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Master Thesis

The effect of group diversity on group process and result

Camilla Nordstrøm Jensen

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**AALBORG UNIVERSITY – DEPARTMENT OF BUSINESS STUDIES**

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# 1. Abstract

The main focus of the thesis is an empirical study of different groups at a four day innovation workshop called WOFIE. This is the biggest workshop of its kind offered by Aalborg University and the workshop is located at different location in Denmark, at the same time. The purpose of the workshop was to give the student knowledge about innovation, creativity, and entrepreneurship, and create an idea for a product or service in the theme of Life: Science & Quality.

The research question is as follows:

* *How does the degree of group diversity affect the group process and result?*

The methodological approach chosen to answer the research question is the system approach, which of course affected the methods for answering the research question. To answer the research question it was important to describe theory regarding diversity, innovation, and creativity and how they interconnect. This is because WOFIE is focused on innovation and creativity and it is important to link these theories to diversity because the result in the end will describe the effects of diversity in regard to the creative process and indirectly innovation.

The empirical evidence was collected through a questionnaire, which was handed out at the workshop at the end of the third day; the day before the students had to present their idea. The questionnaires was analysed in the second part of the project. This was with a focus on the degree of diversity and how this affected the group process and result. First all the questionnaires were divided into which group they belonged to and then analysed in regard to the degree of diversity in the following attributes: Age, gender, nationality, experience, and education. It was especially in regard to gender, nationality, and education that the degree of diversity affected the group process and result differently. Especially a higher degree of diversity had a positive effect on the group process and result, and thereby indirectly creativity and innovation. The reason these was the most notable could be because of the choice of case, WOFIE. This is due to the fact that the age difference in students is not as significant. Also the functional background/experience is not that different between the students because they have more or less the same experience, with some differences of course. These considerations are important in regard to the results of the thesis.

# 2. Introduction

Competitive advantage is one of the main reasons for organizations to focus on innovation. The global economy has changed and has increased global competition (Dicken, 2007). Competitive advantage can come from many different directions firm size, possession of assets, the ability to innovate etc. Innovation occur in organizations that are able to mobilize knowledge, technological skills and expertise to create novelty in their products/services, or novelty in the ways that they produce and deliver those offerings (Tidd et al., 2005).

Innovation can be a process within the organization, with cross-functional groups or teams working together and this collaboration between functional background and educations creates a higher degree of work group diversity; *“Work-group diversity is a fact of organizational life… Groups in organizations have become more diverse in terms of their demographic composition over the years and will continue to become more diverse in years to come…”.* (Van Knippenberg et al., 2004: 1008)

Society has changed which also has lead to an increase in organizational diversity, more and more people get an education and more diverse educations, a lot more women are working now than just forty years ago (Østergaard & Bram, 2011). The complexities of many different educations in an organization has another positive effect of increasing an organizations’ ability for spotting new opportunities outside the organization; the absorptive capacity of an organization (Cohen & Levinthal, 1990).

The need for understanding the effects of diversity has also increased because the process of innovation has changed over time from focusing mainly on internal R&D at the beginning, to external and internal collaborations across organizations and knowledge institutions, which has increased the degree of diversity in many different attributes such as education and functional background (Rothwell, 1994).

The process of innovation in organizations often use creativity as a mean for creating innovations (Tidd et al., 2005). The process of innovation is often complex and complex problems needs complex solutions but the complexity of the knowledge creating process should never exceed the problem (Davenport & Prusak, 1998). Using diversity in the innovation process and the creative process creates complexity especially because diversity seems to be a double-edge sword. On one hand it increases the opportunities for creativity, and on the other hand it decreases group member satisfaction and group identification (Williams & O’Reilly, 1998, Chatman & Flynn, 2001).

It is difficult to connect innovation and diversity in organizations because there might be created very good ideas in a diverse work group, but there are other steps (e.g. National laws, politics, and internal procedures) in the innovation process that can either stop the idea in the process, or catalyse the idea further along.

Solution Camp and WOFIE are both a collaboration between students, Aalborg University and the business community. They consciously use diversity as a mean for creating innovation through creative processes (Solution Camp 1 & WOFIE 1). These camps, with student from different educational backgrounds, are one way of looking at the effects of diversity on the ability to be creative. This would eliminate some of the complexities of the innovation process in the results, which might have affected larger scaled quantitative studies.

## 2.1. Research question

The focus of the thesis is on degree of diversity in newly formed groups and its effect on the group process and result. The research question is as follows:

*How does the degree of group diversity affect the group process and result?*

# 3. Methodology

The following chapter is a description of the methodological considerations in this thesis. This will be both in regard to the theory used and the way of collecting and analysing the empiric material in connection to the research question. The fundamental idea behind this project is to have a strong focus on the empirical evidence and discuss and analyse the results on the basis of the theories. The overall purpose of the thesis is to describe the benefits and consequences of group diversity in regard to creativity and indirectly innovation. This is done through a description of the real system through empiric evidence and discussing the findings with previous research.

## 3.1. Empirical knowledge

The following section will describe the empirical evidence in this project. The first section is a description of Solution Camp, which initially was meant as the focus of the study and then a description of WOFIE, and why this was chosen instead.

### 3.1.1. Solution camp

Before the official beginning of the project I participated in a Solution Camp at Business Park Nord. Solution Camp is a concept which is based on different firms has set an innovative assignment to interdisciplinary students from Aalborg University. The camps are either for seven hours or 48 hours, this is for 1-2 firms or 4-5 firms, respectively (Solution Camp 2).

The camp I participated in was for seven hours and the firms that participated were Business Park Nord and Støvring Handelsstandsforening (trade association) and the camp was as previously mentioned located at Business Park Nord. There were representatives from both organizations at the camp and they participated in the creative process along with the students.

The purpose of the participation in the camp was to collect empiric evidence to this thesis, both through questionnaires and observations.

It was a very exciting and interesting day but do to a lot of different circumstances the output of the camp was not as useful as I had hoped, in regard to the thesis. There were not as many students as expected, some of the representatives from Støvring Handelsstandsforening went to manage their shops before the camp was finished, and the composition groups were changing during the day, so it was not possible to observe the group process as planned.

The camp is not included in the thesis because the empiric evidence from the questionnaires was not comparable with the questionnaires from WOFIE. This is among other thing because I got wiser during the process, and found a new way of outlining the questionnaire; further, I was more certain about the direction of the thesis, which made the questions different.

The whole process was a learning experience, which in the end lead to the chosen research question for the thesis.

### 3.1.2. WOFIE

The following chapter is a short description of the WOFIE workshop and its purpose. This is to describe how and why the students are participating at the workshop, and how the groups are assembled.

**WO**rkshop **F**or **I**nnovation and **E**ntrepreneurship is an educational offer, offered by Aalborg University from the 12th to the 15th of April 2011, both days included (WOFIE 2). WOFIE emerged as an idea for providing courses in the areas of entrepreneurship, innovation and creativity across the different educations at Aalborg University (WOFIE 1 & Den kreative platform). The workshop is one of the largest of its kind and is located in different parts of the country. It runs for four days with education in creativity, innovation and business development. Furthermore the workshop is based on the problem based learning, which is the method of Aalborg University and is either a mandatory or an optional course for AAU candidates, Master or Ph.D. students. The focus of the workshop is to heighten knowledge about innovation and entrepreneurship through interdisciplinary group work. The groups were in advance divided into interdisciplinary groups consisting of five to six students. The groups would make an idea-concept for a product or a service within the theme “Life: Science and quality”. The ideas would be evaluated in four different categories: idea, research, organization, and presentation (WOFIE 2) by a jury. The grading of the jury is unfortunately confidential ans was destroyed after the workshop.

The questionnaires were handed out Thursday the 14th of April close to 16.00 the end of the third day. The questionnaires were later collected the same say, when the students had completed them. I handed out 65 questionnaires and ended up with 41 completed questionnaires. These 41 questionnaires will be a part of the analysis later in the project.

## 3.2. The scientific paradigm

The scientific paradigm is the link between the researchers’ ultimate presumptions and the chosen methodological approach. This makes it very important in regard to the research method used in the project.

As previously mentioned the focus of the project is on the empirical evidence. The empirical evidence was collected at WOFIE, which is the main focus of the project and therefore very important in the case of research method and thereby the scientific evidence.

The paradigmatic category chosen in this case is number four; Reality as a world of symbolic discourse (figure 1). This paradigm states that reality is concentrated on the patterns of the symbolic relations and significance that happens when people interact and the actions of people. The social reality is an exchange of subjective interpretation of the labels or even prejudices that are attached to people, situations and even things. All of these interpretations end up as social rules shared by most people. This also leads social reality to change dependent on the people that are participating. Researchers from this paradigm do admit that the situations and systems are unique and therefore difficult to generalize, but at the same time they do think that there can be similarities from other studies even though the case and the time are different. Even though people are unique they might share some of the same cultures, which affect the way people act in specific situations and this might help determine, what will happen in a similar situation even though it is not exactly the same (Arbnor & Bjerke, 1997).

This paradigm is a shown in figure 1 under the system approach, which in some cases are very objective. In this case it is still objective in the case of generalization but it is also open for more subjective data which the empirical knowledge from the questionnaires is. One of the most important assumptions about the system approach is that it views reality as arranged, such as the “*[T]he whole differs from the sum of its parts”* (Arbnor & Bjerke, 1997: 51). This can also be described as synergy and that it is not only the part but also their relations which have an effect and this can both be in a negative or positive way (Arbnor & Bjerke, 1997). Through questionnaires the members of the group (the parts) and their group process (relations) is described to be able to analyse the effects of diversity on the group process. The use of questionnaires and how they are constructed will be further discussed later in this chapter.

Reality as concrete and conformable to law from structure independent of the observer

Reality as a concrete determining process

Reality as mutually dependent fields of information

Reality as a world of symbolic discourse

Reality as a social construction

Reality as a manifestation of human intentionality

1

2

3

4

5

6

THE ANALYTICAL APPROACH

THE SYSTEMS APPROACH

THE ACTORS APPROACH

Explanatory Knowledge

Understanding Knowledge

(Explanatics)

(Hermeneutics)

**Figure 1:** *The three methodological approaches relate to paradigmatic categories & The Boundary Between Explanatics and Hermeneutics. (Arbnor & Bjerke 1997: 44&46)****[[1]](#footnote-1)***

## 3.3. Methodics

In the system approach there are five levels of ambition, which also are called the goals of the approach. The following bullet points are the five levels of ambition (Arbnor & Bjerke, 1997: 295):

* *“to determine the type (of system)*
* *to describe*
* *to determine relations*
* *to forecast*
* *to guide”*

The three first bullet points; *to determine the type (of system*), *to describe*, *and to determine relations*, are from a methodological point-of-view more or less inseparable. This is because the presumption of reality is that it is constructed of various totalities, which each contain numerous connections and relations and this is why they are systems.

In the system approach the most important level of ambition is *to determine relations* this is because as previously described, this is what makes realty a system, so no matter what the level of ambitions is in a project you will have to describe connection in this approach.

The level of ambition in this thesis is *to guide* in the real system which in this case is the WOFIE workshop. There are two different ways to conduct a guiding study one which is oriented toward trial-and-error and the other has a goal-means orientation. In the case trial-and-error you have to make some kind of changes in the real system on behalf of an analysis of the system. This approach requires an opportunity to return to the same system, implement changes, and then see if they have the effect as expected, or then modify the system and try again until it functions as wanted. In the case of the subject and possibilities for data collection, this approach would require the possibility to make several studies, at the same place, with the same people and maybe change how the groups are constructed from different attributes of diversity and study in which cases the groups functions the best and creates positive synergy.

In this case the goal-means orientation is much more appropriate. This is because the goals for both the system and the study can be stated early in the study and therefore be able to seek the means that will make the goals achievable. The problem is formulated by the researcher, followed by a system analysis and a system construction and ends with implementation of the new proposal. This show a distinction between what is theoretical and what is done in practise, the real system.

When selecting units for study in the system approach it is important to stress, that the system chosen for study cannot be chosen for representativeness because this is not valid in this approach. The most you can expect is that the system can represent a certain type of system, which in this case is newly formed groups which is only working together for a short time, which is the case at WOFIE.

The subject of group diversity is very complex and so is the ways to study it. This is because to study group diversity it preferably has to be in newly formed groups so the attributes of diversity is as distinct as possible. Furthermore the group studied in this project were only working together in five days and therefore might be more overbearing also because most of them voluntarily sign up for the workshop fully knowing what was to be expected in the case of working together with people they have never met before.

Another important issue to mention is that the real system that was studied, WOFIE, was a temporarily system, which only existed in those five days the workshop was active. So there is no way to implement the results from this study into the real system to find out if it will make improvements and create positive synergy.

To be able to generalize there has to be more than one testing of the findings in different environments/systems to verify that this does not only exist in the studied system. But in general the system approach does not aim to be able generalize but instead show how a single system function because it does not use qualitative evidence, which makes it less “precise” in regard to generalizations (Arbnor & Bjerke, 1997).

The method chosen to gather empiric evidence for the project is questionnaires. This is due to the fact that it is a good way of getting a good amount of evidence and in the case of WOFIE it was not possible to get information about the participants, because this information was confidential which made it impossible to conduct interviews with the participants.

## 3.4. Questionnaire

This section will describe the use of questionnaires in connection to the system approach. Furthermore there will be a discussion of the use of open and closed questions and the use of questionnaires in general.

**Data collection through questionnaires**

When having the system approach as methodology it has a significant impact on the way in which case studies and empiric knowledge can be gathered and used in the project. You gather data so you are able to describe, explain and understand the real system, which is very complex and therefore difficult to describe and reproduce. In the system approach interview or observations is preferably, but because this was not a possibility in this case the empiric evidence had to be gathered through questionnaires. The questionnaires was not electronic, which means that they were personally handed out at the camp, and this also helped in getting as much respondents as possible from the same groups to answer the questionnaire. This was important to get as much information about the attributes of diversity from each group.

If it had been possible to send out the questionnaire by mail it would not have been possible to have the system approach, at the same time, because it might not have been possible to analyse the systems of each group as thoroughly, because the quantity would be much larger. And it would be less likely to have several respondents from the same groups. This study would then be of the analytical approach and it would be possible to generalize if the sample in the study is representative (Arbnor & Bjerke, 1997).

**Open or closed questions**

The decision between open or closed questions is always a dilemma when gathering empirical information, both in the case of doing structured interviews and when you choose to use questionnaires. There are advantages as well as disadvantages in both open and closed questions.

I have chosen to make the questionnaires of mostly closed questions but in some cases the respondent has a possibility to further explain attributes that they feel have an impact on the group process (appendix 1). The respondents also used this to elaborate why they have chosen the specific answers.

The choice of using the closed question is based on different reasons. One of the main reasons to choose closed questions is the ability to compare the different answers, ensure that the questionnaire looks short, simple and only takes a short time to complete to increase the amount of respondents. This is because it is not required for the respondents to write an essay in answer each question, but just have to place ticks or circles around the right answer. Another advantage of the closed questions is that the presence of answers also can be a help to the respondent to answer the question right and therefore minimise misunderstandings. One of the serious disadvantages is that that you do not get spontaneity of the respondents’ answers and there might be a new answer or point-of-view that is not covered by the fixed answers. Another important point is to make sure that the fixed answers are as precise as possible and cover as much different answers as possible, or maybe even have a choice called others, where the respondent can write their own answer if none of the choices match (Bryman & Bell, 2007). The possibility to write your own answer is important in the system approach to make sure that the respondent has the chance to answer, what they want. Otherwise it would not show a realistic picture of the real system.

## 3.5. Validity

Validity is always a difficult thing to discuss in the case of the system approach because it only aims to study one real system at the time and is not meant to be generalizing. At the same time if the studies are many and in different systems there can be some conclusions about the likelihood for the same outcomes in more than one study. Also if the researcher studies one system it is important to only conclude on this system. Another thing is that the purpose of the study is important in the system approach. There has to be a purpose of the study to gain useful knowledge which is important and relevant for other researchers (Arbnor & Bjerke, 1997). This is definitely the case in this study because it is interesting to study newly formed groups, which are purposely constructed to have diversity. Another important subject of the system approach is as described earlier in this chapter the ability to; determine the type of system, to describe, and to determine relations. This is because to see reality as a system there has to be relations for these relations to create synergy, positive or negative.

The only way to make sure that the findings in this study are valid through the system study is to implement the changes in the real system and investigate if positive synergy is created through trial and error. Due to the time frame and realistic possibilities in the thesis this is not possible. On the other hand these findings might inspire other researchers to try to construct new ways of using diversity in group work and study the effects of these new synergies that are created and thereby modify the theories once again. The summery will be a description of the findings in this study and how they connect to both creativity and innovation. The summary cannot give any solutions, but only describe what effect diversity had on the group process and result at WOFIE. The summary will be followed be a chapter called perspective which will discuss the study and the results and other ways of conduction such a study.

The following chapter will describe the project and how the validity of the study will be ensured through the design of the project.

## 3.6. Project description

The chosen methodology has an important effect on the set up of the project. The project is divided into two sections; the first section is more descriptive due to the system approach because it is very important to determine the type of system, to describe, and determine relations. The type of system is the groups at WOFIE and WOFIE as a workshop is more a super system which contains the groups. WOFIE focuses on the creative process which makes it possible to connect the finding to creativity and indirectly innovation. The groups are the focus of the project and it is the relations between the member and thereby the synergy which is in focus. WOFIE is important because it influences the conditions that the groups have to work under. Another aspect of the first section of the project is a short theoretical description of the connections between diversity, innovation, and creativity. This is the theoretical perspective of the project and it is also important in this case to show how the different theories create synergy for further discussions in the analysis. There is also a description of some of the previously studies on the effects of diversity in regard to the different attributes, which also will be discussed in regard to the finding in the analysis of the questionnaires.

The second part of the project is the analysis and discussion of the results from the WOFIE workshop through the questionnaires. The section begins with a description of the circumstances surrounding the distribution and collection of the questionnaires. This is followed by an analysis of the questionnaires. The analysis is done for each group separately, because each group is viewed as a system which shall be described trough the different attributes of diversity (Age, gender, education etc.), and determined the type of system in regard to the degree of diversity of the attributes in the group. The relations will be described in the following section where each attribute will be discussed in connection to the groups which are divided into maximum, moderate, and minimum degree of diversity. These finding will then be compared to show if there is a significant difference between the groups with a high degree of diversity and the groups with a lower degree of diversity. These findings will then be compared and discussed in connection to the previous finding within this field. There will also be made a connection to both creativity and innovation because it is the focus of WOFIE. This will be followed be a summary of the findings within this system and the chapter *perspective* will be a discussion of further studies and other perspectives on the study.

# 4. Theory

This chapter is focus on the theories of diversity, creativity and innovation. The theory of diversity will be carefully described in the beginning of the chapter because this is the main subject of the thesis. This theory will also be used in the analysis in regard to which attributes to study and to be able to describe and discuss the degree of diversity.

The next section of the chapter will be a definition of creativity because this has a close link to diversity and this will again be followed by a short description of innovation and the process of innovation because this often a place where diversity and creativity appears.

## 4.1. Diversity

Dispersion, heterogeneity, dissimilarity, disagreement, divergence, variation and inequality is just some of the words researchers use when discussing the concept of diversity (Harrison & Klein, 2007).

Diversity is in short *“… a range of many people or things that are very different from each other.”* (Oxford, 2005: 446). The focus of this project is on group diversity and in this case a more precise definition of the term is needed.

In this project diversity is better and more precisely described as the attributes that makes another person different from self and this is regardless of how task-relevant the attributes are (Williams & O’Reilly, 1998, Van Knippenberg et al., 2004).

Diversity can be an endless number of demographic attributes such as age, nationality, religion, gender, education, political preferences, just to name a few. These attributes are very different in complexity and accessibility for studies and are therefore often categorized in different ways. One way of is to categorize into observable and non-observable attributes of diversity. Attributes such as age, gender race/ethnic origin are categorized as observable while religion, education, political preferences are non-observable attributes. The reason for making a distinction between the two categories is that observable attributes are more likely to have an immediate effect in a group-situation because some distinct attributes might trigger a response due to prejudices and stereotypes. It is also important to mention that these two categories are not mutually exclusive because one observable attribute such as ethnicity might have an effect on non-observable attributes such as education and religion, but at the same time this might not be true in all cases. Another not yet mentioned non-observable attribute is personality, which can have an enormous effect on the group process because it can affect the way of communicating and interaction in general in the group. This attribute is very difficult to measure and study because it would be difficult to get to know a person so well under a study that you would be able to understand and describe their personality due to the complexity (Milliken & Martins, 1996).

Another way of categorizing these attributes of diversity is as either Social category diversity (e.g. age, gender and ethnicity) or informational/functional diversity (e.g. functional and educational background). This way of categorizing is more focused on the job-related characteristics that can have an effect in a group situation (Van Knippenberg et al., 2004).

### 4.1.1. Three views on diversity

The previous diversity studies can be divided into three different views on diversity; Social Categorization, Similarity/Attraction and Information/Decision making. These three different theories will be described in the following.

**Social categorization**

Social categorization is one of the theoretical foundations of studies in diversity. It is focused on the demographic composition of work groups and how it affects group process in the case of communication, conflict etc. and the process will in the end have an effect on the performance of the groups (Williams & O’Reilly, 1998).

Social categorization consists of two different theories; Social identity and self-categorization.

*“Social identity rests on intergroup social comparison that seek to confirm or establish ingroup-favoring evaluative distinctiveness between ingroup and outgroup, motivated by an underlying need for self-esteem.”*(Hogg & Terry, 2000: 122) In this theory it is, in short, assumes that people want to maintain a high level of self-esteem which is done by social comparison with others (Williams & O’Reilly, 1998, Chatman & Flynn, 2001). From social identity another theory was brought to life; self-categorization which is viewed as a component of the social identity theory (Hogg & Terry, 2000). The way to make the comparisons is through dividing people into social categories by using characteristics such as age, gender, ethnicity, status or religion. This makes it possible to be categorized either as an individual or as a member of group. Out-group members are thereby seen as less trustworthy, honest, and cooperative than members of their own group. The process of self-categorization has been shown to fundamental and powerful and this process results in increasing stereotypes, polarization and fear which in the social categorization tradition are unavoidable. Because of this view heterogenic group members have less satisfaction with the group, increased turnover, lover levels of cohesiveness, reduces communication within the group, decreased cooperation and higher levels of conflict (Williams & O’Reilly, 1998). Another important point is that due to the stereotyping there are preconceived expectations which in some cases become self-fulfilling due to the fact that *“[I]nduviduals evoke in others behavior that matches their expectations.”* (Williams & O’Reilly, 1998: 84).

Even though this theoretic tradition focuses on intergroup relations there is evidence that in-group/out-group relation can happen despite differences between individuals and this is sometimes referred to as relational demography; but in either case diversity can create in-group/out-group relations and cognitive biases (Williams & O’Reilly, 1998).

*“Results from these studies typically confirm the negative effects of diversity on group process and outcomes.”(*Williams & O’Reilly, 1998: 85)

**Similarity attraction**

The similarity attraction paradigm is also one of the theoretical foundations of studies in diversity. *“[I]t was the distribution of demographic differences in groups and organizations that could effect process and performance.”* (Williams & O’Reilly, 1998: 85).[[2]](#footnote-2)

There had been brought attention to the fact that differences in demographic composition of the groups can create conflict in the case of variations in communication, cohesion, and integration. These effects depend on the degree to which the members of the group feel similar or different to the other members of the group or organization. Through years of research on similarity attraction, the abovementioned assumptions has been proven right in the case of similarities in both observable and non-observable attributes which has been proven to increase interpersonal attraction and liking (Williams & O’Reilly, 1998). *“Similarity provides positive reinforcement for one’s attitudes and beliefs, while dissimilarities are seen as a punishment… In a free choice situation, when an individual can interact with any of a number of people, there is a strong tendency for him or her to select a person that is similar.”*(Williams & O’Reilly, 1998: 85) Also attributes such as time of entry into a group or an organization can create homogeneity because even though they do not have much else in common, they will have the same experiences and increased opportunities for interaction with each other. At the same time, the people who are already a part of the group or organization might already have created extensive communication networks which can be difficult to penetrate for new entrants. The similarity attraction paradigm has many of the same predictions as the social categorization theories. This is shown in the way that social categorization looks at similarities for creation high self-esteem and this could also be connected to the theories of similarity attraction where similarities increases the possibility for reinforcement of attitudes and beliefs which also created self-esteem. The majority of the studies in similarity attraction also find that dissimilarities often result in group process and performance loss, less positive attitudes, less frequent communication, and higher likelihood of turnovers from the group, this is especially among the ones that are the most different (Williams & O’Reilly, 1998).

**Information Decision Making**

The third perspective on the effects of group diversity has some commonalities with the similarity attraction framework described above. This perspective does furthermore have a focus on how information and decision making can be affected by group diversity. One of the focuses of this perspective is that if people communicate more with people that are more similar, if they are in a heterogenic group they will communicate more with people outside the group and thereby get more information that will benefit the group result in the end, even though the group process might suffer from the effects of diversity. At the same time the seeking of similar people inside a group might lead to isolation of the member who are the most different from the group and this can result in failure in captivating knowledge from all member of the group because there will be an emphasis for common knowledge.

Theories from this perspective propose that diversity in the group composition can have a direct impact on the increase in skills, abilities, information, and knowledge which comes directly from diversity. This is independent of what happens in the group process e.g. conflicts.

This perspective values diversity in its ability to add value to an organization or group this is especially in regard to more complex problems such as innovation, and product design. (Williams & O’Reilly, 1998) This positive effect of diversity is especially in regard to non-observable attributes: *”Researchers largely agree that functional or background diversity provides the range of knowledge, skills, and contacts that enhances problem solving.”* (Williams & O’Reilly, 1998: 87).

At the same time there has not been conducted much studies of the effects of the observable attributes such as age and gender. There has been conducted a few laboratory studies which has shown that differences in gender and ethnicity/nationality have a positive effect on the group process, the cooperation because a lot of alternatives are explored and different perspectives were taken (Williams & O’Reilly, 1998).

**Summary**

Most of the theoretical evidence in diversity theory can be divided into the three abovementioned variants of diversity theory. Even though these theories have some similarities they also have some contradictions. Similarity attraction theory and social categorization argue that homogeneity in groups are best in regard to the group process and because many other researchers have found that effective group process leads to effective group performance, then it would be clear that diversity has a negative effect on both the group process and group performance. This is where Informational decision making theory disagree because they believe that diversity has a positive impact because of increased information and skills. They also argue that group homogeneity has a negative effect because the group fails to make use of all information available. There is empirical evidence for every one of the theories from laboratory studies which show the causality that each of the theories predict. But these studies are done in secure and predictable setting of a laboratory and not in the unpredictable reality of the organization where there can be other external factor that can have an effect on the group. This also show a lack of organizational studies that take more factors in account than just the different attributes such as age, gender, education etc. (Williams & O’Reilly 1998)

### 4.1.2. The degree of diversity

There are different ways of describing the degree of diversity in a group or a firm. In this project the concepts of Separation, Variety, and Disparity by Harrison & Klein (2007) is chosen. This is along with the concept of balance from Sterling (2007) which was needs to show as many aspects of the degree of diversity.

**Separation, Variety & Disparity**

Harrison and Klein do not only differentiate between small degree and large degree of diversity but between minimum, moderate, and maximum. The following figure 2 shows a graphic description of the typology; separation, variety, and disparity. The concept of balance by Stirling is also incorporated into the figure because it describes an aspect that is not covered by the diversity typology of Harrison and Klein (2007). This is followed by a description of every typology in regard to what distinguishes them in the case of minimum, moderate, and maximum diversity.

**Amount of diversity**

Maximum

Moderate

Minimum

**Type of diversity**

Variety

Separation

Disparity

Balance

**Figur 2:** *Pictorial of Types and Amounts of four Meanings of Within-Unit Diversity* (Harrison & Klein 2007: 1202 & Stirling 2007: 709)*[[3]](#footnote-3)*

**Separation**

There are three different key assumptions in the case of separation. They are as follows:

1. *“[W]ithin units, members differ from one another in their position along a single continuous attribute – a lateral continuum S (e.g., positive affect perceptions of leader, charisma, organizational commitment);*
2. *Units differ in the extent to which their individual members are collocated along S- in some units, members are close to one another, but in other units, members are more widely spread;*
3. *Differences among units in the extent to which their members are dispersed along S lead to a set of systematic consequences (e.g. higher or lower cohesion).”*(Harrison & Klein, 2007: 1203)

In the figure there are different degrees of separation; minimum, moderate, and maximum. These different degrees will be described and discussed in the following.

*Minimum* is when all members of a group or unit are at the same position along the S continuum. It does not matter where on the S continuum they are positioned. At a minimum of separation the members of a group or unit will likely be psychologically comforting in regard to S. This is probably because there is no insecurity in regard to challenging anyone else’s position because everyone’s position is equivalent. Due to the fact that the members of the group or unit have one attribute in common S, they often assume that they are also similar on other attributes.

*Moderate* separation appears when there is some spread along the continuum. This could be an evenly spread as shown in the figure 2 (middle cell of first row in) or it could be most unit members holds the same position but some are spread at different positions along the S continuum.

*Maximum* separation happens only when the members of the group or the unit are equally split into two subunits as far away from each other on the S continuum. There are not as much research concerned with maximum separation but as the figure indicates there are two polarised sub-units within a single unit. This might cause a division of the social network in the group into two separate sub-units where none or maybe a few members trying to bridge between the two sub-units. These consequences are dependent on the fact that the attribute S has an importance to team identity and task completion (Harrison & Klein, 2007).

*“Separation thus reflects stand point or* ***position****: the distribution of where members stand on a value, belief, attitude, or orientation.”* (Harrison & Klein, 2007: 1207)

Theories as simulation attraction, Social identity and self-categorization, and attraction-selection-attrition are in most cases similar to the concept of separation. In these theories similarity is believed to reduce separation which leads to higher levels of cooperation, trust, and social integration. On the other hand when there are differences that spread the members of a unit or a group on the continuum S will experience the opposite; low cohesion, high conflict, high rates of withdrawal, and poor performance (Harrison & Klein, 2007).

**Variety**

The three key assumptions in variety research of diversity are as follows:

1. *“[W]ithin units, members differ from one another qualitatively- that is, on a categorical attribute V (e.g. functional background, source of external information);*
2. *Units differ in the extent to which their members are evenly spread across all the categories of V;*
3. *Differences between units in their relative spread or diversity on V will be associated, usually positively, with vital unit consequences (e.g., problem-solving or group decision quality, firm performance).”* (Harrison & Klein, 2007: 1204)

*Minimum* variety is quite straightforward because it occurs when all members of a group or unit belong to the same category of attribute V (first cell of row two in figure 2). *”Using communication theory terms, such members are redundant in that there is no information gained by adding more persons to the unit who occupy the same V category.”*(Harrison & Klein, 2007: 1205)

*Moderate* variety is distinctively different from minimum because at least one member of the group or unit differs from the other members there is moderate variety and not minimum. This means that at least one member of the unit comes from another category from attribute V. This also the biggest difference in the case of information because it goes from only one category to two categories or more. *“From a variety viewpoint, the “odd person out” with respect to V is the most crucial.”*(Harrison & Klein, 2007: 1205)When there is moderate variety there is an overlap in knowledge or information which might result in sub-units and unshared information because there is not the same openness as would be in maximum variety.

*Maximum* variety is the richest possible variation and distribution of information. This occurs when all member of the group or unit comes from a unique category of V. This means that everybody is different and has a unique viewpoint to offer in a given situation. Due to the fact that everybody is different there are no possibilities to form sub-units as in the case of separation and this eases communication and makes members open and receptive to other members point-of-view.

In the case of variety it is important to mention, that if there are only two members of the group or unit there can only be either minimum or maximum variety because they can only be alike in their category or completely unique. This is different in the cases of separation and disparity where two members of a group or unit can be viewed as moderate separation or disparity (Harrison & Klein, 2007).

*“Variety reflects* ***information****: the distribution of what each unit member knows that is unique from other members, as a function of the distinct content of his or her education, training, or experience.”* (Harrison & Klein, 2007: 1207)

Units or groups in an organization are, in the case of diversity as variety, informational processing instruments for an organization. Members of a group with different knowledge, functional background, experience, or range of external social ties will be able to make more effective decisions and make more creative products than a heterogenic group. This will also increase the absorptive capacity of the unit or group, because each member will have access to different information external to the group and will serve as a sort of lens, filtering and interpreting information for the members of the group (Harrison & Klein, 2007).

**Disparity**

Research in disparity is based on the three following assumptions:

1. *“[W]ithin units, members can differ in the extent to which they hold or receive a share, amount, or proportion of D;*
2. *Units differ in the extent to which D is distributed among or possessed by their members – in some units members have equal shares of D, but in other units one or a few members hold a disproportionate share of D relative to other unit members;*
3. *Differences among units in the extent to which their D is distributed equally among unit members lead to predictable and important consequences (e.g., fewer members expressions of voice).”* (Harrison & Klein, 2007: 1206)

*Minimum* disparity occurs when all members of a unit or group occupy the same position on the continuum D. In the case of minimum disparity there is equality between the members in respect to D.

*Moderate* disparity is when group or unit members show some but only some differences and therefore are evenly spread along the continuum D. There are still differences in ranking but the differences are more compressed (Harrison & Klein, 2007).

*Maximum* disparity occurs when one member of the group or unit differs remarkably from all of the others in respect to outranking. This is also visible in the figure 2 (third cell of row three) where you can see that one member is at the top of the continuum D and all others are at the bottom. This can also be describes as: “[O]ne individual has everything and everyone else has nothing” (Harrison & Klein 2007: 1206). An example of what can happen in the case of maximum disparity is; *“When a CEO’s power far exceeded that of other TMT members, creating high power disparity in the team, the CEO was likely to engage in “tactics for controlling and withholding information,” and the other executives in the team were likely to engage in “alliance and insurgency behaviours”*.” (Harrison & Klein, 2007: 1207).

*“Disparity reflects* ***possession****: the distribution of how much of a socially valued commodity each unit member has.”* (Harrison & Klein, 2007: 1207)

When it comes to diversity in disparity of status, power, and pay often result in competition, differentiation, and resentful deviance among some unit or group members. Even conformity, silence, suppression of creativity, and withdrawal has been found to be a consequence of disparity. Social capital can also be described as disparity in the network and if one person is centralized the network ties are unevenly distributed between the group or unit members. Also expert knowledge can be viewed as a way of disparity because if one person holds all knowledge about a specific subject it is a valued resource D and it would be a case of maximum disparity (Harrison & Klein, 2007).

**Balance**

*“All else being equal, the more even is the balance, the greater the diversity.”* (Stirling 2007: 709)

The balance element of diversity tells how many of the different attributes there are; How many men or women, and how many engineers or accountants. The more equal the division is the larger the diversity is. For instance if the balance is 75 % women and 25 % men the diversity is less than if the balance was 50 % women and 50 % men (Stirling, 2007).

*Minimum* balance is when the two columns are as uneven as possible; this will be when one different from all of the others. It does not matter where on the continuum B the two columns are placed they just have to be different from each other. There cannot be a minimum of balance when there are only two members of the group or unit, because there will always be a balance between the two, they have to be different.

*Moderate* balance is when there is an unbalance between the two or more variations of an attribute but the division between the variations is as small as possible, as shown in the figure 2. It does not matter where on the continuum B the different columns are placed, because it is not the distance between them but the balance which is important in this case.

*Maximum* balance might seem similar to maximum separation but they are very different. Maximum balance is the balance between two or maybe more variations of an attribute of diversity which can be placed at any point on the continuum B. This is where it differs from separation because it focuses on, where on the continuum S they are placed and maximum separation is when the two columns are as polarized as possible.

Balance is different from the other typologies because it does not depend on a specific variable such as separation is about the position, Variety is about the information, and disparity is about the possession. Balance is only about the balance between the different variations of an attribute.

4.2. Innovation

*“Innovation is driven by the ability to see connections, to spot opportunities and to take advantage of them.”* (Bessant & Tidd, 2007: 6)This can both be in the case of completely new possibilities or it can be about changing product or services to better serve consumers (Bessant & Tidd, 2007). Innovation is not just about creating new products or services there are many other areas in a company where innovation occurs and also the degree of innovation can vary from incremental to radical (Tidd et al., 2005). The different types of innovation can be described through the following four broad categories (Tidd et al., 2005):

* **Product innovation** – This is changes things an organization offers, both product and services.
* **Process innovation** – This is changes in the ways the products or services are produces or delivered. This might not be as obvious for outsiders of the organization as product innovation.
* **Position innovation** – This is changes in the context of which the product or service is introduced.
* **Paradigm innovation** – This is changes in the underlying mental models which frame what the organization does. This might be close to a revolution in regard to an organization or a market.

Even though these different types of innovations are different they often interconnect. It is difficult to make a paradigm innovation without making product or process innovation at the same time. These types do describe what the purpose or end result of the innovation is and this is despite also including some of the other types of innovations in the process (Tidd et al., 2005).

The type of innovation at WOFIE is product innovation in the area of “Life: Science and quality” where the groups have to develop an idea for either a product or a service. This is important to know but in this thesis it is not the most important factor in the case of innovation. It is more important to show how diversity, creativity and innovation interconnect and describe their relations.

The perception of the innovation process has changed over time. In the following, this change of perception will be shortly described. In the beginning around the 1950s - mid 1960s the belief was that more R&D in house resulted in more successful new products out, also called “technology-push”. This later changed in the mid 1960s - early 1970s where the perception of the innovation process changed to focus more the demand side factors. This meant that the market was source of ideas for directing R&D, which made R&D much more reactive in this process. This innovation process is called “market-pull” or “need-pull”. In the early 1970s – mid 1980s it became more obvious that the previously two models were for extreme situations and that the model should be a combination of both technologically capabilities and the market needs. This became “the coupling model”. The fourth model the “integrated innovation process” focus’ on collaboration between different departments in the organization and integrating suppliers into the innovation process. This was to design for manufacturing because competition had increased as well as product-life-cycles had decreased (early 1980s – early 1990s). The new model of the innovation process is focused on several things; which in short is networking, integrating the surrounding system (suppliers, consumers, sales etc.), cross-functional development process, more flexible organization etc. This is a much more complex process and this is also due to the technologically development which has increased competition even more and that the product-life-cycle is shorter than ever (Rothwell, 1994). This was a very short description of how the innovation process has changed over time. The description is especially regarding product innovation which also was the focus at WOFIE.

The innovation process could be described through the following steps:

* *“****Searching*** *– scanning the environment (internal and external) for, and processing relevant signals about, threats and opportunities for change.*
* ***Selecting*** *– deciding (on the basis of a strategic view of how the enterprise can best develop) which of these signals to respond to.*
* ***Implementing*** *– translating the potential in the trigger idea into something new and launching it in an internal or external market. Making this happen is not a event but requires attention to:*
  + ***Acquiring*** *the knowledge resources to enable the innovation (for example, by creating something new through R&D, market research, etc., acquiring knowledge from elsewhere via technology transfer, strategic alliance etc.).*
  + ***Executing*** *the project under conditions of uncertainty which require extensive problem-solving.*
  + ***Launching*** *the innovation and managing the process of initial adoption.*
  + ***Sustaining*** *adoption and use in the long term – or revisiting the original idea and modifying it – reinnovation.*
* ***Learning*** *– enterprises have (but may not always take) the opportunity to learn from progressing through this cycle so that they can build their knowledge base and can improve the ways in which the process is managed.”*(Tidd et al., 2005: 67-68)

I will not describe the different steps of the process further, only the one that is interesting in the case of creativity and thereby where diversity can occur.

Creativity is very significant in the step called *acquiring* knowledge resources. The previously steps of the process of innovation has entailed *scanning* the environment for new opportunities or signals of change (External or internal through R&D) and then *selecting* the right signals to focus on for further development, which is done in the step called *implement* which *acquiring* knowledge resources is a part of. This step is also called ‘invention’ because this step in the process is about combining the combination of ideas around a concept which has already been chosen. This is where innovation moves from being a collection of ideas to becoming a physical reality.

This innovation process is focused on how innovation develops in an organization and not in a more constructed setting as WOFIE is. At WOFIE the organizers have prior chosen a subject or theme for the development is the groups, this year it was Life: Science & Quality. They probably have gone through some of the steps mentioned for *scanning* the environment and *selecting* the theme, they found the most relevant for the students to discuss.

The following section will further describe the concept of creativity and how it relates to both innovation and diversity.

## 4.3. Creativity

The following section will describe the meaning of creativity and how it further can be used for innovation and the connection to diversity.

Creativity is a mean for achieving innovation; a creative idea realized is innovation (Johansson, 2004). The degree of creativity of course depends on if the innovation is thought to be incremental or radical. There is differences in how individuals prefers different creative styles but there is strong evidence that support the view that every individual has a latent capability for creative problem-solving. Many external factors might influence this latent capability both positive and negative and in the step of *acquiring* knowledge resources it is important to manage this process right to improve the ability for creative problem-solving (Tidd, et al., 2005).

When talking about creativity at the work place it is important to distinguish between having a creative job and being creative at the job. Creative job are believed to be in areas like development, advertisement, design, whereas being creative at the job, is being able to choose novelty instead of the routines (Bessant & Tidd, 2007). It is easy to connect creativity to art but creativity also includes new ideas in other fields such as business, law, and even science (Johansson, 2004).

*“Creativity is the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints)…”*(Sternberg & Lubart, 1999: 3) This is a short but good definition because it does not only focus on the ability to create novelty but it also has to have a purpose, to be useful and relevant. But the following definition is much more precise:

*“Creativity is the making and communicating of meaningful new connections to help us think of many possibilities; to help us think and experience in varied ways and using different points of view; to help us think of new and unusual possibilities; and to guide us in generating and selecting alternatives. These new connections and possibilities must result in something of value for the individual, group, organization, or society.”(Bessant & Tidd, 2007: 40)*

The relationship between knowledge and creativity is complex because creativity by definition goes beyond knowledge. Knowledge may be the building blocks in the process of constructing new ideas but it is important to be able to let go of old ideas and knowledge in order to create the new. It is important to have knowledge in an area where you want to create change and new ideas, but too much knowledge in the area might also have the opposite effect which can lead to restraints due to ones old knowledge. This is where diversity can have a positive effect is used right (Weisberg, 1999).

The idea of measuring how diversity affects creativity can meet some obstacles when looking at it from an organizational perspective. As previously mentioned if we look at innovation as a process and at the part where creativity plays a big role, it is somewhat in the beginning of the process and there are many steps left before the idea created, is for instance a product ready for sale. Here it is also important to have in mind that good ideas might get rejected just because they are so far away for the norm or the culture of the organization and is thought of as a too big a risk (Williams & Yang, 1999). So when looking at larger quantitative research on the composition of attributes of diversity and the number of new products or other innovations it might not say anything about the degree to which diversity affects the capability to be creative.

When discussing creativity it is important to make a distinction between individual creativity and group creativity. This thesis is about group work and group diversity, the group perspective will also be in focus in regard to the concept of creativity. The first studies in the subject of creativity were on the individual and specific abilities, traits and process of thoughts associated with creativity. Later a more systemic view of creativity aroused because it was clear that the environment had an effect on creativity too. This still regards creativity as a somewhat individual process but it is perceived to take place within a context of a particular environment instead of in a vacuum (Williams & Yang, 1999).

Some of the difficulties and problems in the process of innovation is the translation of an idea into an innovation and these complications often happen in the early part of the process. This is where the management of creativity and innovation plays an important role (Bessant & Tidd, 2007, Williams & Yang, 1999). Being creative is not enough the right surroundings has to be there to insure motivation and rewards for being creative (Williams & Yang, 1999).

## 4.4. Diversity attributes

There are many different studies which have look at the effects of diversity, though with different focus.

The following chapter will sum up the conclusions of the previously studies divided into the different attributes; Age, gender, race & ethnicity, functional and educational background. These attributes are also the once that will be examined further through an empiric study at WOFIE. Attributes such as tenure and pay have been left out because it is not relevant in relation to WOFIE.

The table below show the different attributes of diversity divided into positive and negative effects on both group process and result. The focus is on the detectable attributes of diversity and the ones that have an effect on a give task at hand, such as education and background. These attributes is also the ones that are most discussed in the literature and therefore makes more relevant to describe and discuss attributes which has been proven to have one or the other effect in previously studies.

|  |  |  |
| --- | --- | --- |
| **Attributes of diversity** | **Positive effects** | **Negative effects** |
| Age | - age differences in top management teams, might lead to better decision making (Horwitz, 2005). | - Age difference has a negative effect on innovation (Østergaard et al., 2009).  - Other studies show no correlation between age and innovation in top management (Milliken & Martins, 1996). |
| Gender | - Facilitates creativity (Milliken & Martins, 1996).  - Balanced cross-gender team has positive effect.  - Balanced cross-gender firms are more likely to innovate than one-gender firms (Horwitz, 2005). | - Conflict, tension and lower levels of friendliness.  - One-gender teams are less advantageous the balanced cross-gender teams.  - Cross-gender teams can create process loss even though the result might be positive (Horwitz, 2005). |
| Race and ethnicity | - Improve a firm’s competitive position.  - Heterogeneous groups outperform homogeneous groups (Horwitz, 2005).  - Heterogeneous groups are more cooperative (Milliken & Martins, 1996). | - Negative effect on group performance (Horwitz, 2005).  - Homogeneous groups are more individualistic (Milliken & Martins, 1996). |
| Functional background/ experience | - Positively related to effectiveness and efficiency (Horwitz, 2005).  - Positive effect on top management in the case of administrative innovation.  - Positive indirect effect on innovation, because of frequent communication outside the group (Milliken & Martins, 1996). | - Negative effect on communication and understanding a specific task at hand (Horwitz, 2005).  - Negative direct effect on innovation in product teams, due to difficulties in decision making and process (Milliken & Martins, 1996). |
| Education | - Positively related to team process because it fosters cognitive skills (Horwitz, 2005).  - Increases the ability to be creative and is an asset in the case of implementation (Williams & O’Reilly, 1998, Horwitz, 2005).  - Positive correlation between educational diversity and the likelihood to innovate in the case of employees with higher degree of education (Østergaard et al., 2009). | - Can undermine the unique knowledge of the individuals.  - Can create conflict in the group especially in the case of differences in length of education (Williams & O’Reilly, 1998, Horwitz, 2005).  - Diversity in top management are negatively correlated to turnover rates, employees who are least similar are more likely to leave the organization (Milliken & Martins, 1996). |

**Table 1:** *Summery of attributes of diversity into positive and negative effects*

**Age**

Age is one of the easy observable attributes of diversity that might have an effect on the group process because people that are born in the same decade might have more of the same values and outlook on live. This might be an indicator that homogeneity can be an improvement to the group process because it might eliminate some of the reasons for conflict and even problems in communication (Williams & O’Reilly, 1998).

A study done in top management teams showed that there were significant differences in how young managers and senior managers made decisions. Young managers were more prone to pursue more aggressive strategies and senior managers were more cautious and sought more information before making a decision and therefore required more time. This can definitely create problem in a case of cooperation in a group which such differences in regard to decision making (Horwitz, 2005).

Other studies have found no correlation, neither negative nor positive, between diversity in age in top management and the likelihood to innovate (Milliken & Martins, 1996).

The theory regarding no correlation between age diversity in top management and the likelihood to innovate is questioned by a Danish study which has found that diversity in age has a negative direct affect on the ability to innovate (Østergaard et al., 2009). This view is not supported by much studies because they do not find any correlation between the two factors, except one study which also find the correlation to be negative in the case of innovation (Williams & O’Reilly, 1998).

The positive side of age diversity is that even though there are some difficulties in regard to the group process there might be some positive impact of age diversity on the outcome. Due to differences in experiences and values the outcome might be more varied and therefore have a positive effect on creativity and performance of the group (Williams & O’Reilly, 1998).

Another important fact to remember is the discussion of the degree of diversity because this might explain the very different outcomes in the different studies, because this has not been taken into account. Even though there might be age differences in the group it is important to distinguish between a 60 year old and a 25 year old working together and a 50 year old and a 60 year old. This is because although there is a difference in age in both cases it might have a larger negative effect on the 60 and 25 year old and not so much the 50 and 60 year old, because they have more similarities so it might be important to look at age groups generation shifts. Furthermore, it is also important to look at the balance between the members of the group, is there a minority or is there an equal balance between the age groups.

**Gender**

Gender is also a very easily observed attribute and even though it does not in itself have much task relevance, it does affect the group process in things such as communication.

It has been concluded through studies that gender diversity results in conflict, tension, and lover levels of friendliness (Horwitz, 2005). In this section the degree of diversity has a large effect on the results. That is, if there is an uneven balance between the genders, especially if the men are in majority, there is a higher risk of the women losing social identity and not feeling any sense of belonging to the group. When men are minority they do not feel left out in the same degree as women, because women are more aware of including men in the group, but research show that although men are more accepted as a minority they still feel less satisfied and committed to the group (Milliken & Martins, 1996). Many studies has shown that teams with gender diversity outperform same-gender teams, but at the same time there are more process loss because of the different ways of communication and interacting men and women between (Horwitz, 2005).

A Danish study show that organizations with more balance in gender, and therefore a higher degree of diversity, were more likely to be innovative than organizations with a more homogeneous gender composition (Østergaard et al., 2009).

Again it is important to look at the degree of diversity because as previously mentioned most of the negative effects of gender diversity appears when one gender is a minority and therefore does not feel commonality to the group. It is especially the group process that suffers in the case of gender diversity and not so much the result, because same-gender teams outperform cross-gender teams. Another important fact is that if the genders are more evenly balanced, as described in the Danish study, they are able to be more innovative than same-gender organizations.

**Race and ethnicity**

At the moment there has not been as much focus on race/ethnicity in the diversity research, but there have been done some studies which will be briefly discussed in this section (Williams & O’Reilly, 1998).

Some studies that have been conducted in the area of racial and ethnical diversity suggest that this attribute of diversity will have a negative effect on group performance (Horwitz, 2005). Most of the research in this field of study has found that the minority in an organization is more likely to leave the organization and be less satisfied in the workplace. This is especially in regard to white people as a minority. Furthermore it is also important to mention that most of the studies have only focused on the division of white versus Afro-American people as race and ethnicity, and white versus other ethnical people. This cannot be regarded as a valid division because the different races and ethnicities can have an enormous effect on their values, ways of communicating etc. (Williams & O’Reilly, 1998).

One a more positive note, there are studies that show that racial homogenous teams (all white team members) had the best team process in the beginning of the study than the racial heterogenic teams, but later in the study the racial heterogenic teams outperformed the homogenous team (Horwitz, 2005). Again the concept of the degree of diversity is not discussed in these studies and this has of course an effect on the outcome of the studies. Because as described earlier the minority always feel less attached to the group and is more likely to leave than the majority, and in the case of race and ethnicity, it can also have something to do with discrimination and other factors that have an effect on the group process or the attachment to the organization.

**Background diversity**

Functional background is based on differences in information, knowledge, expertise, education and functional specialities. This section will be divided into functional and educational background.

*Functional background*

One of the main difficulties in regard to diversity in functional background is communication and difficulties in understanding the task at hand. This is because when people are so different in their functional background, they do not necessarily speak the same professional language and this is also why they might view the task at hand differently. It is also more difficult for groups with functional background diversity to reach a decision and agreement in the group (Horwitz, 2005). Other studies have also shown that functional diversity in product teams has a negative direct effect on innovation. This might be due to the fact that there are more process difficulties and inefficiency in the decision making process. This study showed, at the same time, that diversity in functional background had an indirect effect on innovation because there was more frequent communication with people external to the group, which created a stronger link to the rest of the organization; this can both influence the outcome and the implementation positively (Milliken & Martins, 1996).

Diversity in functional background has also been proven through different research to be positively related to team effectiveness and efficiency (Horwitz, 2005). There is also a study from the late 1980s that has shown a positive correlation between diversity in functional background in top management, and the likelihood to make administrative innovations in the organization (Milliken & Martins, 1996).

*Educational background*

Diversity in educational background can have the effect of undermining the unique knowledge of the individual members of the group. This is because the knowledge of the group members are so different, that in can be difficult to know the value of the knowledge of other people, because it is so different from one’s own. Educational diversity can be a positive element in the creative process but when it comes to implementation, it created problems. When describing educational diversity it is important to remember that it does not only encompass the idea of different educations such as law and economics but also the length of the educations, that is combined, which could be the diversity between a master student and a craftsman, where the difference in education is very notable (Williams & O’Reilly, 1998, Horwitz, 2005). There has not been shown a correlation between educational diversity in top management and the likelihood for innovations but one study argues that there might be an advantage in educational diversity if the top management are allowed to surface and discuss the differences in open debate (Milliken & Martins, 1996).

Educational diversity has much like functional background a positive impact on team performance because it creates a broader range of cognitive skills (Horwitz, 2005). A Danish study showed a correlation between educational diversity, among employees with a longer education, and the likelihood to innovate. This is affected both by the balance and the variety of the different education in the organization. In the case of employees it is important to take into account that studies has shown that having employees in an organization, with a higher degree of education, it in general increases the likelihood for innovation to occur (Østergaard et al., 2009).

# 5. Analysis

The following chapter will be an analysis of the questionnaires from the WOFIE workshop. There are many ways to frame such an analysis, but in this case it will take the point of departure in each group. First the composition of the group will be described in regard to, age, gender, education, and nationality. Then the degree of diversity will be discussed and described to be able differentiate the different groups and their answers. This will be followed by a division of the different attributes (age, gender, nationality, experience, and education) into the groups with maximum, moderate, and maximum degree of diversity. This will allow for a discussion of, how the degree of an attribute, effects the way the members perceive it, in regard to the group process and result. The reason for doing the analysis this way, is to be able to show if the degree of diversity has an effect on the finding. Each section will be followed by a discussion, which will summarise and discuss the finding in connection to previous research and its connection to creativity and innovation.

## 5.1. Questionnaires from WOFIE

The questionnaires were distributed Thursday the 14th of April at Aalborg University, at one of the larger places at the WOFIE workshop. It was around four pm just before they were finished with day three of the workshop. The groups were almost finished with their ideas and presentations, which they had to present orally the following day.

Appendix A is a copy of the questionnaires that were distributed at the WOFIE workshop. The numbers of the groups are changed to ensure anonymity, but it was important to have the numbers of the groups, to start with, to be able to divide the respondents into their respective groups.

There were 41 respondents who completed the questionnaire at WOFIE; the distribution is as follows:

**Age**

The range was from 21 to 33 and the average was 24.

**Gender**

The division in gender was 23 males and 18 females

**Educations**

Two students from humanistic studies, Three from social studies, 33 Natural science and one medicine. (the number of respondent does not add up, because one respondents misunderstood the question)

**Nationality**

27 Danish and 14 Foreign (Hungarian, 2x Portuguese, German, Pakistani, 2x Spanish, Polish, Indian (India), 2x Romanian, Croatian, Bangladeshi & Latvian)

### 5.1.1. Division into groups

The following section is divided into the different groups and starts with a description of the respondents from each group and is followed by a description of the group as a whole. The groups will be described from the knowledge about the different attributes that were collected through the questionnaire. In some cases, where there are only a few respondents from one group, it will not be possible to discuss other attributes than gender, nationalities, and education and only superficially due to lack of information.

**The degree of diversity**

The degree of diversity is in a way a subjective decision because not all of the group members, in all of the groups, have answered the questionnaires. This mostly affects the sections on nationality, background and education. In case of nationality minimum diversity is when there is only one nationality present in the group, or if there is only one foreign and the rest of the members are Danish, maximum diversity in nationality is when there is an equal number of Danish and foreign members in the group. This is regardless of which country the foreigners are from. This is decided because in many cases it is not possible to know which country the foreigner is from, if the foreign group member has not completed the questionnaire. Moderate diversity in nationality is all the groups that do not fit the previous two descriptions of minimum and maximum diversity.

In the case of the degree of diversity in background this is only discussed when there is half or more than half of the group which have completed the questionnaire.

Education is also complicated because there are different possibilities for dividing the groups into minimum, moderate and maximum diversity. In this case each education counts; this means that minimum diversity in education can only be in a group where all members have the exact same education e.g. architecture and design and not just if there are five students from natural science. Maximum diversity is in the groups exists in groups with all different educations, also if they are all from e.g. social science. Moderate diversity in education is all the groups that do not fit the previous description of minimum and maximum diversity.

**Group 1**

Group description:

Number of group members: 3 male

2 female

5 total

Education in the group:

5 Natural science.

Everybody in the group had an educational background in natural science but different in specific educations.

Nationalities in the group:

4 Danish

1 Foreign

Respondents:

* **Male 23**, Danish, *Natural science - Software defined Radio-electronic*, student job, volunteered.
* **Female 24**, Danish, *Natural science - Architecture and design*, student job.
* **Female 25**, Hungary, *Natural science - Architecture and design*.

The degree of diversity in the group

**Age**

The oldest of the respondents is 25 and the youngest is 23; which means that there is not a great difference between the members of the group. This can at the most be a *moderate* degree of separation or maybe *minimum* variety. This is argued on the ground that there are not many differences between a 25 year old and a 23 year old, neither in regard to believes nor experience. The balance is also at a *minimum,* if we say that there are no difference between these three ages.

*- Minimum degree of diversity in age.*

**Gender**

Looking at gender the division is: three male and two female, this would be described as *maximum* separation because there is two polarized factors; there is no middle road in this case. Further, this is also the *maximum* in regard to balance, because there is an uneven number of members in the group there cannot be a perfect balance between the genders; this goes for separation as well as balance.

*- Maximum degree of diversity in gender.*

**Nationality**

Nationality is of *moderate* variety, because there is not a single nationality represented in the group but four Danish members and one member from Hungary. There is not *maximum* separation, even though there are two polarized positions they are not equally split and one person cannot constitute a sub-unit, which places nationality somewhere between *minimum* and *moderate* separation. Balance is also at a *minimum* of diversity in this case.

*- Minimum degree of diversity in nationality.*

**Experience**

The two Danish students have a non study related student job and the Hungarian student does not have a student job. This probably means that they have around the same amount of experience maybe the Danish members have an advantage because they have a student job which give some experience even though it is not relevant for their studies. This gives a *moderate* separation because they all have a different amount of experience, but not much separates them from each other. In the case of balance, this would also be between *moderate* and *minimum*, this is difficult to differentiate when there is only three respondents in the group.

*- Moderate degree of diversity in experience.*

**Education**

Even though the educations of the respondents are of different educations they are still much similar, due to the fact that they are all from the area of natural science; especially because two respondents are from the exact same study. It can also be argued that the group has a *moderate* degree of diversity in regard to variety also if you look at separation the degree is also *moderate,* because they are only a little different. The same is valid for balance, because there are only students from natural science studies and in the case of the respondents who are from the exact same study, and the third differentiate a bit, makes this moderate as well.

The balance and variety is at a *minimum* because there are none of the respondents who differentiate in this attribute in the case of variety, this is also described as there would be no gain by adding another person with the same knowledge to the group.

*- Moderate degree of diversity in education.*

**Group 2**

Group description:

Number of group members: 3 male

3 female

6 total

Education in the group:

1 Social studies

1 Humanistic studies

4 Natural science

Nationalities in the group:

3 Danish

3 Foreign

Respondents:

**Female 23**, Danish, *Humanistic studies - adventure design (oplevelses design)*, study relevant student job, maybe starting own company.

**Female 25**, Danish, *Natural science - architecture*, student job and volunteered.

**Female 25**, Portuguese, *Natural science - architecture and design*, volunteered.

**Male 28**, German, *Social studies - cand.merc.mike*, volunteered.

The degree of diversity in the group

**Age**

There is some difference in age in regard to the respondents of this group. The youngest is 23 and the oldest is 28; this makes it *moderate* separation and in the case of variety, it would be *minimum* or *moderate* diversity. The balance of the group compared to age is also *moderate,* because it differs but some of the ages are alike.

*- Moderate degree of diversity in age.*

**Gender**

The gender distribution of the group is three male and three female and this makes it *maximum* diversity in both the case of separation and balance because the genders are evenly divided into two groups.

*- Maximum degree of diversity in gender.*

**Nationality**

There are three group members from Denmark and three of the members are foreign, this could create two separate groups with polarized opinions or values which would be *maximum* diversity in regard to separation. The variety and balance is also *moderate* because the nationalities are different, but if we look at Danish and foreign it would be *maximum* balance. Due to the fact that we are located in Denmark and foreigners probably feel different there are reasons for a division between Danes and foreigners.

*- Maximum degree of diversity in nationality.*

**Experience**

Both of the Danish respondents have a student job, one has volunteered and the other has a study relevant job. None of the foreigners has a student job but they have all volunteered. In regard to experience as a whole the separation is *moderate* because they have different experiences but they have all working experience no matter if it is volunteered or a paying job. This also makes the balance *moderate*. If student work and volunteering is separated is at a *minimum* in the case of volunteering. In the case of student jobs the balance is at a *maximum* for the respondents.

*- Moderate degree of diversity in experience.*

**Education**

In case of education the variety is *moderate* because there is two of almost the same education, architecture and design and two with different educations, one from humanistic, one from social studies and two other from the group who also have a natural science education. This is also *minimum* balance because there is not an even division of the educations between the members of the group. The separation is also moderate because they do not all have the same education, so it has to be moderate separation.

*- Moderate degree of diversity in education.*

**Group 3**

Group description:

Number of group members: 5 male

5 total

Education in the group:

1 social studies

4 natural science

Nationalities in the group:

4 Danish

1 Foreign

Respondents:

**Male 27**, Danish, *Natural science - automation and control*, study relevant student job.

The degree of diversity in the group

**Age**

Age cannot be discussed because there is only one respondent from this group.

**Gender**

The degree of diversity is at a minimum for both separation and balance, because the group consist of all male members.

*- Minimum degree of diversity in gender.*

**Nationality**

In the case of nationality there is one foreign and four Danish embers of the group. This makes variation somewhere between minimum and moderate, and the balance in at a minimum. Separation is also at a minimum level.

*- Minimum degree of diversity in nationality.*

**Experience**

Experience cannot be discussed because there is only one respondent from this group.

**Education**

The education is divided with one from social studies and four from natural science. This makes the variety moderate under the presumption that all of the natural science students does not study the exact same and this also make separation, at a moderate level. The balance is also moderate because the educations are different.

*- Moderate degree of diversity in education.*

**Group 4**

Group description:

Number of group members: 4 male

1 female

5 total

Education in the group:

4 Natural science

1 Humanistic studies

Nationalities in the group:

5 Danish members

Respondents:

**Male 24,** Danish, *Natural science - MSc in engineering in nanobiotechnology*, has student job, volunteered.

**Male 23**, Danish, *Natural science - engineer*, has student job, volunteered.

The degree of diversity in the group

**Age**

It is different to conclude on only forty percent of the group but the diversity is at a minimum degree of separation and balance. Even though there is a year of difference this will give much diversity.

*- Minimum degree of diversity in age.*

**Gender**

The gender diversity is at a minimum of balance and at a moderate level of separation because there are four male and one female. Due to the fact that minimum level of gender diversity is a group with only one gender, this is a moderate degree of diversity.

*- Moderate degree of diversity in gender.*

**Nationality**

The group consists of five Danish members this makes the degree of diversity minimum in regard to separation, variety and balance.

*- Minimum degree of diversity in nationality.*

**Experience**

The experience is also difficult to describe in the case of the degree of diversity because only forty percent has answered the questionnaire.

**Education**

In the case of education one of the group members is from the humanistic studies and the four remaining is from natural science. Both of the respondents are engineers. This make the variance moderate as well as the separation, and the balance is at a minimum.

*- Moderate degree of diversity in education.*

**Group 5**

Group description:

Number of group members: 2 male

2 female

4 total

Education in the group:

1 Social studies

1 Humanistic studies

2 Natural science

Nationalities in the group:

4 Danish members

Respondents:

**Male 22**, Danish, *Natural science – electrical engineering*, no student job, volunteered.

**Female 24**, Danish, *Natural science - industrial design*, student job, maybe starting own company.

The degree of diversity in the group

**Age**

The two respondents are very similar in age. In the case there is a minimum degree of separation and balance. There is difference in age but because it is this small it would not be likely to be notable difference.

*- Minimum degree of diversity in age.*

**Gender**

The division of gender is 2 female and two male which makes it maximum separation and balance in this group.

*- Maximum degree of diversity in gender.*

**Nationality**

The nationality of this group is four Danish members, which is minimum variety, separation and balance in the group.

*- Minimum degree of diversity in nationality.*

**Experience**

One of the respondents does not have a student job, but has volunteered and the other respondent has a student job, but has never volunteered. This makes it a moderate degree of separation, because they are not that different in experience.

*- Moderate degree of diversity in experience.*

**Education**

The variation is at a maximum because there are two members of the group from natural science, one from humanistic, and one from social studies; the two respondents are both from natural science but from different educations, which makes the variation maximum. The balance is also at a maximum because there is one student from each education. The separation is moderate because there are not two polarized units.

*- Maximum degree of diversity in education.*

**Group 6**

Group description

Number of group members: 5 male

5 total

Education in the group:

1 social studies

4 Natural science

Nationalities in the group:

3 Danish

2 Foreign

Respondents:

**Male 23**, Pakistani, *Natural science – ICTE, volunteered*, wants to start own company.

**Male 25**, Danish, *Natural science – Industrial design (architecture and design)*, has study relevant student job, volunteered, has own company.

**Male 25**, Danish, *Natural science – electrical engineering*, no student job, volunteered.

**Male 24**, Danish, *Natural science – architecture and design*, no student job.

The degree of diversity in the group

**Age**

The differences in age are very limited in this group which makes both separation and balance at a minimum.

*- Minimum degree of diversity in age.*

**Gender**

The group consists of five males which make the degree of diversity minimum in both separation and balance.

*- Minimum degree of diversity in gender.*

**Nationality**

The group has three Danish and two foreign members in the group. This makes the variety, separation and balance moderate. This is because there cannot be maximum balance or separation in a group of five members.

*- Moderate degree of diversity in nationality.*

**Experience**

Two of the respondents has own company and one of them also have a study relevant student job and has volunteered. One has volunteered and one has never had a student job or volunteered. This makes the quite different in regard to experience and this is moderate variety, separation and balance.

*- Moderate degree of diversity in experience.*

**Education**

There is one student from social science and four from natural science in the group. All the respondents are from natural science; two is from the same study and the two others are quite different from the rest. This makes the variety moderate but close to maximum and separation and balance is also moderate.

*- Moderate degree of diversity in education.*

**Group 7**

Group description

Number of group members: 3 male

2 female

5 total

Education in the group:

1 humanistic studies

4 Natural science

Nationalities in the group:

5 Danish

Respondents:

**Female 23**, Danish, *Natural science – Industrial design,* study relevant student job, volunteered, wants to start own company.

The degree of diversity in the group

**Age**

Age cannot be discussed because there is only one respondent from the group.

**Gender**

There is three male and two females in the group and because the group has an uneven number of members, there is moderate separation and balance.

*- Moderate degree of diversity in gender.*

**Nationality**

The group consists of five Danish members which make variation, separation and balance at a minimum.

*- Minimum degree of diversity in nationality.*

**Experience**

Experience cannot be discussed because there is only one respondent from the group.

**Education**

There is one student from humanistic studies and four from natural science. Because it is impossible to know which educations the student has it is moderate variety and separation, and further, minimum balance in regard to education.

*- Moderate degree of diversity in education.*

**Group 8**

Group description

Number of group members: 4 male

2 female

6 total

Education in the group:

1 Social studies

1 Humanistic studies

4 Natural science

Nationalities in the group:

5 Danish

1 Foreign

Respondents:

**Male 27**, Danish, *Social studies – cand.merc.mike B*, study relevant student job, volunteered.

**Male 24**, Danish, *Natural science, interactive digital media*, has student job, volunteered.

**Male 24**, Danish, *Natural science – international technology management*, has student job, volunteered, has own company and might start up one more.

**Female 22**, Spanish, *Natural science – architecture and design*, has no student job.

The degree of diversity in the group

**Age**

Age is of moderate separation and balance. They are a bit different in age, but not enough to be maximum diversity in either separation or balance.

*- Moderate degree of diversity in age.*

**Gender**

The group consists of four male and two female members. This makes the degree of diversity moderate in both separation and balance.

*- Moderate degree of diversity in gender.*

**Nationality**

The group has one foreign member and five Danish members. This makes the variety between minimum and moderate. Separation and balance is of minimum degree.

*- Minimum degree of diversity in nationality.*

**Experience**

One respondent has a study relevant student job and has volunteered, and two others have a student job and have also volunteered. The fourth respondent does not have a student job and has not volunteered. This makes the one less experienced that the others who all have work experience. This is a moderate degree of separation and balance.

*- Moderate degree of diversity in experience.*

**Education**

In case of education the group has a moderate degree of diversity for variety. It might be of maximum degree because all of the respondents come from different studies, but because we do not have the information of the fourth natural science student and it might be of the same education as one of the three others. The separation is also moderate as well as balance, it could also have been maximum balance, if we knew which education the fourth natural science student has.

*- Moderate degree of diversity in education.*

**Group 9**

Group description

Number of group members: 3 male

2 female

5 total

Education in the group:

1 Humanistic studies

4 Natural science

Nationalities in the group:

4 Danish

1 Foreign

Respondents:

**Male 24**, Danish, *Natural science – electronics*, no student job, volunteered.

**Male 26**, Danish, Lived in Italy, *Natural science – media design*, study relevant student job, wants to start own company.

**Male 25**, Danish, *Natural science – computer science*, study relevant student job, volunteered.

**Female 24**, Danish, *Humanistic studies – learning and innovative change*, no student job, volunteered.

**Female 23**, Latvian, *Natural science – constructing architect*, has student job.

The degree of diversity in the group

**Age**

Age is of minimum separation and balance. This is because two of the respondents are of the same age and the age difference is not that significant.

*- Minimum degree of diversity in age.*

**Gender**

There are three males and two females in the group which makes it of moderate separation and balance. This is because it cannot be of maximum degree, when the two separate units are not the exact same size.

*- Moderate degree of diversity in gender.*

**Nationality**

The nationalities in the group consists of one foreign, Latvian, and four Danish members. This makes the variety moderate and the separation of minimum degree of diversity.

*- Minimum degree of diversity in nationality.*

**Experience**

All of the respondents has a student job and/or volunteered and one wants to start own company. So they all have some work experience. This makes experience of moderate separation and balance.

- Moderate degree of diversity in experience.

**Education**

The variety in education is at a maximum because all the educations are different even though four of the group members have a natural science background, they all attend different educations. The balance is also at a maximum because they are all equally distributed between the educations. The separation is at a moderate degree of diversity.

*- Maximum degree of diversity in education.*

**Group 10**

Group description

Number of group members: 2 male

3 female

5 total

Education in the group:

1 Humanistic studies

4 Natural science

Nationalities in the group:

2 Danish

3 Foreign

Respondents:

**Male 24**, Danish, *Natural science – industrial design*, no student job, wants to start own company.

**Male 24**, Polish, *Natural science – network and distributing systems*, no student job, volunteered, wants to start own company.

**Female 21**, Spanish, *Natural science – industrial design*, no student job, volunteered.

**Female 26**, Portuguese, *Natural science – urban planning and management*, no student job, volunteered.

The degree of diversity in the group

**Age**

The degree of diversity is moderate in case of separation and balance because the ages range from 21 to 26 years.

*- Moderate degree of diversity in age.*

**Gender**

In the case of gender the division there is two males and three females which make a moderate degree of diversity in both separation and balance.

*- Moderate degree of diversity in gender.*

**Nationality**

There are two Danish group members and three foreign. The three foreign members are from different countries; Poland, Portugal and Spain. This is a high degree of variance but because there are two Danish members this can only be moderate variety. The balance is also moderate because it is an uneven number.

*- Moderate degree of diversity in nationality.*

**Experience**

None of the respondent from this group has student job but two has previously volunteered and one wants to start own company. This divides the group into two units the two with volunteer experience and the three who do not have work experience. This is moderate separation and balance because there is not an equal separation.

*- Moderate degree of diversity in experience.*

**Education**

The four respondents from natural science are from three different educations and there is also one student in the group, from humanistic studies. This makes for moderate variety, separation and balance.

*- Moderate degree of diversity in education.*

**Group 11**

Group description

Number of group members: 1 male

4 female

5 total

Education in the group:

Students from social, humanistic studies and natural science.

Nationalities in the group:

2 Danish

3 Foreign

Respondents:

**Male 23**, Indian (from india), *Natural science – ICTE*, volunteered wants to start own company.

The degree of diversity in the group

**Age**

Age cannot be discussed because there is only one respondent from this group.

**Gender**

In the case of gender the division there is one male and four females, this makes it at a minimum degree of diversity in balance but moderate degree of diversity in separation. Due to the fact that a minimum level of gender diversity is a group with only one gender present, makes this moderate degree of diversity.

*- Minimum degree of diversity in gender.*

**Nationality**

There are two Danish group members and three foreign members in this group. This makes it a moderate degree of variety and balance.

*- Moderate degree of diversity in nationality.*

**Experience**

Experience cannot be discussed because there is only one respondent from this group.

**Education**

There are students from natural science, humanistic-, and social studies. This makes the diversity of medium variance and balance. Due to the fact that there are only one respondent it is impossible to know which studies they are attending and if any are alike.

*- Moderate degree of diversity in education.*

**Group 12**

Group description

Number of group members: 1 male

3 female

4 total

Education in the group:

1 Humanistic studies

3 Natural science

Nationalities in the group:

2 Danish

2 Foreign

Respondents:

**Female 23**, Romanian, *Natural science – industrial design*, volunteered, wants to start own company.

**Female 23**, Romanian, *Natural science – telecommunication*, study relevant student job, volunteered, wants to start own company.

The degree of diversity in the group

**Age**

In the case of age in the respondents it is of minimum, separation and balance.

*- Minimum degree of diversity in age.*

**Gender**

There are three females and one male in the group which makes it moderate separation and balance in the case of gender.

*- Moderate degree of diversity in gender.*

**Nationality**

In this group there are two Romanians and two Danes in the group. This makes both separation and balance of maximum diversity and variety is of moderate diversity.

*- Maximum degree of diversity in nationality.*

**Experience**

Both of the respondents wants to start own company, both has volunteered and one also have a study relevant student job. They both have some work experience and one a bit more that the other. This makes separation moderate as well as balance.

*- Moderate degree of diversity in experience.*

**Education**

There is one student from humanistic studies and three from natural science. The two respondents are from different studies within natural science. This makes at least three different educations, which will be moderate variety, separation, and balance because the last student from natural science might be the same as one of the others.

*- Moderate degree of diversity in education.*

**Group 13**

Group description

Number of group members: 4 female

4 total

Education in the group:

4 Natural science

Nationalities in the group:

3 Danish

1 Foreign

Respondents:

**Female 25**, Danish, *Natural science – urban design*, student job, volunteered.

**Female 22**, Croatian, *Natural science – wind power systems*, student job, volunteered.

The degree of diversity in the group

**Age**

There is a difference between the two respondents in age but because the age difference is so small, there will not be many differences between the two respondents. This makes it minimum degree of balance, variety, and separation in age.

*- Minimum degree of diversity in age.*

**Gender**

Gender is at a minimum of separation and balance because there are only females in the group.

*- Minimum degree of diversity in gender.*

**Nationality**

There is one Croatian and three Danish members of the group, which makes it moderate variance and minimum balance and separation.

*- Minimum degree of diversity in nationality.*

**Experience**

Both of the respondents has a student job and has volunteered, this makes them much alike in work experience. This is minimum degree of separation and balance.

*- Minimum degree of diversity in experience.*

**Education**

All of the members of the group are from natural science studies, the two respondents differ in education but it is difficult to know which educations the other group members have. This is moderate degree of variety, separation, and balance.

*- Moderate degree of diversity in education.*

**Group 14**

Group description

Number of group members: 4 male

2 female

6 total

Education in the group:

1 social science

4 Natural science

1 Medicine

Nationalities in the group:

5 Danish

1 Foreign

Respondents:

**Male 25**, Danish, *Natural science – product and design psychology*, study relevant student job, has own company and wants to start another.

**Male 32**, Bangladeshi, *Natural science – computer science - Ph.D. e-learning*, study relevant student job, volunteered, has own company and wants to start another company.

**Male 24**, Danish, *Medicine – biomedicine*, volunteered.

**Male 23**, Danish, *Natural science – architecture, volunteered,* has own company.

**Female 33**, Danish, *Natural science – product and design psychology*, student job.

**Female 28**, Danish, *Social science – finance bachelor at UCN*, student job, volunteered, wants to start own company.

The degree of diversity in the group

**Age**

There is a moderate degree of separation and balance in age. There is ten years of difference between the oldest and the youngest member of the group. This is a significant age difference but the difference cannot be described as to polarized units, because the ages are spread almost evenly between the oldest and the youngest member.

*- Moderate degree of diversity in age.*

**Gender**

The genders in the group is divided with four males and two females this makes the diversity in separation and balance moderate.

*- Moderate degree of diversity in gender.*

**Nationality**

In the case of nationality there is a moderate degree of diversity in variety, and minimum degree of separation and balance.

*- Minimum degree of diversity in nationality.*

**Experience**

All of the members of the group have some kind of work experience both in regard to student job, volunteering, and two has own company. This makes it of moderate degree of separation and balance.

*- Moderate degree of diversity in experience.*

**Education**

Two members of the group have the same education and the other four has different educations. This makes the variety moderate and this also goes for separation and balance.

*- Moderate degree of diversity in education.*

### 5.1.2. Division into attributes of diversity

The different groups from WOFIE have been rated in which degree each attribute is in regard to diversity. The following section will look at each attribute and divide the groups into maximum, moderate, and minimum diversity. The findings will be analysed and discussed in regard to how the degree of diversity affect group process and result.

There will also be discussed a connection to innovation and creativity, on the basis that the purpose of WOFIE it to be innovative, find new products in the subject Life: Science & Quality and this is through a creative process. This is why there can be drawn connection from the answers from the questionnaires to innovation and creativity. The focus of the project is on the process and result from these creative processes this means that indirectly it has measured how diversity affects the process of creativity. The result is more complex because the grading of the result by the jury at WOFIE was confidential so it will only be possible to discuss how the respondents viewed that diversity affected the result, and not to comparing the grades of each group with the degree of diversity in the groups. This is not the optimal way of discussing the result but due to the circumstances there are no other possibilities.

**Analysis of diversity in age**

The analysis of age is in some of the groups not possible because there are only one respondent and therefore only one known age. It is also important to consider in which case differences in age is relevant to discuss. If there is only a year or two between two respondents, it will not have a big impact but when the difference in age gets above five years there might be some differences to spot, which might affect group process and result in either positive or negative way.

Moderate degree of diversity

In the case of age diversity, there are four groups that have a moderate degree of diversity; Groups number 2, 8, 10, and 14.

*Group 2:* One of the four respondents answer that age has a negative effect on both group process and result. These answers came from a 28 year old German man, and he is the oldest of the respondents.

*Group 8:* One respondent out of four has answered, that age has a negative effect on group result. This is also the oldest in the group 27 year old Danish male.

*Group 10:* None of the respondents in group number 10 have answered that age has a positive or negative effect on group process or result.

*Group 14:* One of the six the respondents have answered that age had a positive effect on group process. This is a 25 year old Danish male. The age differences in the group range from 23 to 33.

Minimum degree of diversity

Group number 1, 4, 5, 6, 9, 12, and 13 have a minimum degree of diversity in age.

*Group 1:* One of the three respondents has answered that diversity in age had a positive effect on both group process and result. In this group the ages of the respondents are 23, 24, and 25. There are two members of the group that has not completed the questionnaire, so it is difficult to know if they are older or the same age as the respondents. The respondent was the oldest member of the group, a 25 year old Hungarian female.

*Group 4:* One out of the two respondents answered that age had a negative effect on both group process and result. This was the older of the two respondents, by a year, a 24 year old Danish male.

*Group 5:* There is no one in group five, who has marked age neither as positive nor negative.

*Group 6:* Three out of four respondents answered that age has a positive effect on group process, and two out of four answered that age has a positive effect on result. Only one in the group did not think that age had an effect on neither process nor result; a 25 year old Danish male.

*Group 9:* Two out of the five respondents answered that age has a positive effect on the group process. These are a 24 year old Danish female and 23 year old Latvian female. The ages in the group ranges from 23 to 26, so the respondents are the youngest members.

*Group 12:* None of the respondents answered that age had any affect neither positive nor negative on process and result. Both of the respondents were 23 year old Romanian females.

*Group 13:* One of the two respondents answered that age has a negative effect on both process and result. These answers were from a 22 year old Croatian female. The other respondent was 25 year old. This is a group of four and it is difficult to guess, which age the other two members of the group have.

**Discussion**

There are some interesting observations from this analysis of the degree of diversity in age and how the respondents viewed age as having a positive or negative impact on the group process and result.

Groups with a moderate degree of diversity in age viewed the effects differently. Two of the four groups with a moderate degree of diversity each had one respondent who answered that diversity in age has a negative impact on the result and one also answered that age had negative effect on group process. In both cases this was the oldest of the respondents in the groups. One group does not view diversity as having any effect on neither group process nor the result. The one group with the widest range in age has one respondent, who answered that diversity in age had a positive effect on group process. This lead to conclude that the person in the group, who are the most different in age, feels age diversity as a negative effect on group process and result. Further, the groups with a wider range in age might not feel age as a negative thing as long as the group members are spread evenly between the youngest and the oldest member.

In the group with minimum diversity in age, age was regarded as having a positive effect in most groups this was in three of the seven groups. In two of the groups diversity in age was regarded as negative and this was in groups with little differences in age. Two groups did not think that diversity in age had any effect on neither group process nor result. Most of the groups with a minimum of diversity answered that diversity in age had a positive effect on both group process and result and one less group regarded the diversity as negative. This does not leave a clear picture because all of the groups have little differences in age and does this mean that some groups prefer being in group with people of the same age of those who answered positive and the ones answered negative wants to be in groups with more age diversity?

This analysis shows that there is a slight indication that groups with a moderate degree of diversity in age felt more negative consequences of the diversity than groups with a minimum degree of diversity, where slightly higher number of respondents viewed diversity as positive in both process and result. One of the reasons, why there is so little difference between moderate and minimum degree of diversity in age, is because the study is done at a university, which makes the students much similar in age. If the study had been done at another organization with more range in age it might give different results. Previous studies have also shown that diversity in age had negative impact on the group process and that homogeneity in age is to be preferred in regard to the process. Other studies show that diversity in age does not have any effect on innovation. This analysis showed a connection between diversity in age and the creative process and indirectly innovation. Further, it is important to mention that one group with moderate degree of diversity in age, and this was the group with the widest range in age, had a respondent who answered that diversity was positive effect on group process. The two other groups with moderate degree of diversity, which thought age had an effect answered that the effect was negative and in both cases it was the oldest of the respondents from the groups. This might indicate that it is important in age to have either as similar ages as possible in the group or at least make sure that one does not differentiate too much because the creative process will suffer. Also, this shows that there is a little difference in the answers when you look at groups with moderate and minimum degree of diversity separately.

**Analysis of diversity in gender**

Gender can be discussed in all of the groups because all of the respondents had to fill out the gender distribution in their group.

Maximum degree of diversity

Groups number 1, 2, and 5 have maximum degree of diversity in gender.

*Group 1:* One out of the three respondents from this group answered that gender has a positive effect on group process. This was a 23 year old Danish male, who also wrote that he thinks that differences are a great catalyst.

*Group 2:* None of the respondents from this group answered that diversity gender have an effect on group process or result.

*Group 5:* one of the two respondents from this group answered that diversity in gender had a positive effect on group process. The other respondent did not think that diversity in gender had a neither positive nor negative effect on group process or result.

Moderate degree of diversity

Group number 4, 7, 8, 9, 10, 11, 12, and 14 have a moderate degree of diversity in gender.

*Group 4:* One out of two respondents answered that diversity in gender had a positive effect on the group process and both respondents answered that gender had a positive effect on the result. The respondents were both males and the gender diversity in the group was four males and one female.

*Group 7:* The one respondent from this group answered that diversity in gender had a positive effect on both group process and result. It is the maximum degree of diversity as possible in the group, but because there are an uneven number of group members it cannot be regarded as maximum diversity.

*Group 8:* None of the respondents from this group regard diversity in gender as having a positive or negative effect on group process or result. The group consists of four male and two female and the respondents are one female and three males.

*Group 9:* Three of the five respondents from this group answered that diversity in gender had a positive effect on group process. This is both female and male respondents, who answered this and the division of the group is three males and two females.

*Group 10:* One of the four respondents from this group answered, that gender had a positive effect on both group process and the result. The rest of the respondents did not think that gender had any effect on neither group process nor result. The division of the genders were two males and three females.

*Group 11:* The one respondent from this group has answered that diversity in gender has a positive effect on both group process and result. The group consisted of one male and four female, and the respondent is male which shows that he thinks it is positive to work with people of the opposite sex, because it was an asset to have one female group member.

*Group 12:* None of the respondents think that diversity in gender had a positive or negative effect on group process or result.

*Group 14:* None of the respondents have answered that diversity in gender had a positive or negative effect on the group process or result. The group consists of four male and two female members.

Minimum degree of diversity

Group number 3, 6, and 13 have a minimum degree of diversity in gender.

*Group 3:* The one respondent from this group does not think that diversity in gender has any effect on group process or result.

*Group 6:* One of the four respondents from the group answered that diversity in gender had a positive effect on the group process. Due to the fact, that the group is consists of all male members this might mean that it is positive to be in a group of same gender in regard to group process.

*Group 13:* One of the two respondents from this group answered that diversity in gender had a positive effect on both group process and result. The other respondent answered that diversity in gender had a negative effect on group process. The group consists of only females and the answers must be understood as one respondent think that being in a group of one gender was positive in both process and result and the other think it was negative to be in a one gender group.

**Discussion**

In one of the three groups with maximum diversity in gender none of the respondent answered that diversity in gender had a positive or negative effect on group process or the result. The other two groups had respondents that answered that diversity in gender had a positive effect on the group process. These divisions indicate that maximum diversity in gender diversity has a positive effect on the group process but not on the result. This might be because the respondents fell that the process functions better when there are more than one gender and in this case an even division of the genders. This is also the picture from previous studies where an even division of the genders has shown to be more advantageous in regard to the group process.

Three of the eight groups, with moderate diversity in gender, did not think that diversity in gender had any effect on group process or the result. None of the respondents from the rest of the groups regard diversity in genders as having a negative effect on process or the result. Some respondents from all of the groups answered that diversity in gender had a positive effect on both group process and result only one group answered that it only had a positive effect on the process. This also show a remarkable positive view of diversity in gender, none of the groups viewed gender diversity as having a negative effect only three of the eight groups did not think that gender had any effect at all. Even though previous research has shown that an uneven division of the genders in a group results in tension, conflict a lower levels of friendliness, this is not the case in this study. One of the reasons might be that these groups are only to be working together in four days and not for a longer time, which might be the case in an organization. On the other hand the students are more pressed for time, which might induce conflict in the group. The time frame will probably have an effect on the way they work together and communicate, because it is only for such a short time that conflicts might not have a chance to occur. Other studies have also shown that gender diversity facilitates creativity which also can be indicated in this case, where it is the creative process that has the most positive associations, with a high degree of gender.

In the case of minimum diversity in gender, one of the three groups does not think that the diversity had any effect on neither group process nor result. The two remaining groups is of one gender and this is regarded as positive by one respondent from each group and negative by one respondent from one of the groups. This shows more separation between the answers and that heterogeneity in gender either has a positive effect or no effect at all and only one respondent feels that it had a negative effect. Previous studies has show that the process is better in one gender teams because they communicate in the same way in this leads to less misunder-standings. This is not the case in this study, where it is only in homogeneous teams there has been detected negative effects. This also shows that the creative process feels less problematic in cross-gender groups, than in one-gender groups and therefore has a positive effect on creativity and indirectly innovation.

**Analysis of diversity in Nationality**

Maximum degree of diversity

Groups number 2 and 12 have a maximum degree of diversity in nationality.

*Group 2:* Two out of four respondents answered that diversity in nationality have a positive effect on the group process, and one of them also answered that diversity in nationality has a positive effect on the result. Both of those respondents are Danish and the two foreign respondents did not think that nationality had any effect on group process or result.

*Group 12:* One of the two respondents answered that diversity in nationality has a negative effect on group process and result. This was one of the foreigners, who also wrote that Danish people do not like to listen to other people talk. I do not know if this is the general opinion of Danish people or it just was case in this particular group and maybe had more to do with personality.

Moderate degree of diversity

Group number 6, 10, and 11 have moderate degree of diversity in nationality.

*Group 6:* One out of the four respondents from this group answered that diversity in nationality had a positive effect on the result. Further, there is one respondent, who wrote that talking English slows the process a bit. At the same time this respondent has not answered that nationality had a negative effect on the group process. The group consists of three Danish member and two foreign members; both of the respondents are Danish.

*Group 10:* One of the four respondents from this group answered that diversity in nationality had a positive effect on the group process and this was the only Danish respondent. There were three foreign and two Danish members in the group. This means that he thought it was positive to work with different nationalities, than only Danish people.

*Group 11:* The one respondent from this group does not think that nationality has any effect neither positive nor negative on group process and result. The respondent is foreign and there are three foreigner and two Danish members in the group.

Minimum degree of diversity

Group number 1, 3, 4, 5, 7, 8, 9, 13, and 14 have a minimum degree of diversity in nationality

*Group 1:* No one in group number one thinks that nationality has neither a positive nor negative effect on group process or result. (Four Danish members and one foreign member)

*Group 3*: The one respondent from this group thinks that diversity in nationality has a negative effect on both group process and result. The respondent is a 27 year old Danish male and the group consisted of one foreign and four Danish members.

*Group 4:* One of the two respondents in this group answered that diversity in nationality had a positive effect on both the group process and result. Because the group consist of only Danish students, it must be concluded that it was positive to be in a group with all Danish members.

*Group 5:* One out of two respondent from this group answered that diversity in nationality had a positive effect on group process, which in an all Danish group, could mean that it is positive to be of same nationality in the group in the case of group process.

*Group 7:* Diversity in nationality is regarded as positive in both group process and result by the one respondent from this group. The group consists of five Danish members so the answer is probably meant, that it is positive to have a group with all Danish members. Only one nationality represented in the group.

*Group 8:* One of the four respondents from this group answered that nationality had a positive effect on the group process. This was one of the Danish respondents, who regarded diversity in nationalities as having a positive effect. (Five Danish and one foreign member)

*Group 9:* One of the five respondents answered that diversity in nationality had a negative effect on both group process and the result. The respondent was a Danish male, this could either be because the majority of the group is Danish (Four Danes and one foreigner) and wanted more diversity in the group, or it could be because there is only one foreigner in the group, and that makes the group process and result more difficult.

*Group 13:* One of the two respondents of this group answered that diversity in nationality had a negative effect on the result and wrote that it is due to misunderstandings. The respondent is Danish and the group has three Danish and one foreign member.

*Group 14:* Two of the six respondents and one of the six respondents answered that diversity in nationality had a positive effect on group process and result, respectively. These were all Danish members of the group. The group consists of one foreign and five Danish members.

**Discussion**

Two groups have maximum degree of diversity in nationality one group viewed it as positive in regard to process and the result and these respondents were both Danish; the foreign respondents from the group did not think it had any affect. The other group had one foreign respondent that though diversity in nationality had a negative effect on both process and result, because she thinks Danish people do not listen to other people. Groups with maximum degree of diversity does not have much negative effect of the diversity, only one respondent thinks that diversity in nationality has a negative effect and this seems to be more about personality that nationality. The Danish members of the group think that diversity had a positive effect on the group process and result instead of being in an all Danish group. This can also be connected to the creative process, that a high degree of diversity in nationality has mostly positive effects on creativity and that the respondent also feel that it has an effect on the end result and indirectly innovation.

In two of the three groups, with moderate degree of diversity in nationality, respondents viewed diversity as having a positive effect, one group mentioned process and the other mentioned result. There is one comment in regard to that talking English slows the process down, but at the same time, does not mention diversity in nationality as negative in any way. The last group does not think that diversity in nationality had any effect on neither group process nor result. This shows once again that the groups with foreign members, does not view diversity as negative thing neither in process or result and this is regardless of the division of the group members in Danish or foreign. This shows the same picture as groups with maximum degree of diversity in nationality because there are mostly positive perceptions of nationality.

Groups with a minimum of diversity in nationality are three all Danish group, which all regard the diversity as positive, that in this case must be regarded as it being positive to be in an all Danish group. The rest of the groups (six groups) consist of one foreign member and the rest is Danish. Two of the groups answered that diversity had a negative effect on both process and result, and another group thinks diversity had a negative effect on the result and wrote that it was due to misunderstandings. Two groups answered that the diversity in nationality had a positive effect, one group on both group process and result and the other group only on the group process. The respondents from the last group do not think that diversity in nationality had any effect on group process or result. This shows that the groups with only one foreign has the most negative perceptions of diversity in nationality, because three of six groups view it as negative and only two groups had positive experiences with diversity in nationality. One of the respondents that viewed nationality as having a negative effect wrote, that is was due to misunderstanding so the language seems to be a barrier in this case.

Groups with either maximum or moderate degree of diversity, as well as one-nationality groups have a positive effect on creativity and indirectly innovation, while groups with an uneven division of the nationality felt it had negative effect on both creativity and innovation.

There have not been done much previous studies on the effects of diversity in nationality on groups or teams. This is surprising because many larger organizations have become more and more global and have employees working across country boundaries which make the organizations multinational (Dicken, 2007). The lack of research in this area is surprising, because many organizations would benefit from a study in the effects of diversity in nationality. The only research that have been conducted in a similar area, is in regard to ethnicity and race, but there finding cannot be compared to nationality. This is because you can of course be of different racial or ethnical background but be from the same country and that nationality also entails that fact that there are differences in language.

**Analysis of diversity in experience**

Moderate degree of diversity

Groups number 1, 2, 5, 6, 8, 9, 10, 12, and 14 have a moderate degree of diversity in experience.

*Group 1:* Two out of three respondents answered that experience has a positive effect on the group process and all of the respondents thought it had a positive effect on the group result. None of the respondents thought experience had a negative effect on process or result.

*Group 2:* Three of the four respondents and four of four respondents, answered that diversity in experience had a positive effect on group process and result, respectively. Two of the four respondents also answered, that experience had a negative effect on group process. These were both Danish student, which both has student jobs, while the two other respondents were foreign and did not have a student job, but has both volunteered.

*Group 5:* One respondent of the two from this group answered, that diversity in experience had a positive effect on the group process; this respondent has experience from volunteering. The other respondent answered that diversity in experience had a negative effect on group process and this respondent has experience from a student job.

*Group 6:* One out of the four respondents in this group answered that diversity in experience had a positive effect on group process. Two of the four respondents answered that diversity in experience had a positive effect on the result. One of the four respondents answered that diversity in experience had a negative effect on both group process and result; this is the most experienced member of the group (has student relevant job, has volunteered, and has own company). This indicates that the other members’ lack of experience had a negative impact on both group process and result.

*Group 8:* All four respondents from this group answered that diversity in experience had a positive effect on group process and three also answered that it also had a positive effect on the result.

*Group 9:* Three of the five respondents from this group answered that diversity in experience had a positive effect on both group process and the result.

*Group 10:* Three of the four respondents and four of four respondents from the group answered that diversity in experience had a positive effect on group process and the result, respectively. Two of the four respondents also answered that experience had a negative effect on the group process and result. There are no comments in the questionnaires which makes it difficult to explain why they think that experience has both a negative and positive on the process and result at the same time. A guess could be that experience can give new ways of understanding and viewing problems and solutions, but at the same time it can give limitations because the person knows what works and what does not work.

*Group 12:* Both of the two respondents from this group answered that diversity in experience had a positive effect on both group process and result.

*Group 14:* Four of the six respondents answered that diversity in experience had a positive effect on the group process and two of the six thought it had a negative effect on group process. One of the respondents wrote that differences in experiences are a good thing because of the discussions. Another respondent wrote that one of the negative consequences of diversity in experience was that they faced the context of the problem for solution differently. Three of the six respondents also answered that diversity in experience had a positive effect on the result, and two said that it had negative effects for the result. One of the respondents wrote that lack of experience has a negative effect on the result.

Minimum degree of diversity

Group number 13 has a minimum degree of diversity in experience.

*Group 13:* One of the two respondent answered that diversity in experiences had a positive effect on both group process and result but at the same time had negative effect on the result. The other respondent wrote that it had a negative effect on group process.

**Discussion**

Four of the nine groups with a moderate degree of diversity in experience answered that diversity had a positive effect on both process and result. One of these respondents wrote that diversity in experience was positive because of the discussions it created in the group. The remaining five groups all have respondents that think diversity in experience had a positive effect on both process and result but at the same time a few of the respondents also thought it had a negative effect. One wrote that it was lack of experience that had a negative effect, and another respondent wrote it was because they faced the context of the problem differently.

In the one group, with minimum degree of diversity in experience, the results were more ambiguous because one respondent viewed the diversity as positive in group process and result but also negative in case of result. The other respondent viewed that diversity as negative in regard to the group process.

Almost all of the groups viewed diversity in experience as having a positive effect on both process and result, and this was regardless of the degree of the diversity. At the same time a few respondents also felt that diversity had a negative effect, which was explained as lack of experience and different point-of-view toward the subject and this was respondents, who answered that it had both negative and positive effects. There were no group with maximum degree of diversity in experience because this would be e.g. three students with much experience and three without any experience and this was not the case in any of the groups. So the there is only moderate degree of diversity in most groups and one group with minimum degree of diversity. Previous research supports the comment that diversity in functional background had a negative effect because there are different ways of understanding the task at hand; also communication is mentioned in previous research as a negative consequence of functional background diversity. The reason this has not been mentions is maybe because the students are almost the same age and therefore more or less the same experience even though one respondent mentions that lack of experience had a negative effect. This is data taken on the grounds of functional background which is more relevant in an organization, but these students do have some work experience which should be taken into account.

**Analysis of diversity in education**

Maximum degree of diversity

Groups number 9 and 5 has maximum degree of diversity in education.

*Group 5:* Both of the respondents has answered that diversity in education had a positive effect on the group process. One of the respondents also answered, that diversity in education had a positive effect on the result. The group consists of one group member from social studies, one from humanistic studies, and two from natural science. The respondents are the two from natural science (different educations from the same field). This is probably an indication that significant diversity in education had a positive effect on mostly group process, and also a little on the result.

*Group 9:* All five of the respondent from this group answered that diversity in education had a positive effect on both group process and the result. One of the respondents wrote, that it was a new way of working with new people.

Moderate degree of diversity

Groups number 1, 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, and 14 have a moderate degree of diversity in education.

*Group 1:* All of the three respondents from group number one answered that education had a positive effect on both the group process and result. One respondent has also answered that education has a negative effect on both group process and result. This respondent also wrote that it would have been beneficial to have more diversity in the group regarding background (education). All of the members of the group had a background in natural science but different educations within this field.

*Group 2:* Three out of four respondents in this group has answered that diversity in education had a positive effect on both group process and result. One respondent has answered that education had a negative effect on both group process and result. The respondent, who thought education had a negative effect, is from humanistic studies. The other respondents is one from social studies and four from natural science, which means that the respondent who answered negative has a quite different educational background that the other group mem-bers.

*Group 3:* The one respondent from this group has answered that diversity in education had a positive effect on both group process and result. There were one group member from social studies and four from natural science, the respondent was one of the four students from natural science.

*Group 4:* Both respondent from this group answered that diversity in education had a positive effect on group process as well as result. One of the respondents also answered that diversity in education had a negative effect on group process and wrote in the questionnaire that there were too many students from AD (architecture and design). This means that more diversity in education would be to prefer, the respondent is also from a natural science education.

*Group 6:* One of four respondents from this group answered that diversity in education had a positive effect on group process. Three of the four respondents answered that diversity in education had a positive effect on the result. One of the four respondents answered that diversity in education had a negative effect on both group process and education; this respondent was one of four students from natural science. One other group member has the exact same education and there is also a group member from social studies. The respondent also wrote that the group members are thinking quite different, and this is even though they are not that different in regard to education.

*Group 7:* Diversity in education is regarded as positive in both group process and result by the one respondent from this group. The group consists of one student from humanistic studies and four students from natural science. The respondent is one of the four from natural science, which means that he is quite similar to the majority even though there can be quite a differ-rence between the studies within natural science.

*Group 8:* Three of the four respondents from this group answered that diversity in education had a positive effect on both the group process and the result. One of the respondents answered that diversity in education had a negative effect on the result. The same respondent has answered that diversity in education both had a positive effect on group process and result, and at the same time also had a negative effect on the result. The respondent wrote that education resulted in a lot of ideas for the result, and that it from a negative point-of-view resulted in different perspectives.

*Group 10:* All of the respondents from this group think that diversity in education had a positive effect on both group process and the result. All of the respondents are from natural science but only two respondents have the exact same education. The last member of the group is from humanistic studies.

*Group 11:* The one respondent from this group answered that diversity in education had a positive effect on both group process and result.

*Group 12:* Both of the two respondents from this group answered that diversity in education had a positive effect on the group process and one of the respondents though that it also had a positive effect on the result. All the members of the group are from natural science studies but the two respondents have different educations within the field.

*Group 13:* Both of the respondents in this group answered that diversity in education had a positive effect on both group process and result. One of the respondents wrote that they all had small ideas individually, but together it became an even better idea for the product.

Group 14: Four of the six and two of the six members of the group answered, that diversity had a positive effect on group process and the result, respectively. There is one student from social science, one from medicine, and four from natural science in the group. One of the respondents wrote that diversity in education is positive because it created a multidisciplinary group.

**Discussion**

In the groups with maximum degree of diversity in education both group answered that the diversity had a positive effect on both group process and result. None of the respondents from these groups thought it had a negative effect. One of the respondents also commented that it was a new way of working with new people.

The answers are more scattered in the groups with a moderate degree of education seven of the fourteen groups answered, that diversity had a positive effect on both group process and result. Some of the respondents wrote that it was because the ideas got better in the group than it would have individually, and that it created a multidisciplinary group.

Five of the groups had respondents that both though the diversity in education had a positive effect on both process and the result but at the same time though it had a negative side as well. One respondent wrote that diversity resulted in lots of ideas but at the same time gave the members different perspectives which were a negative effect. This negative effect of different perspectives was also mentioned by another respondent even though the educations in the group were not that different it had an effect. Another respondent wrote that diversity in education was negative because there was not enough diversity in the group, the respondent was in an all natural science group.

In the case of diversity in education it seems that the groups with maximum degree of diversity had the best process and result according to their answers. In these groups there were no negative effects but in the groups with a moderate degree of diversity in education there were more negative consequences and these were also perceived differently, because one respondent thought it was negative because of too much similarity in educations, and another one because there was too much difference in education, which lead to different perspectives on the project. This respondent also wrote that it resulted in lots of ideas, so it might be the process, which was the most difficult and negative in groups with moderate degree of diversity. In previous studies some of the same tendencies have been pointed out. This is in regard to the fact that the degree of diversity matters, the groups with maximum diversity in education had the best process and result because there were no negative consequences in regard to the education. There groups with a moderate degree of diversity had more negative experiences in the group and these negative consequences were much alike the ones in previous research. There were difficulties in understanding the value of other members’ knowledge, which in the end undermined the unique knowledge of some of the members of the group. This is much alike what one of the respondents wrote; that the members of the group had different perspective, which he meant as negative but at the same time it resulted in more ideas. Another aspect in studies of diversity in education is also the length of education, which might create the biggest difficulties in communication. Because this study was conducted at WOFIE only student with a higher education was participating, so this looks more at the differences in the fields of the educations than the length, and it is still not free of negative consequences.

# 6. Summary

It is difficult to compare the results from previous research with the results from this study, because the circumstances of the studies are so differently. Many of the other studies have either been conducted in organization, laboratory or even as more quantitative studies with basis is in different statistics. This study has looked at the groups and WOFIE as a system and worked within the system, looking at connections for positive or negative synergy between the different attributes of diversity and the process and result of the group. and to connect this to creativity and in the end innovation.

There were different attributes which were analysed and discussed in the project, age, gender, nationality, experience and education. These were chosen because some were easily detectable and others more task related. This also made all of the respondents capable of describing their group to a certain degree, which ensured that all the questionnaires were usable, also if only one member of the group completed it.

There were a few groups with a moderate degree of diversity in age and the rest had a minimum degree of diversity. There is not a completely clear picture in regard to diversity in age but it seems to be that groups with a moderate degree of diversity in age experienced the diversity as more negative than the groups with minimum degree of age. This was both in the group process and the result which would make homogeneity in age more preferably in innovative groups both in regard to the creative process and the end result. The reason for the difficulties in age diversity could be the fact that WOFIE was only for students, which of course affected the range in age, which was from 21 to 33 years of age. In the case of age it would have been preferably to conduct the study in an organization or maybe at Solution Camp, where the age difference would have been larger.

The majority of the group with maximum and moderate degree of diversity in gender answered that it had a positive effect on especially the process but also the result. This is consistent with other studies that have shown that gender diversity facilitates creativity, which is the purpose of WOFIE. On the other hand studies has also shown that an uneven division of gender in groups creates conflicts, tension and lower levels of friendliness but this is not the case in these groups because none of the respondents regard diversity in genders as having any negative effects. In the case of balance between the genders, it does not seem to have any effect in this study. Only one respondent views diversity in gender as having a negative effect and this is one from a group with low degree of diversity. This actually shows that the cross-gender teams have a more successful creative process as well the result than one-gender groups, and therefore positively affect creativity and indirectly innovation. This lack of conflict could be due to the fact that the groups only have to work together in four days a therefore oppress reasons for conflict on the other hand the groups are pressured on time to get a presentation finished, which could create a stressful environment and thereby conflicts.

Nationality seems to have a positive effect on both the process and the end result in the groups with a maximum degree of diversity in nationality. Only one respondent did not think it had a positive effect, and this was in regard to Danish people in general and probably more concerned with personality. In connection to creativity, it also showed that a high degree of diversity in nationality had a positive effect on the creative process and thereby indirect innovation. In regard to moderate diversity in nationality two of three groups viewed it to have a positive effect on the process in one group, and the result in the other group. The last group does not feel that diversity in nationality had any effect at all. This also shows a positive experience of the different nationalities in the groups even though they are not as evenly divided between foreign and Danish group members. In the case of minimum diversity, groups with all Danish members also answered that diversity in nationality had a positive effect, which must be understood as positive to be in an all Danish group. Groups with one foreign member and the rest Danish had the most negative experience with diversity in nationality, which shows that groups with maximum and moderate degrees of diversity in nationality are most likely to have a positive effect on creativity and indirect innovation, as well as groups with one nationality. Groups with a very uneven division have the most negative impacts on creativity and innovation.

Experience does not have such clear results because there are not many differences in the degree of experience of the group members. It does show a slightly more positive perception of diversity in experience within the groups with moderate degree of diversity even though some of the respondents answered that it had both positive and negative effects in regard to process and result. The groups with a minimum degree of diversity in experience also both had positive and negative perception of experience in the case of group process and result. Some of the previous studies had also found negative consequences in experience in regard to communication, and understanding the task at hand the same way, as one of the respondents also wrote. All in all it does show a slightly more positive than negative effect on both process and result and therefore on creativity and indirectly innovation.

Education in the groups with a maximum degree of diversity answered that it had a positive effect on both process and result. None of the respondents thought it had a negative consequence. In the case of moderate degree of diversity the answers differentiate more than half of the groups thought it had a positive effect on both group process and result, because they created better ideas together than alone. A few of the groups thought it had both positive and negative effects on both process and result. This was due to the fact that they created better ideas but at the same time they understood the task at hand differently, which had negative consequences in the process. The negative effect was by one of the respondents described as there was not enough diversity in education in the group. This might be, why they answered that it was both positive and also negative effect of the degree of education because they wanted even more diversity in the groups. The groups with maximum degree of diversity in education had the most positive effects on creativity and innovation. In the groups with moderate degree of diversity the results were more ambiguous because of both positive and negative results. It does correlate with other studies where the degree of diversity also has been mentioned as having a positive effect on creativity. This study is only with student from university educations, which eliminates the fact that the length of education has an effect on these studies. It is only the fields of study that differentiate the students and it still creates difficulties in the groups.

The summary shows that the findings in this study in some cases reflect findings from previous studies and in other cases are very dissimilar. Due to the system approach this has no effect on the validity because this is a unique system and therefore cannot be expected to be similar to very different systems from the previous studies. Further, the study also shows that the degree of diversity do matter when we look at the effects of diversity in group process and results.

# 7. Perspective

A study like this is a learning process; it began with one idea that changed all the way until the last word was written.

There are many things that would be done differently, if I had to do it all over tomorrow but at the same time there is also thing that was very interesting and workout almost as planned.

The choice of the system approach gives limitations to the methods used in the project and which conclusions can be made. If a more quantitative approach, such as the analytical approach, would have been used it would be possible to send out many more questionnaires and statistically analyse a much larger part of the WOFIE workshop, and to generalize the result in a larger perspective than just the WOFIE workshop (Arbnor & Bjerke, 1997) . The reason this was not done is because WOFIE is so special in regard to the participants. It is only students, and they only have to be working together for four day etc. it would be wrong to generalise these result for more than what they are. Another thing that could have been interesting was to interview some of the participant to supplement the questionnaires; this would not be possible if the analytical approach was used but this could be done through the system approach because it can combine qualitative and quantitative analysis’ (Arbnor & Bjerke, 1997). This might also allow for studying the more non-observable attributes which would be very interesting because not much research has been done in this regard.

It could also have been interesting to have both results from Solution Camp and WOFIE to compare and discuss the results because the two camps are both very similar and different in many aspects which could have been interesting to study. This would have required more time for preparing how to evaluate on the same subjects but in very different ways and in to different systems.

The questionnaire that was handed out at WOFIE covered many aspects, too many aspects. In hindsight it would have been better to focus on some specific aspects and attributes of diversity and not trying to embrace all parts in one questionnaire.

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# Appendix 1

**Questionnaire about diversity, innovation and creativity**

I am currently writing my thesis about the subjects of diversity, innovation, creativity and knowledge. Diversity can be the different attributes that makes people different from each other; age, gender, personality, education etc. Diversity is said, in some cases, to have a positive effect on the ability to be creative and thereby create innovation and knowledge. Because you have participated at WOFIE you have experienced how diversity affects the group process and the result of the project work. I hope you will help me by completing this questionnaire; it only takes about five to eight minutes to complete. Please return the questionnaire to me after completion!

*Thank you in advance*

*Camilla Nordstrøm Jensen*

**1. Personal details**

**Gender:** Female □ Male □

**Age:** Which age do you have \_\_\_

**Ethnicity:** Ethnic Dane □ Different ethnic origin, which one \_\_\_\_\_\_\_\_\_\_\_\_

**Nationality and region:**

● In which region did you grew up?

Northern Jutland(Nordjylland) □ Zealand(Sjælland) □ The Capital(Hovedstaden) □

South Denmark(Syddanmark) □ Central Jutland (Midtjylland) □

Abroad, write which country \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Education:**

● Which degree are you currently studying?

Bachelor’s degree, write which one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Master’s degree, write which one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Work experience:**

● Do you have a student job? Yes □ No □

● If yes, is your student job relevant for your studies? Yes □ No □

● Have you ever worked for free, volunteered for an organization? Yes □ No □

● Do you have you own company? Yes □ No □

● Do you have plans to start your own company within three years? Yes □ No □

**2. Innovation**

● Have you previously participated in courses or lessons in innovation, creativity and/or entrepreneurship? Yes □ No □

● Which effect do you think the process at WOFIE have had on the developed ideas?

Very positive □ Positive □ Neither positive nor negative □ Negative □

Don’t know □

● Have you learned anything new about innovation, creativity and entrepreneurship at WOFIE?

Yes, a lot □ Yes, a little □ No, nothing □ Don’t know □

**3. The group**

● Group number \_\_\_\_\_\_\_

● The total number of group members in your group \_\_\_\_

● Number of women in the group (including yourself) \_\_\_

● Number of men in the group (including yourself) \_\_\_\_

● How was the composition of the group in regard to education? (Write how many group members had which field of study, including yourself)

Social studies (law, politics, sociology, economics…) \_\_\_\_\_

Humanistic studies (language, communication, psychology…) \_\_\_\_\_

Natural science (Physics, engineer, mathematics, chemistry…) \_\_\_\_\_

Medicine \_\_\_\_\_\_

● How many group members was Danish? \_\_\_\_

● How many group members was foreign? \_\_\_\_

● How many group members was ethnical Danish? \_\_\_\_

● Do you think there were a significantly age difference in the group? (Around teen years between the youngest and the oldest group member)

Yes □ No □ Don’t know □

● Do you feel similar or dissimilar to the other members of your group?

I feel very similar □ I feel a little similar □ Neither similar nor dissimilar □ I feel dissimilar □ I feel very dissimilar □

**4. Diversity**

**Group process:**

● Which of the following attributes do you think had a positive impact on the group process? (Mark with a cross, preferably more than one answer)

□ Education

□ Age

□ Gender

□ Nationality

□ Ethnicity

□ Experience

□ Personality

Why have you chosen these answers? (Optional)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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● Which of the following attributes do you think had a negative impact on the group process? (Mark with a cross, preferably more than one answer)

□ Education

□ Age

□ Gender

□ Nationality

□ Ethnicity

□ Experience

□ Personality

Why have you chosen these answers? (Optional)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­­­­­­­­­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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● Are there any other attributes which had a positive or negative effect on the group process? (Optional)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Result of project work:**

● Which of the following attributes do you think had a positive impact on the result of the project work? (Mark with a cross, preferably more than one answer)

□ Education

□ Age

□ Gender

□ Nationality

□ Ethnicity

□ Experience

□ Personality

Why have you chosen these answers? (Optional)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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● Which of the following attributes do you think had a negative impact on the result of the project work? (Mark with a cross, preferably more than one answer)

□ Education

□ Age

□ Gender

□ Nationality

□ Ethnicity

□ Experience

□ Personality

Why have you chosen these answers? (Optional)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_­­­­­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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● Are there any other attributes which had a positive or negative effect on the result? (Optional)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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● Which quality does you think the result of the project work has?

High quality □ Neither high nor low quality □ Low quality □ Don’t know □

# Appendix 2

The results from the questionnaires regarding group process and result in two tables.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **Attributes of diversity regarding group process** | | | | | | |
| **Education** | **Age** | **Gender** | **Nationality** | **Ethnicity** | **Experience** | **Personality** |
| **Group 1** | Positive | 3/3 | 1/3 | 1/3 | 0 | 0 | 2/3 | 2/3 |
| Negative | 1/3 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Group 2** | Positive | 3/4 | 0 | 0 | 2/4 | 0 | 3/4 | 3/4 |
| Negative | 1/4 | 1/4 | 0 | 0 | 0 | 2/4 | 2/4 |
| **Group 3** | Positive | 1/1 | 0 | 0 | 0 | 0 | 1/1 | 0 |
| Negative | 0 | 0 | 0 | 1/1 | 0 | 0 | 0 |
| **Group 4** | Positive | 2/2 | 0 | 1/2 | 1/2 | 0 | 2/2 | 2/2 |
| Negative | 1/2 | 1/2 | 0 | 0 | 0 | 0 | 0 |
| **Group 5** | Positive | 2/2 | 0 | 1/2 | 1/2 | 0 | 1/2 | 1/2 |
| Negative | 0 | 0 | 0 | 0 | 0 | 1/2 | 1/2 |
| **Group 6** | Positive | 1/4 | 3/4 | 1/4 | 0 | 0 | 1/4 | 2/4 |
| Negative | 1/4 | 0 | 0 | 0 | 0 | 1/4 | 0 |
| **Group 7** | Positive | 1/1 | 0 | 1/1 | 1/1 | 0 | 0 | 0 |
| Negative | 0 | 0 | 0 | 0 | 0 | 0 | 1/1 |
| **Group 8** | Positive | 3/4 | 0 | 0 | 1/4 | 0 | 4/4 | 4/4 |
| Negative | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Group 9** | Positive | 5/5 | 2/5 | 3/5 | 0 | 0 | 3/5 | 5/5 |
| Negative | 0 | 0 | 0 | 1/5 | 0 | 0 | 0 |
| **Group 10** | Positive | 4/4 | 0 | 1/4 | 1/4 | 1/4 | 3/4 | 3/4 |
| Negative | 0 | 0 | 0 | 0 | 0 | 2/4 | 3/4 |
| **Group 11** | Positive | 1/1 | 0 | 1/1 | 0 | 1/1 | 1/1 | 1/1 |
| Negative | 0 | 0 | 0 | 0 | 0 | 1/1 | 0 |
| **Group 12** | Positive | 2/2 | 0 | 0 | 0 | 0 | 2/2 | 1/2 |
| Negative | 0 | 0 | 0 | 1/2 | 1/2 | 0 | 1/2 |
| **Group 13** | Positive | 2/2 | 0 | 1/2 | 0 | 0 | 1/2 | 2/2 |
| Negative | 0 | 1/2 | 1/2 | 0 | 0 | 1/2 | 1/2 |
| **Group 14** | Positive | 4/6 | 1/6 | 0 | 2/6 | 0 | 4/6 | 4/6 |
| Negative | 0 | 0 | 0 | 0 | 0 | 2/6 | 1/6 |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **Attributes of diversity regarding group work result** | | | | | | |
| **Education** | **Age** | **Gender** | **Nationality** | **Ethnicity** | **Experience** | **Personality** |
| **Group 1** | Positive | 3/3 | 1/3 | 0 | 0 | 0 | 3/3 | 2/3 |
| Negative | 1/3 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Group 2** | Positive | 3/4 | 0 | 0 | 1/4 | 0 | 4/4 | 3/4 |
| Negative | 1/4 | 1/4 | 0 | 0 | 0 | 0 | 1/4 |
| **Group 3** | Positive | 1/1 | 0 | 0 | 0 | 0 | 1/1 | 0 |
| Negative | 0 | 0 | 0 | 1/1 | 0 | 0 | 0 |
| **Group 4** | Positive | 2/2 | 0 | 2/2 | 1/2 | 0 | 2/2 | 2/2 |
| Negative | 0 | 1/2 | 0 | 0 | 0 | 0 | 0 |
| **Group 5** | Positive | 1/2 | 0 | 0 | 0 | 0 | 1/2 | 1/2 |
| Negative | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Group 6** | Positive | 3/4 | 2/4 | 0 | 1/4 | 0 | 2/4 | 3/4 |
| Negative | 1/4 | 0 | 0 | 0 | 0 | 1/4 | 1/4 |
| **Group 7** | Positive | 1/1 | 1/1 | 1/1 | 1/1 | 0 | 0 | 0 |
| Negative | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Group 8** | Positive | 3/4 | 0 | 0 | 0 | 0 | 3/4 | 2/4 |
| Negative | 1/4 | 1/4 | 0 | 0 | 0 | 0 | 0 |
| **Group 9** | Positive | 5/5 | 0 | 0 | 0 | 0 | 3/5 | 4/5 |
| Negative | 0 | 0 | 0 | 1/5 | 0 | 0 | 0 |
| **Group 10** | Positive | 4/4 | 0 | 1/4 | 0 | 0 | 4/4 | 1/4 |
| Negative | 0 | 0 | 0 | 0 | 0 | 2/4 | 2/4 |
| **Group 11** | Positive | 1/1 | 1/1 | 1/1 | 0 | 1/1 | 1/1 | 1/1 |
| Negative | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Group 12** | Positive | 1/2 | 0 | 0 | 0 | 0 | 2/2 | 1/2 |
| Negative | 0 | 0 | 0 | 1/2 | 0 | 0 | 1/2 |
| **Group 13** | Positive | 2/2 | 0 | 1/2 | 0 | 0 | 1/2 | 2/2 |
| Negative | 0 | 1/2 | 0 | 1/2 | 0 | 2/2 | 0 |
| **Group 14** | Positive | 2/6 | 0 | 0 | 1/6 | 0 | 3/6 | 6/6 |
| Negative | 0 | 0 | 0 | 0 | 0 | 2/6 | 1/6 |

1. The figure is a copy from Nordstrøm, 2011, page 7 [↑](#footnote-ref-1)
2. Williams & O’Reilly 1998, page 85 [↑](#footnote-ref-2)
3. Remake of the figure from Harrison & Klein, combined with the concept of balance by Stirling. [↑](#footnote-ref-3)