on the relationship between team autonomy and team effectiveness?

Survey

This part of the research did not find a statistically significant moderating effect of task interdependence on the relationship between team autonomy and team effectiveness, nor on an individual level, nor on a team level. This conclusion is contradicting with the research of Langfred (2000), who has found the moderating effect of task interdependence to be statistically significant. The direct effect of team autonomy on team effectiveness was proven to be statistically significant, both on an individual level and team level.

Interviews

This section presents the conclusions that can be drawn from the results of the individual and group interviews, held within 7 teams.

The moderating variable task interdependence consists of two aspects, being the interdependence of working activities and the interaction between team members. The indicators of the interdependence of work activities, being the interdependence of production process, the ability to tune work activities, the visibility of a lack of work commitment and the conditions and visibility for social-loafing were not found to have a moderating effect on the relation between team autonomy and team effectiveness.

Three indicators of the interaction between team members; the intensity of communication, helping each other and the usage of knowledge of fellow members are found to moderate the effect between team autonomy and team effectiveness. Awareness of problems is found to be an indicator of the interaction between members, however, it has no moderating effect on the relationship between team autonomy and team effectiveness.

In teams with more intense communication, members seem to be better able to solve problems with the right help and input from the people who are needed. In team 1 and 2, where communication is not optimal between the members, the team leads must direct members to go help, which takes extra time. In team 5, where the communication is not intense, it was said that problems are not solved as fast as they might would have been solved when more members would be involved in solving the problem. Given the above named examples, it can be stated that the intensity of communication has a moderating effect on the relationship between team autonomy and team effectiveness.
The intensity of communication is found to be an important aspect which determines the level of interaction between teams. Moreover, a high level of communication was found to be beneficial for being autonomous. On the other hand, a low level of communication seems to prevent teams in being autonomous in an effective manner. In the examples that were mentioned in the results, the moderating effect is linked to the aspect of time. When communicating intensely it takes less time to be autonomous and when not communicating intensely, it takes extra time to be autonomous.

The usage of each others’ knowledge among members is found to have a moderating effect on the relationship between team autonomy and team effectiveness in teams with a high level of task interdependence and autonomy. The knowledge which fellow members share to execute their work activities is also used for making decisions on a team level.

The extent to which members help each other moderates the relationship between team autonomy and team effectiveness. This moderating effect of helping colleagues is found in teams where members help each other to execute working activities when a member needs time to execute his self-managing tasks. Those tasks are the beacon which makes the teams autonomous.

The three above named mechanisms that moderate the relationship between team autonomy and team effectiveness. When these mechanisms are present on a high level, they will have a positive effect on how effective the team works autonomously. All the mechanisms seem to have a relation to time. In other words, when the mechanisms, or a number of them, are present, the team will not have to invest much extra time in being autonomous.

The indicators of task interdependence that are found to have moderating effect on the relationship between team autonomy and team effectiveness seem to contain shared aspects of how they moderate the relationship. The overlap and interconnectedness between the indicators is discussed in the following chapter.

Based on the results from the survey, in which the moderating effect was not found to be statistically significant, it can be concluded that the intensity of communication and the usage of knowledge of fellow members are not strong enough for explaining the moderating effect of task interdependence in this research setting. However, they do support the positive correlation that was found between task interdependence and the relationship between team autonomy and team effectiveness.
6. Discussion

6.1 Theoretical implications

6.1.1 Major findings of the study

The findings of the survey do not confirm the moderating effect of task interdependence which was found by Langfred (2000). The findings of the second part of the study suggest that the intensity of communication, helping colleagues and the usage of knowledge of fellow members moderate the relationship between team autonomy and team effectiveness. All three mechanisms belong to the indicator ‘interaction between team members’ of task interdependence. None of the mechanisms that represent the indicator ‘interdependence of work activities’ were found to moderate the relationship between team autonomy and team effectiveness.

6.1.2 Meaning and importance of the findings

The three above mentioned mechanisms appear to moderate the relationship between team autonomy and team effectiveness through time. When one or more task interdependent mechanisms are present in an autonomous team, they will save time in working autonomously. In the paragraphs below, the effect of each mechanism will be explained in more detail.

For the moderating effect of mechanism intensity of communication proof was found in teams with both a high level of autonomy and task interdependence, with high team autonomy and low task interdependence and with both low team autonomy and task interdependence. In the model on the right it is shown that the intensity of communication has a moderating effect on the relationship between making a staff planning, solving problems and effective time use.

When team members have an intense level of communicating with each other because their working activities require them to do so, they do not have to invest much extra time in making their staff planning and solving problems. In other words, the team is able to effectively use its time by not spending extra time on working autonomously and thereby, have no process loss.

The results showed that when team members have the autonomy to make their own staff planning and solve problems but do not communicate intensively with each other, they are not able to effectively use their time.
When team members are not stimulated or forced to communicate about their work activities, they are less well able to effectively make a staff planning or solve problems because they will have to communicate about this separately on top of their working activities. The time which they must spend on being autonomous, in this case solve problems and make a staff planning, cannot be spent on production indicating a process loss.

In the teams which have authoritarian team leads, members seemed to have less decision making power to solve problems compared to members from a team with a less authoritarian team lead. Additionally, the members were not responsible for making the staff planning because the team leads were. Considering their level of task interdependence, they did not seem to communicate as intense with each other as the members from other teams because they are much more focussed on their team leads. The data indicate rather low levels of both team autonomy and task interdependence. This combination does not lead to a process loss because the team leads, who were mostly responsible for the autonomous working activities, are not involved in the production process.

The moderating effect of helping colleagues on the relationship between team autonomy and team effectiveness was found in teams with both high team autonomy and task interdependence and in a team with low team autonomy and high task interdependence. This mechanism also seems to have an effect on the time effectiveness that it takes to be autonomous.

In autonomous teams where members ask for help when they need it and where members are willing and able to grant this help, members are able to solve problems effectively and work on their self-managing tasks effectively. If members help each other to solve a problem this can save time compared to when a member does not ask for help or does not receive it. Additionally, when a member is willing and not too busy with his own activities to help a fellow member to execute his self-managing tasks the time of both members is used more effectively. In both cases time is used effectively and will not lead to a process loss.

The results show that the extent to which members share and use each other’s knowledge moderates the relationship between team autonomy and team effectiveness. This moderating effect was only found in teams with both high team autonomy and task interdependence.
By building up shared knowledge as a team, members become more equal. When members possess the same basic knowledge related to the production process and working conditions within the team they could all make decisions for the team, or at least decide whether a shared decision-making process is required or not to make a decision. This speeds up the decision-making on a team level and thereby, does not to a process loss. Of course, the knowledge a member possesses also depends on the experience of the member.

6.1.3 Relation previously done research

This section presents the relation between this study and the research of Langfred (2000), which is the main point of comparison. In the paragraphs below, the differences and similarities between the studies are presented.

First of all, the major difference between the results of this study and the results of Langfred (2000) is that this research did not find a significant moderating effect of task interdependence on the relationship between team autonomy and team effectiveness. Moreover, in Langfred’s (2000) study a higher correlation (.32) between the moderating variable and the relationship between team autonomy and team effectiveness was found compared to this study (.178). The section on the limitations of this research provides explanations why the moderating effect of task interdependence was not found to be significant.

Langfred (2000) and Liden et al. (1997) hypotheses that when team autonomy and task interdependence are high it will lead to high team effectiveness and that when both team autonomy and task interdependence are low, team autonomy will be high. When team autonomy and task interdependence differ in level it will lead to low team effectiveness. In this study, the support for the hypothesis that high team autonomy and high task interdependence leads to high team effectiveness became most evident. Only in two teams support was found for the hypotheses that an imbalance between team autonomy and task interdependence leads to negative team effectiveness. In two teams, support was found that both low team autonomy and task interdependence leads to a high level of team effectiveness. No results have been found which would contradict the hypotheses posed by Langfred (2000).

In his paper, Langfred (2000) makes suggestions of why he believes high team autonomy and high task interdependence lead to high team effectiveness. He also suggests which mechanisms teams with high or low task interdependence possess. The following paragraphs will reflect upon his assumptions about the relations between the variables and the mechanisms of task interdependence in the light of the results of this study.
Langfred (2000) defines task interdependence as ‘the degree to which completing tasks requires the interaction of group members (p. 55)’. His basic though is that in teams with high task interdependence, information sharing and decision making at a team level in order to take advantage of team autonomy, are likely not to require much extra interaction between the team members, because of the already existing interaction between team members. In such cases, having a high level of team autonomy will not lead to process loss.

The results of the second part of the study resemble his proposition that when having a high level of task interdependence, members are able to work autonomously without investing much additional time. Langfred (2000) states that team must share information and must make decisions on a team level in order to be autonomous. When having a high level of task interdependence members already interact by sharing information, and thus, this particular aspect of being autonomous as a team will not cost the team additional time. ‘Sharing information’ is a rather broad term. Langfred (2000) has not further specified what sharing knowledge entails. In this research, sharing knowledge entails using /sharing knowledge about work related aspects and helping colleagues.

Basically, what Langfred (2000) is suggesting, is that both task interdependence and team autonomy require members to share information. When task interdependence of a team is a vast characteristic of the team, indicating that members already have to share information, it will help them in effectively being autonomous by not having to invest additional time in sharing information needed for being autonomous. However, because Langfred (2000) has not specified which information is shared because a team is task interdependent it is hard to determine how sharing knowledge helps the team to be effectively autonomous. Therefore, in this study the researcher aimed to specify sharing knowledge for the sake of being task interdependent, into using each other’s knowledge and helping colleagues. Both these aspects are indicators which are more or less needed by members in order to execute the production activities, and thereby determine the level of task interdependence.

Both indicators were found to have a moderating effect on the extent to which a team is able to operate autonomously in an effective way, as described in section 4.5. Therewith, they form a theoretical contribution to the work of Langfred (2000) in specifying from which shared information teams can benefit in working autonomously.

The other indicator which was found to have a moderating effect on the relationship between team autonomy and team effectiveness is the intensity of communication among team members. Langfred (2000) does not mention the intensity of communication to be a possible indicator of a task interdependent team. Instead, he only refers to the level of interaction between members in general. As can be read in the operationalisation table (Appendix IV) and section 4.5, the intensity of communication is one of the indications that make up the total aspect of interaction between team members. To the author, it was one of the most obvious possible indicators of task interdependence and therefore, it was included in the research. The results indicate that the intensity of communication is indeed an indicator for the level of task interdependence within a team and
seems to moderate the relationship between team autonomy and team effectiveness. However, the author considers that there might be a high degree of interconnectedness between in the indicators of the interaction between members. The section in which an alternative interpretation on the findings is presented will go into more detail in how the indicators might be interconnected.

Langfred (2000) makes the assumption that in highly task interdependent teams members are better aware of problems occur the team, such as social loafing. He believes that social problems are more evident in a team with high task interdependence. In other words, he determines the possibility of social loafing and the awareness of social problems to be indicators of task interdependence. However, he makes no assumption whether these indicators could have an effect on the relationship between team autonomy and team effectiveness.

Because this research aimed to explore the mechanisms of task interdependence that moderate the above named relationship, both the possibility for social-loafing and awareness of social problems were considered to be possible mechanisms. Langfred (2000) only mentioned one example of a social problem, being social-loafing. According to the author social problems could entail more and therefore it was chosen to research a wider variety of social problems. In this study social-loafing / free-riding, a lack of work commitment and internal conflicts were researched. In addition to being aware of social problems, being aware of technical problems was also considered to be a possible mechanism which could have an influence on the relationship between team autonomy and team effectiveness in this study.

No moderating effect of being aware and the visibility of social problems was found. An explanation for this is that either no social problems were present in the teams or they could be identified. It appeared to be hard to research social conflicts within the teams. When the researcher had received information about the manager improvement that there are some tensions in the team, members were not willing to discuss them during the group interview. However, in most teams, members answered that there never are serious conflicts in the team. Therefore, too little information was available on the probability and visibility of social conflicts to indicate it as a mechanism.

However, the fact that most groups had not experienced serious social problems and that if they would exist they would notice, could indicate that both the conditions for social-loafing and lacking work commitment do not seem to be optimal in task interdependent teams and members will become aware of social problems. Based on this interpretation the visibility and probability of social problems was indicated as an indicator of task interdependence.

The assumption that the visibility and probability of social problems is an indicator of task interdependence corresponds with the suggestion of Langfred (2000). However, the results do not indicate that the conditions for these two social problems and the visibility of them, to have a moderating effect on the relationship between team autonomy and team effectiveness. Moreover, no data was found in this research which would
support the opposite idea, namely that in teams with low interdependence, social-loafing and lacking work commitment could happen more easily and that members will not become aware of it.

The final suggestion that Langfred (2000) makes on teams with a high level of task interdependence is that the team possibly acts harsher and stricter on its own members compared to using a more traditional form of management. The results show that in autonomous teams without an authoritarian leader, members must address each other on their behaviour. Additionally, when a member requires another member for help or direct him to do something, members accept this of each other, whereas, in the two teams which have more authoritarian team leads, members do not accept this. However, none of the team members mentioned they act stricter or harsher on their fellow members because they must address each other. On the contrary, some members regard it difficult to address their team members. These results do therefore not support the suggestion of Langfred (2000).

As one may have noticed, many indicators of team autonomy and team effectiveness were not found to have any relation with task interdependence. When looking at the results on the direct relationship between team autonomy and team effectiveness, all indicators of team autonomy seem to have an effect on team effectiveness, except for setting priorities. The effects of the indicators can either be positive, negative or both, as described in section 4.4. However, not data was found that indicators of task interdependence moderate those relations. Furthermore, several indicators of team effectiveness which were researched, such as a healthy climate and the implementation of decisions, do not seem to be effected by team autonomy at all. Task interdependence was only found to moderate the relationship between team autonomy and the indicator ‘effectiveness of working methods’, or more specifically: ‘time and effort of being autonomous’. This corresponds with the suggestions of Langfred (2000), who only mentions that in task interdependent teams team autonomy will not cost additional time.

6.1.4 An alternative explanation of the findings

In the results and conclusion, there is very little freedom for interpretation of the data. Only for three indicators of the 15 indicators that were researched, data was found that they indeed could have a moderating effect. Researching a moderating effect by means of (group) interviews appeared to be very difficult. Since the participants are not able to ‘link’ the three variables to each other this must be done by the researcher. Therefore, based on the results of this study, it is not a 100% sure that they indicators which were found to have a moderating effect also have a moderating effect in other teams in different settings. This statement applies to the believe that ‘the purpose of research is to discover and not to prove (Hess, 2004, p. 1239). In this line of thinking, the researcher would like to make an attempt to interpret the results of the (group) interviews more freely by describing the possible connections between all the concepts which were used in this research. This is done in a so-called ‘mind map’ which includes all the concepts that were used in this research. The mind map and explanation of it can be found on the next pages.
This mind map presents how the concepts could be interrelated to each other. The relations are indicated with + / -, + or -, indicating that the effect could either be positive or negative, or in the latter two cases, the experience of the member has an influence on whether a member mainly gives, or receives instructions. An authoritarian leader is expected to give many instructions to the team members. The following paragraphs present the most important relations of the map.

When looking at the concepts of task interdependence, the intensity of communication is the most central concept. The interconnectedness of the factory parts, holding regular meetings, and giving and receiving instructions could be considered to be the input for the level intensity of communication in a team. Consequently, the level of the intensity of communication has an influence on how effective certain activities can be executed. For example, when intense communication between team members takes place, members will be more aware of technical and social problems compared to a team in which there is less intense communication. The activities which are influenced by the level of the intensity of communication, being using each other's knowledge, helping colleagues and being aware of problems, are considered to moderate the relation between sharing information, solving problems and the invested time in being autonomous, as was found in the results of this study. Moreover, when members use each other's knowledge they are better able to make decisions on a team level.

Different than was found in the results, the intensity of communication is not identified as a moderating indicator of task interdependence. Instead, it is more considered to be an in-between mechanism which entails several indicators of task interdependence. It could be compared to the term interaction among members as it is used by Langfred (2000), instead of an indicator as it was used in this research, because it includes so many other aspects.

As found in the results, the only indicator of team effectiveness in this map which is influenced by team autonomy and moderated by task interdependence is the invested time in autonomy. When no additional time needs to be invested in being autonomously, no process loss will occur, which leads to a better performance. The other concepts of team effectiveness are not linked to the moderating effect of task interdependence or to the direct effect of team autonomy. Perhaps, a relation between the different aspects of being autonomously and the satisfaction of team members can be established because members seem to be pleased to have much control within their own team.

6.2 Limitations and recommendations for future research

This section describes the limitations of this research. It makes a distinction between limitations regarding the first part of the study (survey) and limitations of the second part of the study (interviews).
1.2.1 Survey

The effect of team autonomy on team effectiveness was proven to be significant both on an individual level as on a group level, indicating a very strong effect. The moderating effect of task interdependence however, was not found to be significant on both levels. This section presents possible explanations why the moderating effect was not proven to be significant.

The population that was invited to participate in the survey contained around 300 employees. The total response was 114, indicating a response of around 38%. Langfred’s (2000) response was higher, including 255 respondents from 25 teams. Perhaps, when the population and number of respondents of the survey would have been higher, the moderating effect of task interdependence would be significant. Therefore, future research should aim to get a higher response.

Another explanation for not finding a significant moderating effect of task interdependence is the small variance in the level of the variables among the teams. On all variables, all the teams scored above the average (3.5). In his research, Langfred (2000) included different types of teams from a large services and parts depot of a Fortune 100 computer company in the United States. The teams which were included were quality management, environmental health and safety, inventory management, customer services, warehouse operations, and field inventory operations. This research only included production teams from one organisation. All the teams work under the same organisational strategy, which entails that all the teams are more or less granted the same level of autonomy. Additionally, the level of task interdependence is very similar among the teams as well. Even though the teams are divided over five business units and produce different products, the production processes are very much alike. All the teams contain the same role descriptions, indicating that members have similar responsibilities. When there would have been more variance in scores between the teams, the moderating effect of task interdependence could be found significant. Future research should aim to find more variance in the scores, which could be stimulated by including different types of teams, from different organisations.

The scales of this study were not the ones Langfred (2000) has used in his study. Langfred’s (2000) quantitative study is very brief on the explanation of the variables, leaving them to be very broad terms. In order to find causal mechanisms of the moderating effect the variables needed to contain more details on which dimensions and indicators they include. Therefore, the author came up with a more detailed definition of the variables as presented in the operationalisation table. For the same reason the author chose not to use the scales of Langfred (2000). With each scale only containing 2 or 3 items they could not measure the variables in more detail. Therefore, the more extended scales were used in the survey were considered to measure more aspects of the variables. The usage of a different scale might have caused that the moderating effect was not significant. However, all three scales were used by other researchers before and have proven to measure the variables.
When the survey was launched the team effectiveness scale had a likert scale from 1 to 5 instead of 1 to 7. This mistake was corrected after 20 participants had filled in the questionnaire. For the analyses, a formula\(^3\) 
\[ x_7 = \frac{6\times(x_5 - 1)}{(5-1)} + 1 \] was used to properly convert the scores of the 5 point likert scale to scores on a 7 point likert scale. After the conversion, the scores of the 20 participants could be used together with all the other scores in the analyses.

As mentioned in the intermezzo section between the presentation of the survey results and interview results, the researcher continued the research as planned even though the moderating effect was not proven significant. This decision was made because the author of this study believed that the causal mechanisms of the moderating effect of task interdependence on the relationship between team autonomy and team effectiveness could still be researched in this population. The author was aware of the limitations of the survey and could therefore not rule out that the moderating effect would not exist at all in the population. Moreover, the results of Langfred’s study (2000) had already proven the existence of the moderating effect. Therefore, a continuation of the exploration of the causal mechanisms of the moderating effect of task interdependence was continued as planned.

### 1.2.2 Interviews

Seven teams participated in the (group) interviews, indicating that all the conclusions were drawn on the data derived from these seven teams. In the opinion of the researcher this is a rather small research group. Some conclusions were drawn based on data coming from only one or two teams. For example, only in team 5 low levels of team autonomy, task interdependence and team effectiveness were found. Team 1 and 2 had a somewhat lower level of team autonomy and task interdependence. However, the levels of these teams were not even that low (scores above 3.5 and not all negative aspects which were said by the manager improvement were confirmed or mentioned by the team members). Consequently, for the external validity of this study, it would have been better when more teams participated in the second part in the research. However, due to a time constraint, this was not feasible. Future research should aim to research the causal mechanisms of the moderating effect of task interdependence in larger number of teams.

It was hard to find data on the moderating effect in the interviews. Understandably, the people who were interviewed are not specialists in the research topic, making it hard for them to talk about the variables in detail. As in all good research, the participants were not asked directly what the relations between the variables in their team look like. Compared to researching a direct effect, in researching a moderating effect the researcher must connect three variables to each other. This is hard to do, based on the data from the interviews. In doing this, the researcher paid attention to not interpreting the data too much and making assumptions about the relationship between the variables. However, since the researcher operated individually there has been no one to check for this during the research itself. Future researchers should aim to conduct

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\(^3\) Formula is created by Marijke von Bergh, IVA Beleidsonderzoek & Advies (2011).
such complex research with two persons or have their interpretations of the results checked with the raw data by another person.

During the group interviews the researcher noticed that many members had difficulties with being critical about their own performances. Therefore, a more positive image of the teams was build up compared to reality. The researcher was aware of this limitation and therefore also conducted interviews with the manager improvements / team leads of the teams. They were able to provide the researcher with more critical information about the team. However, since most of the data comes from the group interviews, this bias might have influenced the results.

The researcher noticed in some group interviews that there was some tension between the members, some even started to swear. This could mean that there are some social conflicts within the group. However, in such case none of the members were open enough to the researcher in order to determine the situation in the teams. In one team, the researched got the respond that some questions regarding task interdependence were too personal to be discussed in the team. It might also be possible that in other teams, where tensions did not show during the group interviews, that there some internal conflicts. It is possible that when a team has social problems members are not as open during a group interview as when all relationships are fine. Therefore, during the group interviews information might be held from the researcher. This could have been prevented when individual interviews with the team members were held. Therefore, future research should include both group- as individual interviews with team members.

It was not possible to determine exact levels of the variables for a team as a whole based on the interview data. Some moderating effects of task interdependence were present whilst other examples of the moderating effect are not. Therefore, the researcher chose not to make statements about the level of team autonomy, task interdependence and team effectiveness per team but only per indicator.

For future research it might be interesting to explore possible moderating effects on the relationship between team autonomy and team effectiveness. It is interesting to build up an overview under which conditions teams can be autonomously in an effective way.

6.3 Practical implications

Based on the results of this research, a few managerial implications can be formulated. The results of this study could be useful for managers who would like to invest in autonomously working teams. When a manager reflects on the level of task interdependence, he/she could consider what level of team autonomy would be suitable for a team. More specifically, defining the level of the extent to which team members use each other’s knowledge, help each other and the intensity of communicate, can help a manager to decide whether a team should be granted with more or less autonomy to minimise the process loss within a team and thereby, optimise the team performance.
References


Beste medewerker,

Mijn naam is Rikie de Veer en ik studeer organisatiewetenschappen aan de Universiteit van Tilburg. Voor mijn master scriptie doe ik onderzoek naar teamautonomie en taakafhankelijkheid bij DuPont Dordrecht. Deze vragenlijst is uitgezet onder het productiepersoneel met ondersteuning van de Continous Improvement Lead. Graag zou ik u willen vragen mee te werken aan het onderzoek door de vragenlijst in te vullen. De uitslagen van de vragenlijst zullen op team niveau geanalyseerd en gebruikt worden voor het vervolgonderdeel van dit onderzoek.

Om een zo goed mogelijk beeld te kunnen schetsen van de teams streef ik naar zoveel mogelijk deelnemers. Met de individuele uitslagen van de vragenlijst wordt vertrouwelijk omgegaan en zullen niet teruggekoppeld worden aan derden binnen en buiten Dupont Dordrecht.

**Onderdeel 1. Algemene vragen**

1. In welke business unit bent u werkzaam? ........................................
2. In wel team bent u werkzaam? ........................................
3. Wat is uw rol binnen het team? ........................................

_Gelieve per vraag het vakje aan te kruisen wat van toepassing is._

**Onderdeel 2. De volgende vragen gaan over teamautonomie**

<table>
<thead>
<tr>
<th>1. Helemaal mee oneens</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7. helemaal mee eens</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ons team is vrij om te beslissen hoe het werk uitgevoerd moet worden.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>2. Het team is vrij om welke methode gebruikt wordt bij het uitvoeren van het werk.</td>
<td></td>
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<tr>
<td>3. Het team is in staat om zelf te bepalen hoe ze te werk zal gaan.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4. Het team kan bepalen wanneer bepaalde activiteiten worden uitgevoerd.</td>
<td></td>
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</tr>
<tr>
<td>5. Het team heeft controle over het inroosteren van het werk.</td>
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<tr>
<td>6. Het team heeft controle over de volgorde van de teamactiviteiten.</td>
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</tr>
</tbody>
</table>
7. Het team is in staat om de teamdoelen vast te stellen.

8. Het team heeft controle over wat het moet bereiken.

**Onderdeel 3. De volgende vragen gaan over taakafhankelijkheid**

<table>
<thead>
<tr>
<th></th>
<th>1. Helemaal mee oneens</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7. helemaal mee eens</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Ik heb een individuele functie; het is voor mij niet nodig om met andere samen te werken of zaken af te stemmen.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td><strong>2.</strong> Ik heb informatie en hulp van mijn teamleden nodig om mijn werk goed te kunnen doen.</td>
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<td></td>
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</tr>
<tr>
<td><strong>3.</strong> Ik moet samenwerken en overleggen met mijn teamleden om mijn werk goed te kunnen doen.</td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td><strong>4.</strong> Mijn teamleden hebben informatie en hulp van mij nodig om hun werk goed te kunnen doen.</td>
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<tr>
<td><strong>5.</strong> Ik moet regelmatig met mijn teamleden communiceren over werkerelateerde zaken.</td>
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</tbody>
</table>

**Onderdeel 4. De volgende vragen gaan over teameffectiviteit**

<table>
<thead>
<tr>
<th></th>
<th>1. Helemaal mee oneens</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7. helemaal mee eens</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Anderen zeggen dat ons team goed presteert.</td>
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<td></td>
<td></td>
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<tr>
<td><strong>2.</strong> Anderen vinden dat ons team haar doelen bereikt.</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td><strong>3.</strong> Ons team weet haar doelen te bereiken.</td>
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</tr>
<tr>
<td><strong>4.</strong> Ons team voldoet aan de verwachtingen.</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td><strong>5.</strong> Ons team doet wat het moet doen.</td>
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</tr>
<tr>
<td><strong>6.</strong> Ons team heeft tevreden teamleden.</td>
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<tr>
<td><strong>7.</strong> Ons team levert goede prestaties.</td>
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</tr>
<tr>
<td></td>
<td>Ons team krijgt klachten over de kwaliteit van de geleverde prestaties.</td>
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</tr>
<tr>
<td>9.</td>
<td>De manier waarop ons team werkt garandeert een goede kwaliteit van de prestaties.</td>
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</tr>
</tbody>
</table>

Dit is het einde van de vragenlijst. Ik wil u nogmaals hartelijk danken voor uw medewerking.
Appendix II – interview protocol managers improvement / team leads

Introductie

- **Uitleg mijzelf & onderzoek:** studente Organisatie Wetenschappen, master thesis, werk bij IVA. In mijn onderzoek ga ik mij richten op hoe taakafhankelijkheid binnen een team de relatie beïnvloed tussen teamautonomie en teameffectiviteit. Taakafhankelijkheid binnen een team zou mogelijk deels kunnen verklaren waarom sommige zelfsturende teams effectiever / productiever zijn dan andere.

- **Doel interview:**
  - Bespreken resultaten vragenlijst over uw team:
  - goed beeld opbouwen van de werkzaamheden van het team ter voorbereiding van het groepsinterview en inzicht te krijgen in uw beleving van de mate van zelfsturing en taakafhankelijkheid binnen uw team.
  - Verzamelen van gedrukte informatie over team effectiviteit/prestaties.

- **Uitleg interviewsituatie:** opname, anonimiteit, dus geen directe terugkoppeling naar teamleden in groepsinterview of HR manager (contactpersoon). Gegevens op papier over team effectiviteit zijn vertrouwelijk. Heb geheimhoudingsplicht.

- **Voortellen geïnterviewde:** naam, functie, leeftijd, aantal dienstjaren.

- **Korte uitleg team:** verantwoordelijkheden, omvang/samenstelling, verloop leden, indeling shifts, ...

**Bevindingen vragenlijst teamniveau:**

<table>
<thead>
<tr>
<th>Score zelfsturing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score taakafhankelijkheid:</td>
</tr>
<tr>
<td>Score team effectiviteit:</td>
</tr>
<tr>
<td>Opvallend / aanvullend:</td>
</tr>
</tbody>
</table>

**Zelfsturing in team**

*Zelfsturing: de mate waarin het werk en de organisatie het team voorzien van vrijheid, onafhankelijkheid en discreetie in het plannen van het werk en het bepalen van procedures mbt het werk.*

- Is deze definitie van toepassing op het team? Waarom wel / niet?
- Herken je jouw team in het gevonden niveau van zelfsturing? Waarom wel/niet?
- Waaraan merk je dat jouw team wel / niet zelfsturend is?
  - Hoe worden de doelen van het team vast gesteld?
  - Hoe wordt vast gesteld met welke *methode* en *wanneer* werk uitgevoerd moet worden?
  - Hoe wordt het werkschema gemaakt?
  - ...
- Welke zaken worden *niet* door jullie team bepaald?
- Wat vind je nadelen van zelfsturing binnen je team en wanneer ondervind je die?
- Wat vind je voordelen van zelfsturing binnen je team en wanneer ondervind je die?
Hoe zou je het niveau van zelfsturing van jouw team omschrijven, vergeleken met andere teams binnen de Business Unit / DuPont?

Heb je het gevoel dat de mate van zelfsturing belemmerend is voor:
- Het uitvoeren van je werk?
- Het maken en nakomen van afspraken met teamleden?
- ...

Heb je het gevoel dat de mate van zelfsturing stimulating is voor:
- Het uitvoeren van je werk?
- Het maken en nakomen van afspraken met teamleden?
- ...

Ben je tevreden met het huidige niveau van zelfsturing?

... 

Taakafhankelijkheid in team

Taakafhankelijkheid: de mate waarmee teamleden interactie met elkaar hebben om hun werk te kunnen uitvoeren.

Is deze definitie van toepassing op het team? Waarom wel / niet?

Herken je jouw team in het gevonden niveau van taakafhankelijkheid? Waarom wel/niet?

Waaraan merk je dat de team werkzaamheden wel/niet taakafhankelijk zijn van elkaar?
- Informatie, hulp nodig
- Communicatie met teamleden
- Samenwerken, overleggen

Wat vind je nadelen van taakafhankelijkheid binnen je team en wanneer ondervind je die?

Wat vind je voordelen van taakafhankelijkheid binnen je team en wanneer ondervind je die?

Kunnen teamleden elkaar makkelijk bereiken wanneer zij elkaar nodig hebben?

Vind je, gelet op de aard van de werkzaamheden, de mate van interactie tussen teamleden op peil?

In welke mate moeten teamleden samenwerken om hun goepstaken uit te voeren?

Hoe zou je het niveau van zelfsturing van jouw team omschrijven, vergeleken met andere teams binnen de Business Unit / DuPont?

... 

Technische taakafhankelijkheid...?

Teameffectiviteit

Teameffectiviteit: de kwaliteit/nauwkeurigheid van het geleverde werk en de algemene prestaties van het team.

Is deze definitie van toepassing op het team? Waarom wel / niet?

Herken je jouw team in het gevonden niveau van teameffectiviteit? Waarom wel/niet?

Hoe worden de teamprestaties gemeten? (aan de hand van welke gegevens?)
- Team objectives and integration
- Decision making
- Implementing decisions

Hoe wordt in jullie team de teameffectiviteit gemeten? (de effectiviteit van werkwijzen):
- Healthy climate
- Meeting
Ben je tevreden over de teameffectiviteit?

Benodigde documenten team effectiviteit (verschillend per team)

- Omschrijving teamdoelen
- Monitoring behalen teamdoelen:
  - Omzet / productie cijfers
  - Klachtenlijst
  - Aangeleverde ideeënlijst
  - Uitgevoerde ideeënlijst
- Week / maanverslagen

Afsluiting

- Eventuele vragen en opmerkingen
- Wijze van terugkoppeling toelichten
  - Focusgroepen: inplannen, minimaal 4 leden met verschillende rollen, duur: 1.5 uur.
  - Opstellen rapport, januari klaar.
  - Terugkoppeling vanuit HRM nog nader bepalen.

- Afronding en bedanken voor medewerking
Appendix III – interview protocol group interviews

Introductie 15 minuten

- **Uitleg mijzelf & onderzoek:** studente Organisatie Wetenschappen, master thesis, werk bij IVA. In mijn onderzoek ga ik mij richten op hoe taakafhankelijkheid binnen een team de relatie beïnvloed tussen teamautonomie en teameffectiviteit. Taakafhankelijkheid binnen een team zou mogelijk deels kunnen verklaren waarom sommige zelfsturende teams effectiever / productiever zijn dan andere.
- **Doel interview:**
  - Ik wil weten hoe jullie samenwerken. Waarom is het niveau van zelfsturing wat jullie hebben als team goed voor jullie teameffectiviteit en waarom niet?
- **Uitleg interviewsituatie:**
  - opname, anonimité, dus geen directe terugkoppeling naar MI-er of HR manager (contactpersoon). Heb geheimhoudingsplicht. Graag zo open en eerlijk mogelijk zijn, ook naar elkaar.
  - Het is de bedoeling dat jullie op elkaar kunnen reageren maar om overzicht te houden niet door elkaar praten. Ik zal als gespreksleider aangeven wie aan het woord zal zijn.
- **Voortellen geïnterviewden:** naam, functie/rol, leeftijd, aantal dienstjaren.

Bevindingen vragenlijst & interview MI-er:

<table>
<thead>
<tr>
<th>Niveau zelfsturing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niveau taakafhankelijkheid:</td>
</tr>
<tr>
<td>Niveau teameffectiviteit:</td>
</tr>
</tbody>
</table>

Zelfsturing in team 25 minuten

**Zelfsturing:** de mate waarin het werk en de organisatie het team voorzien van vrijheid, onafhankelijkheid en discretie in het plannen van het werk en het bepalen van procedures mbt het werk.

- Is deze definitie herkenbaar voor jullie? Waarom wel / niet?
- Hoe zelfsturend vinden jullie het team op een schaal van 1 tot 10? Waarom wel niet zelfsturend?
- Kost het veel moeite / tijd om zelfsturend te zijn?
- Wat vind je **nadelen** van zelfsturing binnen je team en wanneer ondervind je die?
- Wat vind je **voordelen** van zelfsturing binnen je team en wanneer ondervind je die?
- ...

Taakafhankelijkheid in team 45 minuten

**Taakafhankelijkheid:** de mate waarmee teamleden interactie met elkaar hebben om hun werk te kunnen uitvoeren.

- Is deze definitie herkenbaar voor jullie? Waarom wel / niet?
- Hoe taakafhankelijk is jullie werk op een schaal van 1 tot 10? Waarom wel/niet?
- Waaraan merk je dat de team werkzaamheden wel/niet taakafhankelijk zijn van elkaar?
- Informatie, hulp nodig
- Communicatie met teamleden
- Samenwerken, overleggen

• Heb je het idee dat je als alleen in een team werkt of als team binnen DuPont?

• Kunnen jullie werkzaamheden goed met elkaar coördineren / op elkaar afstemmen?
• Maken jullie veel gebruik van elkaars kennis en expertise/vakmanschap? Wanneer en hoe vaak?
• Wetens jullie welke problemen zich voordoen binnen het team? (technisch / sociaal)
• Pak je problemen in je werk meestal alleen aan of vraag je hulp?
• Of komen je collega’s je al helpen voordat je om hulp hebt gevraagd?
• Heb je het idee dat je soms (onnodig) veel tijd kwijt bent met het maken van een beslissing omdat je je teamleden (moet) betrekken bij de beslissing? (kleine & grote beslissingen!)
• Zijn jullie in staat om een probleem als team aan te pakken? (fabriekssluiting...)
• Als een teamlid niet zo hard of goed werkt, merken jullie dat dan of kan hij meelitten op het werk van andere?

• ...
• Heb je veel instructies nodig van je teamleider / MI-er / engineer?
• Hoe wordt je ingewerkt?

**VOORBEELDEN!**

<table>
<thead>
<tr>
<th>Teameffectiviteit</th>
<th>15 minuten</th>
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</thead>
</table>

*Teameffectiviteit: de kwaliteit/nauwkeurigheid van het geleverde werk en de algemene prestaties van het team.*

- Is deze definitie herkenbaar voor jullie? Waarom wel / niet?
- Hoe goed presteert jullie team op een schaal van 1 tot 10? Waarom wel / niet goed?
- Hoe effectief is het team op de volgende gebieden (overall performance of group operations):
  - Team objectives and integration
  - Decision making
  - Implementing decisions
- Hoe effectief is het team op de volgende gebieden (accuracy of work):
  - Healthy climate
  - Meeting

**Afsluiting**

- Eventuele vragen en/of opmerkingen
- Wijze van terugkoppeling toelichten:
  - Opstellen rapport, januari klaar.
  - Terugkoppeling vanuit HRM nog nader bepalen.

- Afronding en bedanken voor medewerking.
### Appendix IV – operationalisation tables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dimensions</th>
<th>Indicators</th>
<th>Calculation of score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Team autonomy</strong></td>
<td>Freedom granted by task and organisation in scheduling the work</td>
<td>Setting up team goals</td>
<td><strong>Survey question(s):</strong></td>
</tr>
<tr>
<td></td>
<td><em>The degree to which the task provides substantial freedom, independence, and discretion in scheduling the work and in determining the procedures to be used in carrying it out.</em></td>
<td></td>
<td>- Het team is in staat om de teamdoelen vast te stellen.</td>
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<td></td>
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<td></td>
<td>- Het team heeft controle over wat het moet bereiken.</td>
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<td></td>
<td><strong>Interview topic(s):</strong></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Influence goal setting process</td>
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<td><strong>Survey question(s):</strong></td>
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<td>- Het team heeft controle over het inroosteren van het werk.</td>
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<td></td>
<td><strong>Interview topic(s):</strong></td>
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<tr>
<td></td>
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<td></td>
<td>- Being in charge of year planning (free days)</td>
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<td></td>
<td>- Determining who does what</td>
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<td><strong>Survey question(s):</strong></td>
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<td>- Ons team is vrij om te beslissen hoe het werk uitgevoerd moet worden.</td>
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<td><strong>Interview topic(s):</strong></td>
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<td></td>
<td>- Involvement setting up procedures / protocols / regulations</td>
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<td></td>
<td>- Being bounded to procedures (safety)</td>
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<td></td>
<td>- Determining working methods</td>
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<td></td>
<td></td>
<td>- Solving technical / social problems</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Responsibilities team members / team lead / manager improvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Executing DuPont’s self-managing tasks</td>
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<tr>
<td><strong>Determining procedures</strong></td>
<td>Setting up / working with working methods</td>
<td></td>
<td><strong>Survey question(s):</strong></td>
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<td></td>
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<tr>
<td>Variable</td>
<td>Dimensions</td>
<td>Indicators</td>
<td>Calculation of score</td>
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</tr>
</tbody>
</table>
| **Task interdependence** | Structural work features                         | Interdependence of work activities              | **Survey question(s):**  
- I heb individuele werkzaamheden; het is voor mij niet nodig om met andere samen te werken.  
- What does your work look like  
- Ability to tune working activities  
- Social loafing  
- Visibility lack of work commitment  
- Training time  

**Interview topic(s):**  
- intensity communication / sharing information  
- Helping colleagues  
- Using each other’s knowledge / skills  
- Awareness problems |
| **Level of interaction between members** | | | **Survey question(s):**  
- Ik heb informatie en hulp nodig van mijn collega’s om mijn werkzaamheden goed uit te kunnen voeren.  
- Ik moet samenwerken met mijn collega’s om mijn werkzaamheden goed uit te kunnen voeren.  
- Mijn collega’s hebben informatie en hulp van mij nodig om hun werkzaamheden goed uit te kunnen voeren.  
- Ik moet regelmatig met mijn teamleden communiceren over werkgerelateerde zaken.  

**Interview topic(s):**  
- intensity communication / sharing information  
- Helping colleagues  
- Using each other’s knowledge / skills  
- Awareness problems |

| **Team effectiveness** | The overall performance of group operations       | Team objectives and integration                 | **Survey question(s):**  
- Anderen vinden dat ons team haar doelen bereikt.  
- Ons team weet haar doelen te bereiken.  
- Ons team voldoet aan de verwachtingen.  
- Anderen zeggen dat ons team goed presteert.  

**Interview topic(s):**  
- Achieving team / business unit goals  
- Comparison team performance to other teams  
- Satisfaction performance / points of improvement  
- Internal and external complaints  

**Implementing decisions** | | | **Survey question(s):**  
- Ons team doet wat het moet doen.  
- Ons team levert goede prestaties.  
- Ons team krijgt klachten over de kwaliteit van de geleverde prestaties.  

**Interview topic(s):**  
- Delivering and execution ideas  

**Decision making** | | | **Interview topic(s):**  
- How are decisions being made?  
- Effectiveness decision making to solve problems  

**Accuracy of work** | Healthy climate | | **Survey question(s):**  
- Ons team heeft tevreden teamleden.  

**Interview topic(s):**  
- Respect  
- Trust  
- Pleasantness  

**Working methods** | | | **Survey question(s):**  
- De manier waarop ons team werkt garandeert een goede kwaliteit van de prestaties.  

**Interview topic(s):**  
- Holding meetings  
- Time and effort of being autonomous |