

# Advisory report Virtual teams ASML

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# Forword

In front of you is the "Advisory report Virtual teams ASML". This advisory report is written for ASML commissioned by Michiel van Popering.

This advisory report is written in the context of our minor "Smart Industry". This is a short additional education on top of the student's main education. "Smart Industry" also called industry 4.0, is a new movement that focuses on new innovative technologies to improve processes within companies. For example, big data, artificial intelligence and microprocessors. We are four students of the HAN University of Applied Sciences. Our educational backgrounds are Business Administration, Communication and Multimedia Design, Industrial Product Design and Human Resource Management.

We were able to answer our main question through qualitatively research with theoretical research and interviews. Our advice is based on these results and formulates a follow-up research. We also made a showcase as an option for the follow-up study.

We want to thank Michiel van Popering for being our project manager and supporting us during the project. For helping us with the needed information and bringing us in contact with the right people.

We also want to thank Mariëlle Seegers for for the continuous feedback during our research and for guiding us during the project. In order for our project to succeed we needed the help of a number of employees from ASML. We want to thank them for participating in our interviews and for being open and thinking along.

# Management summary

## Purpose

The aim of this report is to advise ASML about improving the virtual communication and giving a possible solution. The main question is 'How can ASML improve her virtual communication within (international) team's through smart technology'. The sub-questions are:

- What means of communications are available?
- Are there other organizations that have internal solutions for international cooperation?
- What do studies with regard to (digital) communication conclude?
- What cultures are there at ASML at the 60 different locations and what does the theory say about the differences within those cultures?
- Which teams are currently in place and how are they built?
- How large is the geographical distribution and does this cause problems?
- How do the teams experience the current virtual communication?
- How What is the (dynamic) structure of the teams and does it cause any problems?
- To what extent do the teams depend on technology and does this cause any problems?
- How does ASML communicates with its virtual teams?
- What ensures a psychologically safe communication climate in ASML?
- Does the difference in nationality and culture cause problems at ASML?

## Method

Theoretical, empirical and analytical research has been done. We have interviewed 9 people from different teams, backgrounds and nationalities. By combining the results of our desk research and the interviews we made our conclusion. Based on the conclusion we were able to make an advice with a possible solution which requires further research.

## Results

The employees are overall satisfied about Microsoft Teams and the communication in the teams. ASML could improve its communication within the virtual teams on the following aspects:

- Culture
- Time differences
- Behaviour
- Organizational culture
- Verbal languages
- Body language (micro expressions)
- Knowledge of the tools

## Advice

The advice is constructed of the improvement points from the conclusion. The possible solution to improve the communication, regarding to these aspects, is a virtual coach. We have been developing two showcases, in the Microsoft Teams environment, to give an idea of how a virtual coach can help in daily work. The coach is still a concept and further research is needed. The further research that is required is mainly for the development of the coach but also for the possible technologies that may be useful.

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# Chapter 1: Introduction

Technology is developing at lightning fast speeds and so is the arrival of virtual teams. ASML is a technology company that is an innovation leader in the semiconductor industry. With almost 25.000 employees from 118 different nationalities they work in 16 country's and collaborate with partners, to offer market leading patented solutions and to stimulate the development of microchips. (ASML. n.d.)

The aim of this research is to optimize the digital teams so they can work more efficiently. ASML works with a lot of people from different nationalities and works at multiple locations around the world. Employees have to deal with different time zones and cultural differences. This can cause difficulties in the communication. This report formulates an advice based the main question: 'How can ASML improve her virtual communication within (international) team's trough mart technology'.

The sub-questions will help answer the main question. Four of these questions are part of chapter 2, Theoretical research. In addition to the theoretical research, we conducted interviews with ASML employees from different countries, teams and backgrounds. The results are shown in chapter 3. The remaining part of the sub-questions are answered in chapter 4 Empirical and analytical research. Which teams are currently in place and how are they built, how is the geographical distribution and does this cause problems, and what ensures a psychologically safe communication climate in ASML are questions that will be answered? This research is followed by conclusion in chapter 5 which will answer the main question. After that the advice will follow for further research and a show case.

# Chapter 2: Theoretical research

## 2.1 What means of communication are available?

### Research Methode

The internet and personal knowledge will be used to investigate the area about the sub-question. At the start of this research the main differences between communication systems will be elaborated. After which a detailed comparison will be made between categories of different types of communication platforms.

### Type of communication systems

Over the years a number of different media types were built to communicate digitally with each other. Email was created to send digital letters to each other. SMS was introduced as the first "chat" application to start text conversations and the webcam introduced video conversations.

Nowadays, there are many different types of applications that created new communication systems through a multitude of media types. In this research, well known and less known applications will be compared to each other.

All these different applications are divided in three groups. The first group of applications, that focuses just on *communication and connection*. These applications are limited to chat, voice and video conversation.

In the second group the applications are not only a communication platform, but the goal is also to work together in a digital environment. These applications have functionalities that focus on communication and collaboration.

The third and last group are applications that offer a system with a multitude of functionalities, so that you can work from a distance with colleagues or friends. These applications offer a *full* package.

### Connection and communication

#### *Viber, Hangouts and Whereby*

These applications are about the same in terms of functionalities. In addition, these applications are relatively simple and only offer functionalities that are aimed at the "call". Discord and Jitsi, on the other hand, are more complex than they appear at first sight. In the following sections, these applications are discussed in more detail.

#### *Discord*

Discord (Discord, n.d.) is specifically aimed at gamers who want to communicate with each other during and about gaming. That is why the Discord application has all kinds of specific advantages such as a very clear voice chat and it is much more "light-weight" than Skype, which makes it work more smoothly. You can also use Discord within a browser without a plugin and it has an in-game overlay function.

In addition to the light-weight focus, Discord has some unique features. This way you can download community bots that add extra functionalities to chats. In addition, Discord has the option to start so-called servers. These are environments where you can start different chats and voice channels and where people can grant access. On this server, participants can contact each other in different channels. With the help of the bots you can add a number of extra functionalities to the server and adapt them to a facility that you are looking for.

## Jitsi

Jitsi (Jitsi, 2020) is an open source program that allows you to use Jitsi to develop your own platform, in addition Jitsi is "community driven". Jitsi offers companies the opportunity to develop their own systems.

Jitsi cannot be compared to its predecessors, this is a program that supports different protocols. On the website you will find a download button from which you can access the 'stable builds', these are the installation files that have been tested and no longer contain errors. It's immediately noticeable that Jitsi is available for various systems, you will also find installation files for various Linux variations. Recently Jitsi is also available for Android devices.

After installation you will be welcomed by a login screen where you can enter your account details for various services. In addition to your Facebook and Google data, you can also add a SIP and an XMPP account here.

(Figure 1: Oversight of applications that are part of the group "Connection and communication")

Service	Text messages	Voice call	Video call	Extra features
<b><u>Discord</u></b>	Text, Files, links up to 10	One on one, up to 50	Camera, Application, screen, live stream (50) (Due to CoVID-19 up to 50; live stream only BETA)	Server, community- bots
<b><u>Viber</u></b>	Text, voice, video	Up to 5 people	In Beta	
<b><u>Google Hangouts</u></b>	Text, Photos	Available	Camera (up to 10) (Desktop only),	
<b><u>Jitsi</u></b>	Text chatting (web only)	Available	Camera, screen sharing, Application sharing, System audio sharing	Edit documents together, focus on quality, security, open source, can be used to build your own application, no account needed, Auto-view the active speaker or click on any attendee to see their video, Android and iOS apps, Lock a room with a password, Streaming a conference to YouTube live (if Jibri is configured), Shared text document based on Etherpad, Raise/Lower your hand for attention, Participant talk-time statistics, Push-to- talk mode, Play a YouTube video to all attendees call, Audio-only option, Telephone dial-in to a conference (if Jigasi is setup), Dial-out to a telephone participant (if Jigasi is setup), Integration in other apps / websites
<b><u>Whereby.</u></b>	Available	Available	Video, screen sharing, record (download and share) (up to 50)	No app download needed



## Communication and Collaboration

<i>Service</i>	<i>Conversations</i>	<i>File system</i>	<i>Team organisation</i>	<i>Extra features</i>
<a href="#">Slack</a>	chat, voice, video, screen sharing	File sharing, archiving for development	Channel system (Groep chat), within and outside your organisation.	App Intergrations; cloud services, project management tools, API Intergrations
<a href="#">BigBlueButton</a>	Chat, Voice, video (no limit), screen sharing		Live whiteboard, Breakout rooms, pooling	Intergrations for LMS systems, focus on adduction

(Figure 2: Oversight of applications that are part of the group "Communication and collaboration".)

### Slack

Slack (Slack, n.d.) brings all communication in a company together in one place that is clear and searchable. It is an out-of-the-box chat program that can significantly improve collaboration in companies.

Benefits:

- Works with all kinds of tools (G suite, Office 365, Dropbox, Zoom)
- Can link external people to your organization
- Let them know where you are so people don't have to look for you in the office when you're not there
- Works with, for example, Skype, Zoom, Google + Hangouts, GoToMeeting. This makes a call very easy

Cons:

- Unnecessary functionality
- Bad user interface

### BigBlueButton

BigBlueButton (BigBlueButton, 2020) is an open-source web conference system. It is based on GNU / Linux operating system and runs on Ubuntu 16.04. In addition to various web conference services, it has integrations for many of the major learning and content management systems.

Benefits:

- Supported by a global developer community
- The simple API makes it easy to integrate into your own products
- Integration with Moodle is possible
- Free
- Since 2007 focused on education.
- Easily upload PowerPoints and texts
- Desktop sharing (time and paper savings)
- Different operating systems (Linux, Microsoft and Mac)
- 35 control languages

Cons:

- Co-browsing not possible
- Eye contact teacher-student
- Installation
- The applications need to load
- Students have no control over what the teacher shares

## Full package's

Service	Communication	Files	Collaboration	Organisation	Extra features
<b>MS-teams</b>	Chat, voice, video, group, recording	Sharing, editing	Tabs (Management tools integration, whiteboard, files, websites)	Teams, subclasses, adding guests	Intergrations with external application like Slack, API Intergrations, add own app, bots, template types per industry type, company usage analytics
<b>Bitrix24</b>	Chat, video, social intranet, special email (Task, Calendar and discussion Intergrations)	Storage, sharing, management	Calendars, task, project management tool (Kanban). Guest users, task dependencies	User groups, workload management, time tracking,	HR, CRM and contact centre system, website, open API, https connection for al web-based apps, office 365 API

(Figure 3: Skype for Business has been omitted from the table because it is being replaced with MS teams, Skype is still offered for consumers )

### Microsoft Teams

Microsoft Teams (Microsoft, n.d.) is currently one of the most used packages for both companies as educational institutions in the Netherlands. Teams is a successor to "Skype for Business". In addition to chats, voice and video, Microsoft Teams also offers numerous additional functionalities. Microsoft Teams is built with the focus on teams (hence the name). The idea is that you create a team where all these functionalities are connected between the participants of that team. In addition, a team environment can be extended with shared files and forbidden with external applications such as "Trello", "Moodboard" and many other web-based applications (Kent, n.d.).

### Bitrix24

Bitrix (Bitrix24, n.d.) has a lot of different functionalities in the field of communication and organization, just like MS-Teams. In contrast to Microsoft Teams, Bitrix is not built around an idea of teams. Bitrix focuses more on a total system for your company. You can also do web hosting for an e-commerce website in combination with your system. And Bitrix has a CRM system. Fully equipped with a customer support and contact center environment.

In addition, Bitrix, like Microsoft Teams, has various integrations (Getapp, n.d.). And you can also continue to use your Office 365 package in Bitrix and supplement it with communication platforms such as Stack.

## 2.2. Are there other organizations that have internal solutions for international cooperation?

To answer this question, other studies regarding communication within international teams have been analysed. We looked at which problems arise and how they can be solved.

### Project Aristotle

Project Aristotle is a project by Google re:Work that investigated, what makes an effective and efficient team (Google re:Work, n.d.). Project Aristotle is a sequel to Project Oxygen, an investigation into what makes a good manager "good" (Google re:Work, n.d.).

Project Aristotle covers some very interesting aspects of team collaboration. For example, the question is asked what a team actually is. Where the effectiveness depends on. What is important within a team and what is not important (Google re: Work, n.d.).

### What is a team?

In order to determine what makes an effective and efficient team, according to Google re:Work, it is important to know what a team is. Important according to Google re:Work is the difference between a team and a workgroup. A working group is defined as a group that works together but where the members are not dependent on each other and can work individually. The difference with a team is, according to re:Work, dependence. re:Work says that the members of a team must be dependent on each other in order to perform the work, and if this is not the case, there is no team relationship (Google re:Work, n.d.).

### Effectiveness: depending on result or culture?

Now that it is known what a team is, it is possible to look at what determines the effectiveness of a team. Google first looked at the amount of code that was written, fixed bugs, customer satisfaction, etc. However, this turned out not to be the right way to determine effectiveness. Writing more code does not mean that the code is better, as the quality may be lower. The same goes for the number of bugs that have been fixed and a high customer satisfaction does not necessarily mean that the effectiveness of the team is high (Google re:Work, n.d.).

But what determines a high effectiveness? During the investigation, Google discovered that the effectiveness of a team depends on who wants to know. During the investigation it appeared that a manager defines the effectiveness of a team differently than a team member or a team leader. Therefore, re:Work measures the effectiveness of a team in four different ways (Google re:Work, n.d.):

- Evaluation of the board / management;
- Evaluation of a team leader;
- Evaluation of a team member;
- Sales results compared to the quarterly quota.

These four ways of measuring effectiveness ensure that the total effectiveness of a team can be determined.

### Important in a team

According to Google re: Work, there are some aspects that are and are not important in a team. The following aspects are important (Google re:Work, n.d.):

- Psychological safety
- Dependency
- Structure & clarity
- Meaning
- Impact

### ***Unimportant in a team***

According to Google re:Work, there are some aspects that are and are not important in a team. The following aspects are unimportant (Google re:Work, n.d.):

- Location of the team members
  - Consensus-oriented decision-making
  - Extraversion of the team members
  - Individual performance of team members
  - Workload
  - Seniority
  - Team format
  - Tenure of office
- 

### **The impact of organizational and individual factors on team communication in surgery: A qualitative study**

This study focuses on the influence of organizational and individual factors on group communication during an operation. This research uses the Grounded Theory Approach with the aim of creating a theoretical model that examines the relationship between organizational and individual factors and the interdisciplinary communication during an operation (Gillespie, B et al., 2010). A total of 16 respondents were interviewed in both groups and individually. These respondents are from different disciplines who all work during operations.

### ***Results***

The results of this study showed that they are divided into three themes. These three themes each address an aspect of the purpose of this study. The three themes are explained below.

#### ***Interdisciplinary diversity in teams contributes to complex interpersonal relations***

The first theme revealed that differences in education and rank are amplified by differences in responsibilities based on gender, authority and patient care. This all contributes to the strengthening of the ranks and the differences between these ranks. This has advantages and disadvantages, as the clear grades and division of labour ensure that everyone knows what to do and by whom, so that the work goes smoothly. On the other hand, this also means little communication, so that the cooperation is not truly a form of collaboration is more individual tasks performed by different people with the same goal, treating / operating the patient (Gillespie, B et al., 2010).

#### ***The pervasive influence of the organization on team cohesion***

The second theme illustrated the impact that the organizational context has on team communication practices. The findings described the general lack of confidence of the participants in the organizational context regarding resource allocation and the introduction of patient safety initiatives that were required to improve team communication. It is conceivable that bureaucratic decision-making regarding policy design and resource allocation was apparently far removed from the primary activities of surgical teams in the OR. In the study, a culture of "debt" was not conducive to effective teamwork; and it turned out that the organization was not promoting a culture of collaboration. A collaborative culture is informed by reflection on recent history, and there is an acceptance of an inevitable degree of uncertainty when security initiatives are implemented to change the practice - recognizing that protocols themselves must change over time. In essence, this should be done collectively and supported by respect for the difference between clinicians. Tolerance of differences triggers lively discussions about the quality of safety practices (Gillespie, B et al., 2010).

### ***Education is the panacea to improving team communications***

The third theme described education as central to the changing culture and increasing understanding among interdisciplinary team members. The majority of participants felt that teaching communicative skills to older clinicians was pointless: for older clinicians, the development of effective interpersonal skills was not necessarily emphasized during their formative socialization period, and may reflect traditional biomedical training aimed at developing technical skills in isolation from interpersonal capabilities. That said, the goal of any education strategy must ultimately lead to deliberate and continuous changes that address interdisciplinary communication practices, there is an important first step. Changing deep-seated clinical practices depends on attitude change. Yet it is only possible if the change in attitude accumulates that a new culture can arise. Good teamwork starts with a set of norms and values. The participants' collaborative behaviour was characterized by the idea of multi-professionalism. Without first valuing inter-professionalism over multi-professionalism, it is impossible to develop a collaborative culture based on learning at work. Participants also recognized that culture change would only provide lasting change if education took place during the formative training period. While interdisciplinary education must be included in professional development programs, it must necessarily also be embedded in medical and nursing undergraduate curricula. Education programs that emphasize leadership, communication, and conflict management skills are critical to collaborative practice (Gillespie, B et al., 2010).

### ***Conclusion***

Although this research focuses on the medical world, there are a number of special findings that are very important. Such as the fact that the different ranks within a team can have both positive and negative consequences for cooperation.

Secondly, it turned out that if the culture within an organization does not promote cooperation, cooperation can certainly not be successful.

Thirdly, it appeared that communication within teams is more difficult when there are large age differences. This is because older employees are more resistant to learning new methods and strategies, so that cooperation cannot improve. Teaching the correct methods of communication is less difficult among younger employees.

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### **The process of team communication in multi-cultural contexts: An empirical study using Bales' interaction process analysis (IPA)**

This research studies the effects of cultural differences and method of communication (face-to-face or virtual) on the communication process. In this study, communication between team members was measured using Bales' Interaction Process Analysis (Nam, C et al., 2009).

### ***Result***

The results of this research are divided into two parts, the effect of cultural differences and the effect of communication method.

### ***Cultural differences***

Homogeneous teams, teams with members of the same culture and origin, generally showed a higher level of communication, especially socially oriented communication, during the tasks as a team compared to heterogeneous teams, teams with members from different cultures and backgrounds. In particular, homogeneous teams used more agreement, expressing opinions and showing stress communication patterns compared to heterogeneous teams. In addition, homogeneous teams were characterized by higher overall levels of positive and negative social-emotional communication (functional area scores) compared to heterogeneous teams. The homogeneous teams appeared to develop better socially than their heterogeneous counterparts, as evidenced by their willingness to show agreement within their team, express opinions and show levels of tension during the task. This is consistent with the literature on teams that suggests that diversity, although a long-term performance enhancer, can inhibit team processes such as team cohesion (Nam, C et al., 2009).

When considering the higher functional areas, the homogeneous teams seemed to have the psychological safety to induce both positive and negative social-emotional communication patterns. A possible explanation for these results is that the heterogeneous teams may have had difficulties building confidence. In the early stages of team interactions, individuals base their perception of trust on demographic similarity (Nam, C et al., 2009). Demographic diversity can hinder the development of trust in ad hoc teams, reducing psychological safety and hindering social-emotional communication. Interestingly, there were several instances where team diversity interacted with communication mode when predicting team communication patterns (described further below).

### **Communication method**

Overall, the Face-To-Face (FTF) condition was associated with higher levels of communication compared to the Computer-mediated Communication (CMC) condition. In particular, teams interacting using FTF communication showed greater freedom of tension, showed agreement, gave suggestions, opinions, orientation, showed disagreements, and showed stress communication patterns. In addition, when considering the higher functional areas, teams using FTF communication strategies were characterized by more positive social-emotional communication, more attempted answers, more questions, and more often negative social-emotional communication. Face-to-face communication strategies seem to be a robust promoter of team communication for different communication types. Given the importance of information sharing in collaborative activities (Nam, C et al., 2009), current findings indicate that FTF teams disseminate information more effectively. Previous research has shown that FTF teams often result in better performance compared to CMC teams (Nam, C et al., 2009).

This finding may apply in particular to tasks that require decision making, problem solving, conflict resolution, or agreement (Nam, C et al., 2009). Some researchers have suggested that CMC strategies may promote "flaming" or reduced inhibitions in communicating negative emotional information. In contrast, the current study shows that FTF strategies were associated with more general communication, including both positive and negative socio-emotional information. These findings are inconsistent with previous research showing that FTF and CMC communication modes have similar effects on emotional communication (Nam, C et al., 2009). Researchers have called for more research to investigate the social and other contextual factors that influence the effectiveness of collaboration tools (Nam, C et al., 2009). As a step towards that goal, the current study investigated the combined effects of different communication modes and team composition on team communication patterns.

### **Conclusion**

A number of results from this research are very important. For example, the study showed that the cultural differences certainly have an effect on the way of communicating. It turned out that teams from the same culture used more agreement, give more opinions and are more resistant. The level of communication is therefore generally higher compared to teams with cultural differences.

It also appears that the communication method has a great effect on the communication level. It turns out that Face-to-Face communication provides a more personal form of communication, with the result that team building goes better and relationships are built earlier. Virtual forms of communication turned out to be much more business-like, which makes team building more difficult. Also, teams interacting Face-to-Face had more freedom of tension, showed agreement, gave suggestions, opinions, orientation, showed disagreements, and showed stress communication patterns.

## 2.3 What do studies with regard to (digital) communication conclude?

Three studies have been analyzed to answer this question. To find out the base of a good team work we read "The 5 dysfunctions of teamwork" by Lencioni. To extend this with information about communicating virtual while being geographically spread, we analysed "Unpacking the concept of Virtuality" by Gibson and Gibbs (2006). To delve deeper onto the effect of the Psychologically safe communication climate we analyzed the effect of team development on team performance in the study "The influence of Leadership and team development on team performance", by Martijn A. van der Meer.

### The 5 frustrations of teamwork

In the book "The 5 dysfunctions of teamwork" by Lencioni (2002) he indicates that most organizations fail to achieve good teamwork and those who try to, face 5 frustrations. These 5 frustrations are:

1. **Lack of trust:** When there is no mutual trust, team members do not dare to communicate honestly and openly. The team members must be comfortable and vulnerable.
2. **Fear of conflict:** Conflicts can only arise when there is confidence in a team. If this is not the case, team members will confront each other and defend themselves instead of entering into a discussion with each other. As a result, there is no progress and the team works inefficiently.
3. **Lack of involvement:** Productive conflict creates wider support for decisions. This allows all team members to agree and feel involved in the decision.
4. **Avoiding responsibility:** If not everyone feels involved in the decisions, the team members do not hold each other responsible for agreements. Only when there is a clear picture of expectations for everyone, they can hold each other accountable for their behaviour and activities.
5. **Too little attention for results:** If there is a lack of accountability for contributions, team members will focus on their own needs. There is no attention for the collective results.

Lencioni (2002, p.200) says in his book: "Success is not a matter of acquiring subtle and advanced theories. Rather it is common sense with an unusual degree of discipline and tenacity."

The members of a successful team trust each other, bring ideas and debate openly about this. They make decisions together and act according to the plan. They hold each other accountable because each member is an important and valuable part of the team. They focus on achieving the common team goal. (Lencioni, 2002)



## Unpacking the concept of Virtuality

The research "Unpacking the concept of Virtuality" by Gibson and Gibbs (2006) indicates that when there is no good group interaction, the insights and efforts of team members cannot deliver the best. As a result, no organizational benefit can be obtained.

If you want to know why the groups interaction does not work you have to look at 4 parts:

- Geographical distribution (Consists of members spread over more than one location)
- Mediated by technology (communicating using electronic tools such as email or instant messaging)
- Dynamic structure (where change often occurs among members, their roles and relationships with each of them)
- National diversity

People often think that teams that are more geographically divided are also more electronically dependent and therefore more "virtual". This is usually not the case. Teams where members are in the same building can still send an email not to have to move to another wing or floor. So, they are electronically dependent but not geographically distributed. It does reduce their informal exchanges and social signals.

### *Spread geographically*

An obvious problem here is that team members are unable to get together to discuss. Another thing that team members who are geographically separated also miss is mutual knowledge. They do not know about each other's situation, which increases coordination problems when gaining knowledge and using resources.

### *Depends on technology*

In some cases, you are dependent on technology because you cannot speak to someone "face-to-face". Think of someone who works at home or someone who is abroad. Electronic dependence creates logistical and technological limitations in the field of informal spontaneous interactions, which may hinder the interpretation of knowledge.

It has also been found that teams that are electronically dependent have more difficulty interpreting feedback during discussions. Communication via computers can reduce non-verbal signals. The tone, warmth and attention that someone can give "face-to-face" does not come across via the computer. These signals are important in conveying a clear message. People who mainly communicate via the computer often use more direct communication styles with less social cues than those in personal circumstances.

### *Structure dynamic*

A dynamic structure reduces the strength of social bonds between team members because there is too often a change between people and functions, among other things. When there is a tie / social relationship there will be more interactive, emotional intensity, and reciprocity between two individuals. It is also argued that weak ties can lead to more creativity because new participants can bring in new knowledge. However, people generally feel more comfortable with stronger bonds when it comes to sharing information that requires risk and candor. Furthermore, it is more difficult to implement knowledge when the structure is dynamic.



### *Teams more successful*

Projects are more innovative when information is brought together, translated and provided to fellow team members. Teams whose members lobby for such support, buffer the team from outside pressures, engage in impression management, and coordinate the use of external information for technical or design issues are more innovative. Teams with more thorough internal communication (for example, they defined better goals, developed workable plans and priority work) superior innovation performance. Developing a shared, general vision has contributed to innovation.

Geographically:

- Ensure that people have mutual knowledge of each other's situation.

Depending on technology:

- Provide more informal spontaneous interactions among the team members.
- Make sure that the non-verbal signals also come across.

### *Psychologically safe communication climate*

"An atmosphere within a team characterized by open, supportive communication, speaking out and risk taking can help turn geographic distance, electronic dependence, dynamic structure and national diversity of liabilities into assets and drive innovation." (Gibson & Gibbs, 2006)

A psychologically safe communication climate fosters innovation because it involves speaking out, discussing differences and engaging in spontaneous and informal communication. It is about providing unsolicited information and bridging differences by suspending judgment, remaining open to other ideas and perspectives, and actively listening.

Psychological safety appears to play a crucial role in stimulating team learning and innovation. Psychological safety teams help to learn more effectively by reducing interpersonal risks and encouraging members to admit mistakes, question current practices, ask for help and ask for feedback.

Minimizing functional and status differences promotes speaking about such boundaries and designing preparatory hands-on sessions and early trials help encourage new behaviours in technology implementation.

A psychologically safe communication climate can ensure a satisfying working relationship. This increases the likelihood that team members efficiently collect the necessary external links to acquire knowledge and resources. Second, a psychologically safe communication climate helps to give and receive informal communication and feedback to overcome problems of subtle control, low message clarity and interpretation of knowledge that result from reduced personal interaction and lack of social cues during electronic communication.

Team members who communicate more supportively with each other are more likely to develop a common frame of reference and a shared mental model. Furthermore, the innovation process requires stakeholders to suspend judgment, remain open to the ideas and perspectives of others, and make the necessary efforts to integrate new knowledge with existing knowledge to produce the innovation. (Gibson & Gibbs, 2006)

## Importance of team development for team performance

In the study "The influence of Leadership and team development on team performance", Martijn A. van der Meer developed a new model for team performance. In this, he assumed a positive effect of team development on team performance. The conclusion that van der Meer draws from his research confirms this. "Team development appears to have a very significant impact on team performance. Task-oriented and people-oriented leadership both ensure team development, where task-oriented leadership also leads to team performance and people-oriented leadership leads to enthusiasm." (A. van der Meer, 2007).

### Team performance

A number of points that are important for team performance, according to van der Meer, are the composition of the team, the environment of the team and how there is cooperation within the team. It is important that there are different qualities in the team. The roles of Belbin (1999) can help with this. It is important for the environment that the organizational units are well organized and that there is a suiting culture. The cooperation within the teams is very important for the end result.

### Team performance Team development

In this research, Tuckman's model is taken as the basis, because that model has formed the basis for most other phase models and is still the most used after more than 40 years. (Tuckman, 1965). The higher a team scores on the team development factors, the further the team is developed (Chang, Duck, & Bordia, 2006).

The development factors of team development are social cohesion, psychological safety and mutual trust, open communication and division of roles. (Tuckman, 1965; Tuckman & Jensen, 1977). Social cohesion represents the social cohesion in a team. There are stable, lasting and close relationships between employees (Raub, 1997). Psychological safety and mutual trust ensure that important conflicts can be resolved. It is important here that team members can be themselves without any consequences (May & Harter, 2004). Mutual trust is described in the literature by Dirks (2000) as being able to count on each other's actions, words and intentions. In open communication and feedback, it is a requirement that there is mutual trust first. When this is the case, it can ensure that positive behaviour is stimulated and negative behaviour is restored. Open communication also clarifies the relationship between people (Remmerswaal, 2004). With a good division of roles, the qualities of the team members and the division of tasks are coordinated (Tuckman & Jensen, 1977). This way the team members know what is expected of them and what they can expect from each other.

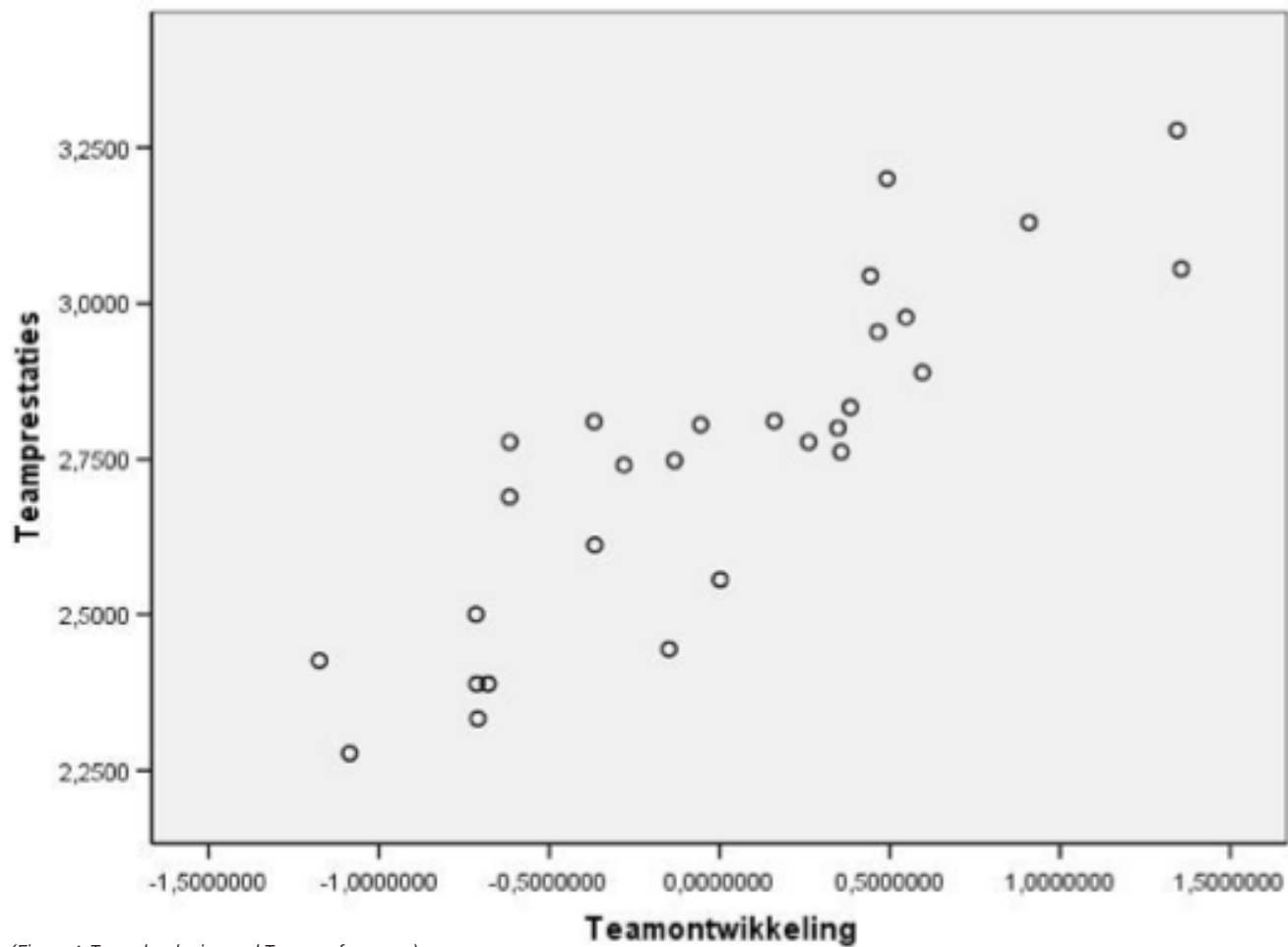
Previous literature has already shown that team development has a predictive value on team performance (Tuckman & Jensen, 1977; Wheelan, 1994; Lingsma, 1999; Levine, 1979). The research by Van der Meer (2007) shows that team development has a very positive influence on team performance. 74.4% of the change in team performance is explained by the level of team development. Figure 4 shows the changes for team development and team performance. .

### Coaching leadership and team development

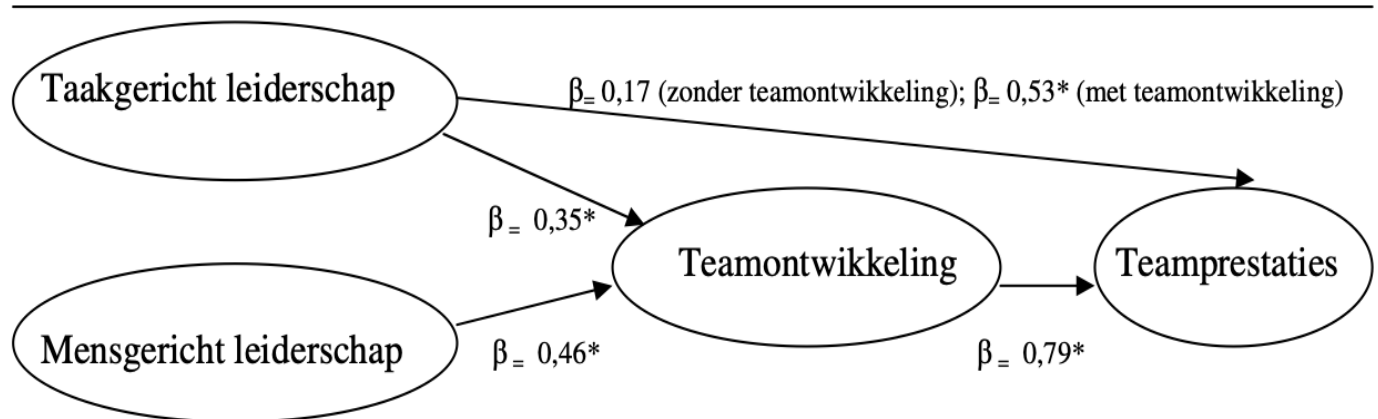
A link has been found between coaching leadership (combination of people- and task-oriented leadership) and team development. This has a positive effect on team development and therefore also on team performance. Task-oriented leadership can also have a direct positive effect on team performance. See Figure 5.

### Conclusion

The results show that the higher the team scores on team development, the higher it scores on team performance. Because almost all of the change in team performance is explained by team development for 74.4%, team development is of great importance for good team performance. Team development and team performance run almost parallel to each other. "Teams that score high on the team development factors (safety, trust, open communication, feedback, social cohesion and division of roles) are almost certain of better performance." (Van der Meer, 2007)



(Figure 4: Team developing and Team performance)



(Figure 5: New team development model based on results with the betas of all relations)

## 2.4 What cultures are there at ASML at the 60 different locations and what does the theory say about the differences within those cultures?

To answer this question, we first looked at what the theory says about communication within a team consisting of members with different national backgrounds. We have analyzed the study "Unpacking the concept of Virtuality" by Gibson and Gibbs (2006). Then we did research on the four most common cultures at ASML. These results are incorporated in a matrix.

When team members represent different national backgrounds, each with their own values, orientations and priorities, this may compromise effective internal communication.

In addition, team members at a location have certain knowledge that is self-evident to them and therefore often cannot easily describe that knowledge, nor articulate its relevance for team members from other locations.

Cultures (characteristic ways of thinking, feeling and behaving shared by members of an identifiable group) exist outside the national cultures at many different levels, including organizational and functional cultures. For example, there is a lot of difference between ASML and CANON (organizational culture), but there is also a difference between IT professionals and business administration within ASML (functional culture). But the most dominant culture is that of identity. It is anchored from birth. This difference is more noticeable than a particular organizational or functional culture. National diversity can hinder internal communication, conflict resolution and the development of a shared vision.

When team members represent different nations, this can create different expectations about the way of communicating and this can lead to a lesser identification of the entire team.

So, while collaborations made up of members from different countries may have access to more information due to different worldviews, it can create misunderstandings, stereotyping, and the inability to reach agreement, make decisions, and take action.

For example, some national cultures are "high context" and others "low context," referring to the importance of nonverbal, contextual cues in communicating or interpreting messages. Members of high context cultures tend to avoid negative or confrontational responses when communicating with members of their own workgroup to save face and maintain a sense of harmony in the group. Members of low context cultures use explicit language to convey exactly what is meant in a much more direct way, even if the message is negative or confrontational. In addition to differences in high or low context, other relevant differences can be individualism-socialism, uncertainty avoidance, power distance or time orientation. During multicultural collaboration, differences between these dimensions are likely to cause communication disruptions, making it difficult to aggregate and process information.

In addition, high national diversity and the identification of members with their nationality are likely to lead to social categorization, a process in which individuals from different groups only distinguish "in-group / out-of-group" based on nationality, especially if they lack information about other stakeholders. These differences can lead to stereotyping, mistrust and suspicion of members outside the group, which reduces team identification and integration and the team's ability to use information.

Developing a shared vision is particularly dangerous in nationally diverse teams because of its strong identification with subgroups. (Gibson & Gibbs, 2006)

It is therefore important to know whether there are differences in the cultures within ASML. Because ASML has 60 locations in 16 different countries, we decided to look at the cultures within the Netherlands, America, Taiwan and Korea. What means we looked at least 75% of the cultures within ASML.

We have drawn up a matrix to gain more insight into the values, orientations and priorities of different cultures within ASML and to take this into account.

For the topics in the matrix, we looked at the components that are important for good communication. We have chosen the following topics:

- Hierarchy (Is there a strong hierarchy)
- Communication (What way do they communicate, what do other countries think of it)
- Context (Do they communicate in a high or low context)
- Decision-making (How are decisions made. As a team or alone by a leader)
- Appointments (How do they make agreements and stick to them)
- Relationship management (Do they want social contacts with colleagues or is everything only work related)

	The Netherlands	USA	Taiwan	Korea
Hierarchy	There is a hierarchy, but status is not the most important.	Has a plate hierarchy but it is clear who is in charge. (Agten, 2016)	Hierarchy is very present. The older you are the higher you are in the hierarchy. It is disrespectful to go against someone who has a higher status like you. They take great care to avoid direct communication of something that would hurt or offend a colleague, as it would cause a loss of "face." They will gently put forward their ideas and wait for others to respond. If they disagree with an idea, they will simply remain silent. (Commisceo global, z.d.)	Respect for age and status is very important in Korean culture, where hierarchy affects all aspects of social interactions. Everyone has a role in society as a result of hierarchy - that is why it is essential to respect it. Koreans feel most comfortable interacting with someone they consider their equal. Status is largely determined by a person's role in an organization, for which organization they work, which university they attended and what their marital status is. (AsialinkBusiness, etc.) While your professional position is important, your age is equally important to the hierarchy. The hierarchy in South Korea has been pushed so far that it is rare for a position to be awarded to a person younger than those who would be under their supervision. (expat, 2019)
Communication	"They are quite direct and can come across as blunt, but seldom this is meant to be rude. The Dutch communication style is fairly calm and reserved, but also direct and honest. A well-structured, factually accurate presentation is expected, with clear evidence or data to support any statements. The Dutch have a very analytical approach and will examine all proposals in detail." (The Hague international center, n.d.)	"Americans say exactly what they mean." (Agten, 2016)	Taiwanese value a well-made message. They appreciate sharing a deep and broad contextual understanding so that the core message can be conveyed and understood. That context comes in the form of words, gestures and facial expressions. Brevity is not particularly appreciated, especially if it sacrifices something in the delivery. (Commisceo global, z.d.)	Koreans feel most comfortable interacting with someone they consider their equal. (AsialinkBusiness, etc.)
Context	Low context, use explicit language to convey exactly what is meant in a much more direct way, even if the message is negative or confrontational.	High context, tend to avoid negative or confrontational responses when communicating with members of their own workgroup to save face and maintain a sense of harmony in the group.	High context, tend to avoid negative or confrontational responses when communicating with members of their own workgroup to save face and maintain a sense of harmony in the group.	High context, tend to avoid negative or confrontational responses when communicating with members of their own workgroup to save face and maintain a sense of harmony in the group.
Decision-making	Decisions once made are implemented quickly and are considered final. Managers often ask for input from their team. Depending on the corporate culture, this can often mean that they are open to constructive criticism.	When making decisions, American managers are categorized as performance oriented. Decisions are driven by competitiveness and are very result-oriented. The American decision-making style reflects a great need for achievement. When business leaders in the United States make decisions, those decisions will respond to challenges or create opportunities that will have their efforts recognized and praised by others. (Agten, 2016)	The person who is the oldest and thus the highest in the hierarchy will make the decisions (Commisceo global, z.d.)	Employees must obey the choices made by the employer. (Sweets, 2013)
Appointments	"Our plan focus can also be linked to the well-functioning legal system in the Netherlands. We want to put everything on paper and make agreements. If you come from a country with a less reliable legal system, such a paper or agreement says less, you focus more on contacts." (Luimstra, J. 2017)	Punctuality is paramount in the US Being on time - especially at meetings - is essential to your success. Five minutes late with an apology is acceptable, but ten to fifteen minutes late requires a phone call to warn of the delay and apologize. Being late can be seen as a sign of disrespect. Americans plan ahead with concerns about planning; however, long-term strategies usually do not last longer than three years. Keep appointments as soon as they are made. Meetings may seem quite relaxed, but they are taken seriously. If there is an agenda, it will be followed. (Agten, 2016)	Meeting schedules are not very structured. There may be an agenda, but it serves as a guide for the discussion and can be a springboard to other related business ideas. Time is not considered more important than satisfactorily rounding off a meeting, therefore the meetings will continue until the discussion is completed and may take longer than a scheduled end time. (Commisceo global, z.d.)	"It is inappropriate in Korea to say no. Therefore, conversations and discussions can take longer to avoid rejection or refusal." (Globaltalk, 2019)
Relationship management	"About three-quarters of the Dutch are friends with colleagues. For example, 64% say they have friendly relationships with their colleagues. And 12% say they consider some colleagues to be close friends." (HR Practice, 2019)	"When you get out of the traditional workplace, you just have to be careful about how you act, what you say. What seemed fun on Friday night at the time could be a Human Resource issue on Monday morning." (Gardner, 2008)	"Since relationships are valued, some time can be spent during the meeting on non-business discussions." (Commisceo global, z.d.)	"Building relationships is an essential part of doing business in Korea. Relationships arise through informal social gatherings and generally involve a significant amount of food and drink. Such gatherings also provide an opportunity for both parties to discuss business in a more relaxed and friendly environment, including during dinner." (Hogan, 2017)

(Figure 6: Matrix culture differences)



# Chapter 3: Results

The results of this research originate from two different researches. The first section are the results from other studies and research papers regarding the subject of this research paper. The second part of the results are the results that come from our interviews with ASML employees from different locations from all over the world.

## 3.1 Results desk research

The results of the desk research that has been done regards four different subjects;

- Available means of communication;
- Solutions of other companies;
- Other studies regarding the subject;
- Cultures within ASML.

These results of these subjects will each be individually explained.

### *Available means of communication*

It soon becomes clear that there is a wide range of communication platforms. For large and small use and for targeted applications to complete IT environments for your company. At the end of the day, it remains important to be clear as an organization about your requirements. And whether you are looking for an addition to your existing systems or a replacement / simplification of what you already have.

For ASML, two options seem to fit within the company, Microsoft Teams and Jitsi. Microsoft Teams is the easiest option to choose. As a company you pay for the application and support. You entrust Microsoft with the support and further development of the system. As a result, relatively little knowledge is needed internally of the "core" of the application itself. However, this also has a drawback. Because you do not have complete control over the application, you as a company depend on the structure and functionalities that Microsoft chooses. Microsoft Teams offers widgets that you can integrate or possibly develop yourself. Only these widgets are always webpage and functions as a addition rather than it is really integrated in Microsoft Teams. Because you are attached to the MS Team structure, this can cause friction with the company structure.

Jitsi, on the other hand, is open source and is developed by different organization. Jitsi has a Wide support and offers a lot of different functionalities and integration. Jitsi has several additional projects, they focus on a different purpose. For example, "Jicodfo" is intended for conferences and size events. And there is Jitsi Desktop, for an addition of functionalities including file sharing.

With Jitsi you can easily develop your own communication as a company without running any security risks. The base of Jitsi is widely supported.

### *Solutions of other companies*

The question "Are there other organizations that have internal solutions for international cooperation?" has a short answer, yes. There are other organizations that have ran into the same problem as ASML. The general conclusion that can be drawn is that distance communication is not considered to be the problem. Safety in a team does affect it and can be considered the greatest success factor for international teams. A team member must also feel important and wanted and there must be structure and clarity in the team.

It is true that team building is easier if this happens face-to-face, but this does not mean that it is impossible to do this internationally. This is however a process that will take some time and needs constant guidance for it to be successful.

### *Other studies regarding the subject*

The results show that the higher the team scores on team development, the higher it scores on team performance. Because almost all of the change in team performance is explained by team development for 74.4%, team development is of great importance for good team performance. Team development and team performance run almost parallel to each other. "Teams that score high on the team development factors (safety, trust, open communication, feedback, social cohesion and division of roles) are almost certain of better performance." (Van der Meer, 2007)

### *(Digital) Communication for ASML*

In "The 5 frustrations of teamwork" by Lencioni (2002), five frustrations are indicated for both teams that work together physically and virtually. This is an important basis for any "High Performance Team". When a team works virtually, these pitfalls can be even more difficult to avoid.

In addition, in "Unpacking the concept of Virtuality" by Gibson and Gibbs (2006) some tips are given for teams that are geographically dispersed and dependent on technology.

When these studies are combined, the following principles emerge:

- Make sure that people have mutual knowledge of each other's situation
- Provide more informal spontaneous interactions among the team members
- Make sure that the non-verbal signals also come across
- Provide a psychologically safe communication climate
- Have a clear common goal
- Ensure involvement through accessibility to all information
- Make sure that members hold each other accountable

In his research, Van der Meer (2007) focuses on team development. The higher the team scores on team development, the higher it scores on team performance. So, in order for a team to function efficiently, investments must be made in team development. This can be achieved by working on the following issues: social cohesion, psychological safety and mutual trust, open communication and feedback and the correct division of roles. In addition, his research also shows the positive effect of task-oriented and people-oriented leadership on team development.

### *Cultures within ASML*

In studies such as that of Gibson & Gibbs, they say that cultural differences can hinder communication within a company. (Gibson & Gibbs, 2006) Now we have compared the different cultures within ASML and a number of points emerge from this.

If you look at hierarchy, it is very much present in Asian cultures. The older you are the higher you are. There is not a very large hierarchy in America. But it is very clear who is in charge. In contrast to the Netherlands, where there is a hierarchy in the way that it is clear who is higher, but status is not so important in the Netherlands.

The way of communicating with each other is also very different. The Dutch are very direct and it is sometimes seen as blunt. America is honest in what they find, but in Asian culture it is rude to say no. They will therefore take the time to put a message into words. They try to avoid conflict through this.

There is also a big difference in making decisions. In the Netherlands it is a team decision, while in America and in Asian culture, the boss or elder is in charge. Furthermore, you must obey their decisions.

The Dutch generally have friends in the workplace. Building relationships with colleagues is also very important in Asian cultures. While Americans are very reserved about this. They are quickly afraid that if they tell too much about their private life, they will get in trouble with their work.

## 3.2 Interview Results

The employees we interviewed were from a variety of different nationalities. We interviewed people from India, Spain, Italy, Netherlands, Korea, China and America. The different ages ranged from 22 to 50 years old. The interviewees have different educational backgrounds and roles within ASML. For example, we interviewed employees from HR, D&E, management teams, engineers, marketing and finance. They also work at different locations from ASML spread around the world.

The interview was split in four parts which were Teams, Meetings, Tools and Culture. The entire interview and the anonymously processed answers are added in the appendix. For every interview part a short summary has been made.

### Teams

The definition for a team is a group of people that work together to a common goal. Most employees are part of one or multiple teams. A team by ASML is normally part of the organisation structure. Sometimes a temporary team is formed for a specific goal. Mostly to improve specific processes within the company.

Not all the teams by ASML work remotely or have participants that work on a different location. The ones that do are permanently located at another location within ASML, or are sent to a customer to assist with the product.

Within ASML, teams have around 10 members. A few teams have up to 40 members.

In the teams there is one employee that has the role of manager for the team. Team members often have multiple roles. The ones that have a single roll are part of that team because they have a specific set of skills. A hierarchical is almost non existing in the teams. Someone who is assigned as team leader does not have to be the highest person in rank within that team.

The teams in ASML are built around the idea that every person has to feel part of their group, respected and useful. Collaboration and ownership of your ownership have the overtone. This makes a hierarchical ranking less needed. Leaders often have the roll to assist and help the team and serve as communicator outside the team.

In the end the conclusion that can be drawn is that the teams within ASML work already very well. And there is not much to improve. Things that are not working very well are mostly caused due to the complexity of ASML as a worldwide multicultural company.

### Meetings

Based on the results from the interviews a couple of interesting conclusions can be made. The first part is that most employees didn't have a change in frequency of the meetings due to COVID-19. The only difference is, is that all meetings are digital now whereas most meetings prior to COVID-19 where physical. This has made a lot of aspects around digital meetings a lot clearer than they were.

Since the COVID-19 pandemic all of the meetings in ASML are now digital and this has had the following benefits according to the interviewees:

- Everybody listens to each other and everybody awaits their turn;
- Meetings start at the scheduled time and usually takes no longer than scheduled;
- Meetings take less time as everybody is more focused which causes less interruptions;
- During a meeting an individual participant can be contacted to get clarification without interrupting the others.



Obviously, besides the benefits, there are also a couple of downsides:

- No time in between meetings doesn't allow for processing the information given during the meetings, this is due to the meetings being scheduled back-to-back;
- There is no visual feedback during meetings as the reactions aren't clear on the screen;
- The lack of human contact makes it so that if someone is having a bad day this isn't clear as the body language can't be read. This can be difficult when that person responds agitated for no apparent reason;
- It is difficult to communicate with foreign and local people at the same time due to connectivity issues.

## **Tools**

Everyone works through Microsoft Teams when it comes to communication within the organization. They are all positive about Microsoft Teams and most find it an improvement over Skype Business. They think that Microsoft Teams gives more flexibility and the working environment is more pleasant.

Some do indicate that they are new to Microsoft Teams and probably use less than 10% of the capabilities. They think if they know more about Microsoft Teams, it would work even more efficiently.

Virtual meetings are possible, but it is different from a physical meeting. If possible, they would rather meet physical.

## **Culture**

### **Noticing differences**

The interviewees indicate that the differences between cultures are clearly noticeable. There are differences in communication, way of thinking and way of working. There are also differences in expectation and in level of tolerance. There are differences in what is socially accepted and what is not. Not only are there communication differences, the employees also work in different time zones and have different working hours. This makes the time in which they can communicate small.

### **Benefits**

The diversity of cultures ensures an open mind. The interviewees are positive about the way these differences give them more respect for other cultures and other ways of working. Because of the different opinions you think about different ways of working and approaching a problem. It's about realizing your way of working is not the only way and it also softens the extremes.

### **Dutch culture**

ASML employees who work outside of the Netherlands notice some difference with their culture when it comes to communication. The Dutch culture is direct and open. The focus lays on giving each other feedback regardless of the hierarchy.

Some have trouble with speaking out loud and challenging authority.

### **Improvement**

Some of the interviewees mentioned they had a hard time adjusting to the international culture. Or they saw this happening with other colleagues. Receiving direct feedback from you colleagues or your boss without being prepared can have the wrong impact.

# Chapter 4: Empirical and Analytical research

## 4.1 Which teams are currently in place and how are they built?

ASML has over more than 2500 teams. We interviewed employees from different kind of teams. For example, teams for management, sales, engineering, HR, finance, IT. Most of the time employees are participating in multiple teams. Most teams are part of the organizational structure. This is why most of the employees have at least one team that is permanent. Some of them also have a team that is built for a specific project. Most of these teams have 5 to 15 members. Some of them are bigger groups with up to 40 people. All of the interviewees mentioned their definition of a team was sharing a common goal. They also mentioned supporting each other and achieving more together than you thought was possible. In the book "The 5 dysfunctions of Team work" Lencioni (2002) said a team needs to focus on achieving the common team goal in order to work efficiently as a team.

We asked our interviewees about their communication before and during the Covid-19 crisis. Most of them mentioned they had at least one meeting where they saw their team members face to face every week. Some of them saw each other every day in the office. Most of them only communicated virtual with each other when someone was working from home or if there was an emergency. 3 out of 10 had virtual contact once every two weeks to four times a week.

During the Covid-19 crisis everyone had to work a lot more virtual. In this crisis the employees of ASML were divided into green and blue teams. Teams of the same color were allowed to be at the office at the same time. It is very different for each country if they work from home completely or they use these green and blue teams depending on the measures of the government. For example, in the Netherlands they worked with these teams, but currently everyone who can, works from home. There are exceptions for employees who can't do their work from home. In some countries like Korea and China the employees are now back from working from home to working in these green and blue teams.

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## 4.2 How do the teams experience the current virtual communication?

Most of the interviewees don't see their team members face to face at the moment. Only if their working on the green and blue teams again or for an important or special meeting or task which can't take place virtual. Most of the employees mention they have more meetings planned now they need to communicate virtually. The employees need more time to communicate with each other. They also plan 'coffee meetings' to replace the little chats at the water cooler.

### *Advantages*

We asked our interviewees how they experience this different way of working. The answers are all really alike. They feel like working virtual has his pro's and con's. The pro's are spending more time with family, less traveling and more convenient because they're not place dependent. The fact that there are more official meetings, and these meetings are more structural, the employees find positive. One of the interviewees said we connect more than before the crisis. Like we need to get true this together. So, lets help each other.

### *Disadvantages*

The disadvantages are a lower job satisfaction because of lack of communication with colleagues and having trouble keeping work and personal life separated. It's harder to make a connection with someone especially with new employees. One of the interviewees mentioned that she noticed people turn on their camera's more often now because they want to feel more connected. Which is the positive side of it. There are no more walks in between buildings or offices. These walks give time to process information and gives the opportunity to have a chat with people you cross.

Communicating virtually also makes the step to ask someone for help harder. One of the interviewees said now you also have to be more respectful of someone else's time because they may have kids at home or a family member who has corona. Because of this it takes longer to get information and more effort.

One of the employees said he found the online communication difficult because this was his first experience with online meetings. The thing that he especially considered difficult was that he wasn't able to deliver his emotional feelings towards the customers or his team members. More interviewees mentioned this aspect. Another one said that whenever he has to address an import issue, he is less comfortable doing it in an online meeting. Some conversations can easily be misinterpreted. They say it is hard to find out if your information is well received. You don't hear or see most people and people respond less in a virtual meeting. The body language is missing.

### *Work environment*

Something that the interviewees experienced different was being able to concentrate at home. Some mention they are really productive because they have less distractions while others share their work space with family or roommates and experience more distractions. This also makes it hard for them to keep work and personal life separated. Normally you leave the office and have the evening free. Now it is easier to keep on going after work hours because you have your laptop at home and you can move your work. Also, one of the interviewees mentioned she must be available in the evening to answer the phone now.

### *New way of working*

Some of the employees hope that even after the Covid-19 crisis they can work from home more. Most of them mention they would prefer working half of the time at home and the other half at work. They also hope there will be less traveling. Working from home is very flexible and efficient because of the traveling. But they still want to come to the office for the relationships with their colleagues. One of the interviewees said: "A balance is required between virtual and physical".

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## **4.3 How large is the geographical distribution and does this cause problems?**

ASML has 60 locations in 16 different countries which means the geographical distribution is very large. We asked the interviewees if their teams work remotely to find out if they have team members at different locations. Most of the employees work with team members that work at the same location as they do. Even if they have to travel much the meetings are mostly face to face. This is an exception for 15% of the teams that work from different departments or countries. These are mostly management teams. These management teams also have to deal with cultural differences and different time zones.

One of the interviewees who works in a remote team mentioned that it is hard to get everybody together at the same time. When the teams want to meet with America, Europe and Asia all at once it is very late in the evening or very early in the morning for people from America and Asia. Also, people are not their most productive in the late evening or early morning. Another interviewee said that the communication is going well as long as they are physically present so not for the remote teams.

In the research "Unpacking the concept of Virtuality", Gibson and Gibbs (2006) mentions "An obvious problem here is that team members are unable to get together to discuss". The fact that they only have this little time slot available where they can meet makes that only the necessary things are discussed. This leaves no time for brainstorming or small talk. Gibson and Gibbs (2006) address the importance to ensure that people have mutual knowledge on each other's situation. This is something that could be improved at the remote teams of ASML.

Van der Meer (2007) concluded in his research that a team scores higher on team performance when they are scoring good on team development. So, in order for a team to function efficiently, investments must be made in team development. The geographical distribution makes this harder to accomplish because of the lack of mutual time.

## 4.4 What is the (dynamic) structure of the teams and does it cause any problems?

In sub question 4.1 the team structure is further explained. Most of the time employees are participating in multiple teams. Most teams are part of the organizational structure. This is why most of the employees have at least one team that is permanent. Some of them also have a team that is built for a specific project. "People generally feel more comfortable with stronger bonds when it comes to sharing information that requires risk and candor. Furthermore, it is more difficult to implement knowledge when the structure is dynamic" (Gibson & Gibbs, 2006). The fact that the employees have a permanent team with team members they can create a bond with is important. The good thing about teams that are created for a specific project, is that the knowledge is spread outside the teams.

To find out more about the structure in the teams we asked the question: Are there different hierarchical rankings within those teams? To make it clearer we also asked about the different roles the team members fulfill. It becomes clear that hierarchy is not obvious within ASML. Some teams have no leader at all. When there is a group leader, he/she communicates equally with the other team members. One of the interviewees mentioned that the project manager can also have a 'lower' level than another member of the team. The leader style in ASML is more to collaborate and brainstorm instead of one-way communication. Leaders often have the role to help the whole team to communicate with other teams and managers.

Gibbs and Gibson (2006) also mention the structure dynamic in their research. It says: "When there is a tie / social relationship there will be more interaction, emotional intensity, and reciprocity between two individuals". The dynamic structures of the teams at ASML cause little to no problems. Most employees know they can count on their team members and feel connected to them. They are especially satisfied with the way the hierarchical differences are almost invisible. But because ASML is a very large company there are a lot of layers within the organizational structure. One of the interviewees mentioned that it can take a long time before your idea can go to the next stage. These many processes can be frustrating.

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## 4.5 To what extent do the teams depend on technology and does this cause any problems?

Because of the Covid-19 crisis the employees now depend completely on the technology and especially on Microsoft Teams. One of the interviewees mentioned it was a good idea to upgrade to Microsoft Teams before the corona crisis. "If we would still be using Skype it would have been really bad". The interviewees like about Microsoft Teams that the connection and video image have a good quality. Also, you can chat during the meeting, add a digital whiteboard, send gifs. Microsoft Teams is also user friendly and needs little explanation to new employees. The interviewees experienced Skype as less user friendly and buggy.

### *Human contact*

One interviewee said: "I have to say we have the necessary tools in order to perform our job while 100% on remote. But it also causes some trouble, especially in the long run." Employees miss the human contact. Not only the small talks at the coffee corner or the water cooler. But also, the body language of their team member while giving information, an idea or feedback. One interviewee said: "You can't see the person. So, whenever you are saying something you are not exactly sure the way he or she is receiving that information. So, for example when I am having a bad day and I am not saying something in the right tone, it can come across that I am being aggressive or I am being too pushy with something". "The tone, warmth and attention that someone can give "face-to-face" does not come across via the computer. These signals are important in conveying a clear message. People who mainly communicate via the computer often use more direct communication styles with less social cues than those in personal circumstances." (Gibson & Gibbs, 2006). The use of technology makes it harder for people to connect emotionally. Making sure someone interpreted your message well is very important.

Sometimes people have their microphone on mute while they are talking or don't notice that their microphone is on while doing other things. Also, the interviewees prefer the camera on during the meetings but notice this is not the case most of the times. People turn their camera off for privacy reasons, to save connection or the fact that it is faster and more convenient. One of the interviewees mentioned she notices

that more people turn on their camera during the Covid-19 crisis because they miss human contact. But even if everyone has their camera on you can't see everyone's reaction when you are in a meeting with many people.

### *Microsoft Teams*

The research "Unpacking the concept of Virtuality" (Gibson & Gibbs, 2006) concludes that: "Projects are more innovative when information is brought together, translated and provided to fellow team members". Microsoft Teams gives the option to create a team and share files with each other. It creates a good overview and every team member can work in these files at the same time. There is no translation option in Microsoft Teams. Interviewees do mention they probably don't know about all of the functions that Microsoft Teams has to offer.

We asked the interviewees if there are functions or tools they are missing. Things that were mentioned were splitting what screen sharing shows in combination with people's faces or multiple files. So, you can still see someone's reaction while opening a file or sharing a screen. Missing the option to chat with someone one-on-one while in a meeting. Also, a coffee break and a survey function. One of the interviewees mentioned that ASML could invest more in their communication tools. "Being a tech company with the newest technology in their machines they should invest more in digital tools."

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## **4.6 How does ASML communicate with its virtual teams?**

We asked the interviewees which tools they are using to communicate with each other. The employees of ASML are provided with a Microsoft Teams package. They can use Microsoft Teams for meetings, agenda, chatting, sharing files etc. Other tools they are using are WhatsApp, Microsoft Teams application on phone, phone calls, Skype, email (outlook), whiteboard, Share Point internal webpage. The interviewees were all very satisfied about Microsoft Teams and prefer it to communicate.

Microsoft Teams is more interactive than Skype Business, it's quite similar to the social media networks that we use these days. Someone posts something and you can like or replay. We also have these jokes within the teams where we share some gifs or funny images just to keep the team spirit going. The Microsoft Teams agenda synchronizes automatically with outlook, which means meetings can also be planned from you outlook. Also, the files and information that is shared in Microsoft Teams and the application for mobile phones are directly protected.

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## **4.7 What ensures a psychologically safe communication climate in ASML?**

### *Hierarchical differences*

The hierarchical differences are almost invisible in the teams of ASML. This was further substantiated in sub question 4.4. Employees feel they can challenge the authority and speak up. This ensures that employees feel more responsibly and are more motivated. The interviewees do mention that not everyone is used to the international organizational culture yet. Employees from South America or from Asia tend to have more trouble with challenging the authority. One of the interviewees mentioned you must therefore be careful that they not remain aloof. While most of the little differences in hierarchal rankings are less of an obstacle, it can be challenging for some cultures.

In "The 5 dysfunctions of teamwork" by Lencioni (2002) he mentioned two import parts that stands in the way of achieving good teamwork: fear of conflict and lack of involvement. This means having confidence in a team and feeling involved in the decisions. One of the interviewees mentioned the managers are very approachable and everyone in the team feels equal. The team members take the decisions together. This makes the fear of conflict and lack of involvement not a problem for these teams.



## **Emotional connection**

The western cultures tend to be less emotional than cultures from America or Asia. One of the interviewees said: "My feeling is that we, Korean, are in more need for physical gathering. We work more closely sitting together and we prefer face to face communication".

We also asked our interviewees about their non-work-related communicating with their colleagues. Most of the interviewees mentioned they don't have much casual conversations with their team members. One interviewee said: "98% is business". Although most of the teams integrated coffee sessions. Some teams try to have them every day but most have them once or twice a week.

In "The 5 dysfunctions of teamwork" by Lencioni (2002) he mentioned an import part that stands in the way of achieving good teamwork: lack of trust. Creating an emotional connection stimulates the trust between the team members. It's important for the teams of ASML to work on their team development. "Teams that score high on the team development factors (safety, trust, open communication, feedback, social cohesion and division of roles) are almost certain of better performance." (Van der Meer, 2007)

## **Expectations**

Because of the cultural differences there are different expectations in the way of communicating with each other. Dutch people tend to be very direct and outspoken in their approach. Other cultures are more introvert. It is important to know what is socially accepted to say or do within these different cultures. In sub-question 4.8 the differences between cultures and nationalities and the problems they cause are further explained.

These problems cause misunderstanding between cultures. One of the interviewees said: "Dutch are direct, open. Americans try's to be more flowery and complimentary. When a Dutch boss says that you did a good job it means you did a GREAT job. You need to learn the different meanings behind the languages". Another one said: "The stereotype of Dutch people is that they can give very direct feedback. If the person joining don't know this it can appear if you are being rude". If ASML paid more attention to these differences and if employees would be more informed less misunderstandings would take place.

## **Respect**

Continuing on the previous parts there is need for respect towards each other. ASML promotes an open culture where there is nothing you can't talk about. While working with different cultures and nationalities opens your mind to different ways of thinking and working. It also takes more patience and effort to understand each other. Sometimes it is harder to connect with someone because of different languages or different way of working. One interviewee said: "You cannot force somebody else to adapt".

One of the interviewees mentioned people tend to forget others outside their own sight and scope. "So, caring more about people not directly in their team." Another one mentioned you always learn new things each day when you meet with people with a different nationality. Working with so many different cultures and nationalities drives respect for others. This respect and understanding of each other is a very important part.

Gibson & Gibbs (2006) explain in their research "Unpacking the concept of Virtuality" how important a psychologically safe communication climate is for bridging differences. "An atmosphere within a team characterized by open, supportive communication, speaking out and risk taking can help turn geographic distance, electronic dependence, dynamic structure and national diversity of liabilities into assets and drive innovation." (Gibson & Gibbs, 2006)

## 4.8 Does the difference in nationality and culture cause problems at ASML?

ASML works in 16 country's all around the world. This means there are employees with a lot of different nationalities and cultures. Does the difference in nationality and culture cause problems at ASML? In order to answer this question, we first compared the differences in cultures within ASML as mentioned in sub-question 2.4. We looked at the cultures within the Netherlands, America, Taiwan and Korea. These together cover at least 75% of the cultures within ASML.

### *Different cultures and nationalities*

We asked our interviewees if their team members come from different cultures and if they noticed any differences between the cultures. 80% of the interviewees says they have multiple cultures within their teams. One mentioned he has five different nationalities in a team of seven. Even when team members have the same nationality, they can notice a difference in culture. Another interviewee could already name 12 different nationalities working in her teams.

Everyone we talked to notices the differences between the cultures. They mention different behaviour, expectations, way of thinking and working. The biggest differences they notice is in the way of communication. For example, some western cultures are more likely to speak out loud or to challenge authority. While some Asian cultures are used to be more submissive and are in more need for emotional connections. One of the interviewees mentioned she learns something new about how to approach the different cultures every day. It is important to know what to expect and what is exactable to say. It can also be more challenging to connect with someone outside of you culture.

### *Organizational culture*

ASML tries to manage the Dutch culture in all of their locations. In the Netherlands, we attach little value to a status and we make decisions as a team. In America it is very clear who is in charge and who will determine everything. In Asia, the older you are, the higher you are in the hierarchy. It is therefore extremely rude to go against someone higher than you.

Even though the organizational culture is very different than a lot of the employees are used to, the Dutch culture is really well accepted. Employees who don't have the Dutch nationality are pleased with the open culture because they feel that there is less of a hierarchical ranking and the managers are very approachable. ASML is experienced as a more flexible and informal company.

### *Different ways*

All of the interviewees are very positive about working with different cultures. One of the interviewees said it opens your mind. You realize there are different ways of doing things, of thinking and approaching the problem. Another one mentions working with people from different countries and cultures learns you to think of a different way and makes you connect on a different level with people. ASML also promotes getting to know different cultures and stimulates an open culture, where you can talk about everything. Realizing your way is not the only way that creates respect for others. Having multiple cultures in an organization also softens the extremes.

Employees are experiencing the Dutch people as very direct and outspoken in their approach. Because of this some people struggle to speak up because they never find the right time. Dutch people are also not always wielding a meeting agenda which makes this even harder. The open culture means challenging your manager and seeing them as another individual. One of the interviewees said that you need to learn the different meanings behind the languages. People from the United States tend to give more compliments while the Dutch people are tended to be more negative.

## *Creating issues*

The research by Gibson & Gibbs (2006) shows that when team members represent different national backgrounds, each with their own values, orientations and priorities, this may compromise effective internal communication. Team members at a location have certain knowledge that is self-evident to them and therefore often cannot easily describe that knowledge.

To find out if these differences in culture and nationality creates problems, we asked the question what can be improved regarding the cultural differences. Working with different cultures requires more energy. You need more patience and time to understand the other person and to explain yourself. The interviewees mention they would like to see more awareness of the difference of each employee. It would make communication easier if they knew better what to expect of each other. This is especially difficult for employees who are new with the company culture.

As mentioned earlier in the report, the Dutch can be very direct. Americans say what they think, but they watch how they say it. But in Asia they take the time to formulate a very comprehensive message. They try not to offend anyone. One of the interviewees said the stereo type of Dutch people is that they are giving really direct feedback. "If the person joining don't know this it can appear as if you are being rude. New employees experience the company different. You have to be eased in to the process you should be understanding of the new person."



# Chapter 5: Conclusion

In the conclusion we will answer the main question which is: "How can ASML improve her virtual communication within (international) team's through smart technology?". With the results from the desk research we answered the sub-questions. The conclusions of these sub-questions were combined to provide an answer to our main question.

ASML could improve its communication within the international teams on the following aspects:

- Culture
- Time differences
- Behaviour
- Organizational culture
- Verbal languages
- Body language (micro expressions)
- Knowledge of the tools

To improve their communication through smart technology we devised a digital tool. Using this tool and our findings ASML can conduct further research. This will be further explained in Chapter 6 Advice. The different aspects ASML could improve upon to enhance the efficiency of their communication are further explained below.

## Culture

As mentioned before ASML works with employees from 118 different nationalities. Everyone we talked to notices the differences between the cultures. ASML wants workers to get to know each other's culture better and stimulates an open culture. People tend to forget others outside their own sight and scope. The employees also mentioned that they want to know more about each other's cultures. This creates respect and understanding of each other which is a very important part when you are working together as a team.

## Time differences

Some teams include employees from different time zones. It is hard to get everybody together at the same time. When a team wants to meet with employees from America, Europe and Asia all at once, it is very late in the evening or very early in the morning for people from America and Asia. This makes it difficult to schedule a meeting but people are also not their most productive in the late evening or early morning which can cause communication problems.

In the research of Gibson and Gibbs (2006) it is mentioned that there is an obvious problem when a team is unable to get together to discuss. The fact that they only have this little time slot available where they can meet makes that only the necessary things are discussed. This leaves no time for brainstorming or small talk.

## Behaviour

The differences between behaviour, expectations, way of thinking and working in the different cultures were noticed by the employees. The biggest differences they notice is in the way of communication. For example, some western cultures are more likely to speak out loud and give direct feedback. While some Asian cultures are used to be more submissive and are in more need for emotional connections. This different way of communication can cause problems like misunderstanding and feeling disrespect.

## Organizational culture

ASML tries to manage aspects of the Dutch culture in all of their locations. In the Dutch culture it is very important decisions are made as a team and there is little value attached to status. There is less of a hierarchical ranking and the managers are very approachable. ASML is experienced as a more flexible and informal company. In other countries in for example America or in Asia people are not used to challenge authority. It is important that these employees do not remain aloof but also dare to speak up.

## Verbal languages

ASML manages English as their main language. Because ASML works with 118 different nationalities, for most employees English is not their native language. Because of the language barrier it takes more patience and effort to understand each other. Sometimes it is also harder to connect with someone because of different languages.

## Body languages

When you are in a virtual meeting it is harder to read someone's body language. Especially when you are in a meeting with a bigger group and you cannot see everyone's face. Employees have trouble delivering their message while it is very important how they interpret the information. They feel like the emotional connection, which you have to deliver sometimes, is missing.

## Knowledge of the tools

ASML recently switched to Microsoft Teams. The employees are satisfied about Microsoft Teams and experience few problems. Some indicated that they don't know everything about Microsoft Teams yet and that it would probably work even more efficiently if they knew all the functions.

To make the communication within the teams even more successfully you have to keep the previous points in mind. If you improve all of these, it can make a big difference.

# Chapter 6: Advise

Based on the results of the research, will we be giving a couple of advices about how to continue. The advices are based on the conclusion regarding the question: "How can ASML improve her virtual communication within (international) team's trough smart technology?". The advices are divided in multiple segments, starting with further research, followed by possible solutions, showcase and last but not least, expansions coach. It is good to find out how other company's deal with different time zones.

## 6.1 Further research

In order to continue the possible solution that is given in 6.2, the virtual coach, the following studies are necessary. The technical know-how, technical research into the applicability, similar applications, the psychological factors needed to help/guide people and the character development.

To create a solution for the problems, explained in the conclusion, further research is required. The area's that require research are ethical issues and privacy laws and regulations. Also, research has to be done about the smart technologies that can be used.

### *Virtual coach*

Before the coach can be created and integrated a couple of aspects require some more research. These aspects are:

- Technical know-how
- Technical applicability
- Similar applications
- Psychological support factors
- Character development

These aspects each require more research as they can provide obstacles or problems if not addressed properly.

The technical know-how refers to research the technologies and systems required to make the coach work and function properly, such as Artificial Intelligence, Big Data and Computer-Human Interaction. These technologies require further research as these technologies are all relatively new and therefore are less known to most people.

The technical applicability refers to research that needs to be done to determine in what manner the Coach will operate. The Coach could be implemented within Microsoft Teams as an internal program. The coach however could also work as a background application, allowing it to function in the entire pc. This would enable it to also provide help in applications such as email, agenda and other communication programs that an employee could use.

Similar applications refers to the search of other programs or applications that have already been developed with the same or similar purpose. This search also requires to look into the safety of these programs and/or applications as the data this program would have access to, cannot be stored anywhere as this could cause serious confidentiality and business secret issues.

Psychological support factors refers to the research that needs to be done to make all the data complete for the coach. Also is it necessary to know with what aspects the coach should and shouldn't help, requiring a thorough investigation into the exact requirements for the coach. The coach needs to know everything it can about cultures, languages, emotions, time zones etc. This data then needs to be put in a database for the coach to refer to. This would also make this research already a part of the development of the coach.

Character development would be the research into how the coach should interact with the user and in what manner it should and shouldn't communicate with its user.

### **Ethical question**

The problem has to do with people and as soon as your solution affects people, ethical issues are involved. Which requires further research. The following questions could be necessary to investigate further in.

These questions are:

- Which data from my employees can and can't I store?
- When should and when shouldn't I apply an AI system?
- How far should I go when influencing your employees, where is the accepted limit?

When one or more of these questions do apply to your implementation. It is necessary to investigate that ethical question first before implementing.

### **Privacy laws and regulations**

The protection of personal data is not the same everywhere in the world. The level of protection therefore varies per country. For example, in the European Union (EU) the same privacy laws and regulations apply. This is documented in The General Data Protection Regulation (GDPR). Japan has established the Personal Information Protection Commission for her residents. It is important that these laws and regulations are not violated and the privacy of the employees of ASML stays protected. Therefore, thorough research is important and the solution must be adapted to these laws and regulations.

### **Smart technologies**

In order for the coach to work properly, a couple of different types of Smart Technology need to be used. The coach for example will likely use technologies such as Artificial Intelligence, Big Data and Human-Computer Interaction. These technologies first require research further investigation in how they work, how they can be applied and how to best implement them.

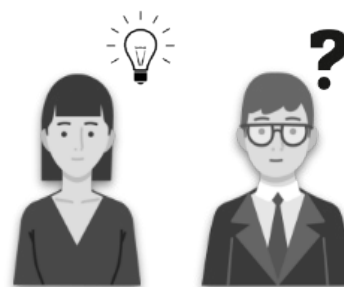
Also is further research required to determine if any of the other types of Smart Technologies can be applied into the coach, but this will be discussed in 6.4, "Expansions Coach".

## **6.2 Possible solution**

We looked at all the points we mentioned in our advice and came up with a concept for a virtual coach. Each employee would get his or her own personalized virtual coach. The coach emerges when it thinks it is necessary.

Like we mentioned in our advice there are some aspects that can be improved. The coach acts based on those different aspects:

- Culture
- Time differences
- Behaviour
- Organizational culture
- Verbal languages
- Body language
- Knowledge of the tools



(Figure 7: Coach)

## ***Culture***

Because of Artificial Intelligence and Big Data, the coach knows who the employee is talking to. When the coach noticed that the other person is from a different culture, it can give the employee some background information about that culture.

The coach can indicate if, for example, there is a national holiday somewhere. So, the employee knows why someone isn't responding or it's a good way to start a conversation about a not-work related subject. This way the employee gets to know more about the culture of the other person and gets to understand their situation.

## ***Time differences***

When you work in an international company you have to deal with time differences. Of course, the coach cannot remove the time differences, but it can indicate which moments are all possible to come together by using Artificial Intelligence and Big Data. In addition, the coach can advise which time is best to send someone a message or schedule a meeting. This way the employee has an overview of all options and can decide with option is the best for everybody.

## ***Behaviour***

There is a difference between behaviour, expectations, way of thinking and working in the different cultures. The coach can help with approaching somebody from a different culture so for example, employees experience the Dutch as very direct and outspoken in their approach. Because of this, some people struggle with speaking up because they never find the right time. But instead of addressing this person to say something, the coach of the Dutchman will indicate that he or she should also ask the opinion of others. In this way a team feeling can arise because everyone gets the feeling that they are being listened to. The coach uses Artificial Intelligence and Big Data to do so.

## ***Organizational culture***

ASML tries to manage aspects of the Dutch culture in all of their locations. But this can be difficult because of the different national backgrounds within ASML. The coach can guide people through the business culture. ASML would like decision to be made as a team. Therefore, the coach will try to involve everyone. People who often speak will get the tip to ask other colleagues what they think. People who are quieter and are less likely to express their opinions will be reminded that in this corporate culture, you are allowed to give feedback to someone higher in the hierarchy.

## ***Verbal languages***

If people have difficulty understanding each other because of the language, the coach can help with a translation function using Artificial Intelligence and Human-Computer interaction in order to detect the different languages and Big Data in order to translate them. If someone wants to say something in a meeting but does not know how to do it in English, the coach can make the translation for him. The coach is in possession of the different languages so that everything can be translated into the correct language. This allows you to prevent miscommunication.

## ***Body language***

Virtual meetings non-verbal signals are harder to notice but this is very important. When there is a meeting where people have their camera's on, through Artificial Intelligent's the coach knows how you respond in a conversation based on your facial expression. In the meeting this will be show through an emoji. This way people can notice more non-verbal signals even when they don't see your face on their screen.

## ***Knowledge of the tools***

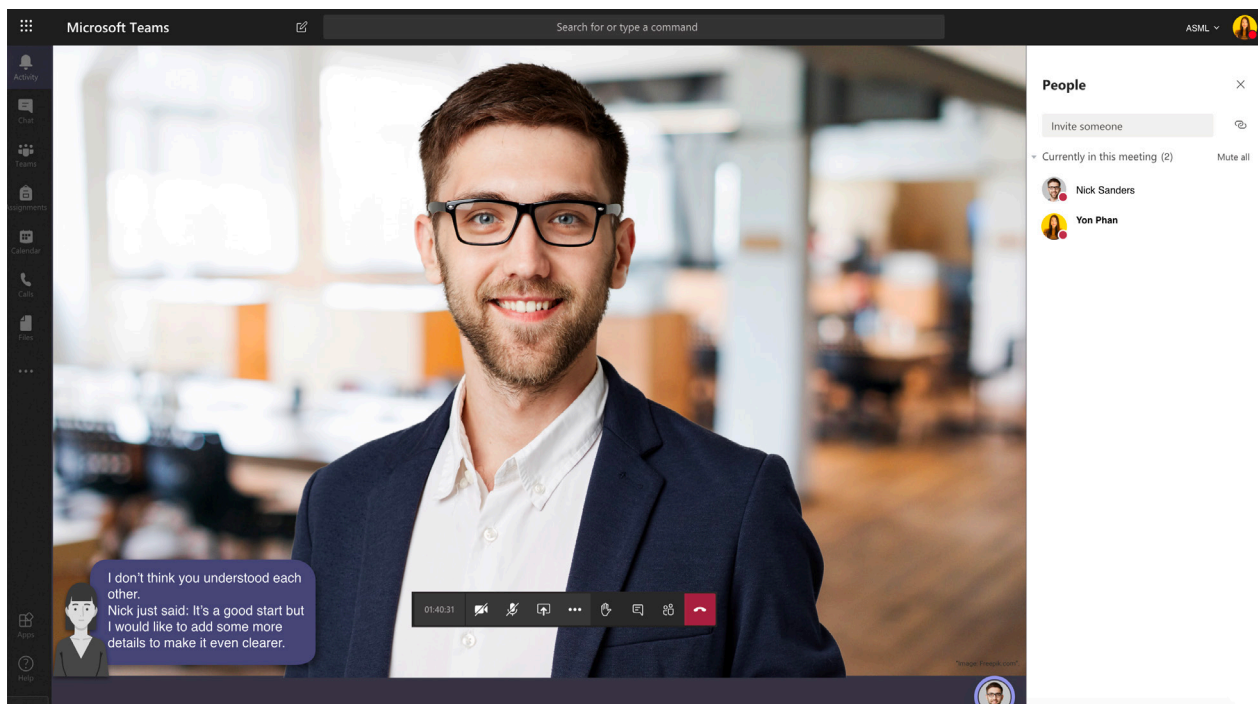
Some of the interviewees mentioned that they don't know all the functionalities of MT. When they would know more about the functionalities, the efficiencies will be even bigger then now. The coach can give tips for using the functions within Microsoft Teams using Artificial Intelligence and Big Data. For example, showing how to share your screen or showing where to find the whiteboard.

## 6.3 Showcase

We have developed two showcases to give you an idea of how a virtual coach can help in daily work. We used the persona's Yon Phan and Nick Sanders. A persona is a characterization of a certain group of users, in this case ASML employees.

During the showcase you walk through a part of the day of the persona in quest. Here you see at which moments the coach could support an ASML employee. The actions and behaviour of the coach depends on the employee. The coach also pays attention to the people with whom the employee has, makes or wants to make contact with.

The Microsoft Teams environment was chosen in the showcase. Incidentally, the coach could also be used in other applications. But that requires further research.



(Figure 8: Showcase)

## 6.4 Expansions coach

The coach is still a concept and as mentioned in the previous section, further research is also needed in the field of the coach. This is only a representation of how the coach could help.

In addition to research, we also think that applying new technologies can make the coach more advanced. A few examples of technologies that would fit are:

- IoT
- Health Tech
- Immersive Media
- Cybersecurity
- Voice Assistants
- Mobile Technologies

The coach could be applied to other applications so that it can also be used on, for example, a Smartwatch. The sensors in the Smartwatch allow the coach to read out if there is a change in the resin stroke or breathing that can display emotions. This makes the recognized emotion even more accurate. This example would make the coach expanded with IoT, Health Tech, Immersive Media and Mobile Technologies.

Because this is about personal data, it is important that the security is optimal. For example, no data should be stored or shared and people would not be able to hack into the system. Cybersecurity could help with this very important security problem.

The coach could communicate with the user through speech. But the coach can also respond to speed of speech, language use etc. when using Voice Assistants.



# Source list

ASML. (n.d.). *Home page*. Consulted at June 2, 2020, from <https://www.asml.com/en>

Agten, B. (2016, February 24). *Work Culture in the United States*. Consulted from <https://careerprofessor.works/work-culture-united-states/>

AsialinkBusiness. (n.d.). *Korean business culture and etiquette*. Consulted from <https://asialinkbusiness.com.au/republic-of-korea/conducting-business-in-korea/korean-business-culture-and-etiquette?doNothing=1>

Belbin, R.M. (1999). *Managementteams, over succes en faalfactoren voor teams*. Schoonhoven: Academic Service.

BigBlueButton. (2020, May 22). *Web Conferencing System Designed For Online Learning*. Consulted at April 20, 2020, from <https://bigbluebutton.org/>

Bitrix24. (n.d.). *What is Bitrix24?* Consulted on April 12, 2020, from <https://www.bitrix24.com>

Chang, A., Duck, J. & Bordia, P. (2006). *Understanding the multidimensionality of group development*. Small Group Research, 35(4), 327-350.

Commisceo global. (n.d.). *Taiwan - Language, Culture, Customs and Etiquette*. Consulted from <https://www.commisceo-global.com/resources/country-guides/taiwan-guide>

Dirks, K.T. (2000). *Trust in leadership and team performance: Evidence from NCAA Basketball*. Journal of Applied Psychology, 85(6), 1004-1012.

Discord. (n.d.). *How People are Using Discord to Keep in Touch*. Consulted on April 16, 2020, from <https://discord.com/why-discord>

Expat. (2019, October 4). *The work culture in Seoul*. Consulted at May 28 2020, from <https://www.expats.com/en/guide/asia/south-korea/21335-the-work-culture-in-seoul.html>

Gardner, M. (2008, March 17). *Meet up after work? No thanks, say many U.S. officemates*. Consulted from <https://www.csmonitor.com/Business/2008/0317/p13s01-wmgn.html>

Gerber, S. (2015, January 9) *9 Most Effective Apps for Internal Communication*. Consulted on April 16 2020, from <https://www.business.com/articles/9-most-effective-apps-for-internal-communication/>

GetApp. (n.d.). *Bitrix24 vs Microsoft Teams Comparison*. Consulted on April 12, 2020, from <https://www.getapp.com/collaboration-software/a/bitrix24/compare/microsoft-teams/>

Gibson, C.B. & Gibbs, J.L. Unpacking the concept of Virtuality: The Effects of Geographic Dispersion, Electronic Dependence, Dynamic, Structure, and National Diversity on Team innovation. Administrative Science Quarterly 51.3 (2006): 451-95.

Gilbert, N. (2019, November 5). *10 Best Communications Software Systems - Financesonline.com*. Consulted on April 16, 2020, from <https://financesonline.com/top-10-communications-software-solutions>

Gillespie, B et al. (2010). *The impact of organisational and individual factors on team communication in surgery: A qualitative study*. Consulted on May 12, 2020, from <https://www.sciencedirect.com/science/article/abs/pii/S0020748909003563>



- Globaltalk. (2019, October 22). *Omgaan met de Zuid-Koreaanse cultuur*. Consulted from <https://www.tvcn.nl/blogs/omgaan-met-de-zuid-koreaanse-cultuur/>
- Google Meet. (n.d.). *Google HangOuts*. Consulted on April 16, 2020, from <https://apps.google.com/meet/how-it-works/>
- Google re:Work. (n.d.). *Project Aristotle*. Consulted on May 12, 2020, from <https://rework.withgoogle.com/print/guides/5721312655835136/>
- Hogan, J. (2017, January 25). *Differences In Work Ethics Between Korea And The West*. Consulted from <https://www.englishspectrum.com/differences-in-work-ethics-between-korea-and-the-west/>
- HR Praktijk. (2019, May 27). *Driekwart van de Nederlanders is bevriend met collega's*. Consulted from <https://www.hrpraktijk.nl/topics/arbeidsrelaties/nieuws/driekwart-van-de-nederlanders-bevriend-met-collegas>
- Jitsi. (2020, May 13). *What is Jitsi? - open source video conferencing API's, SDKs, and installers*. Consulted on April 17, 2020, from <https://jitsi.org/what-is-jitsi/>
- Kent, D. (n.d.) *Best Microsoft Teams Features*. . Consulted on April 28, 2020, from <https://dispatch.m.io/best-microsoft-teams-features/>
- Lencioni, P. (2002). *De 5 frustraties van teamwork*. (30e druk) Amsterdam/Antwerpen: Business Contact
- Levine, B. (1979). *Group psychotherapy: practice and development*. Englewood Cliffs: Prentice Hall.
- Lingsma, M.M. (1999). *Aan de slag met teamcoaching*. Baarn: Uitgeverij H. Nelissen.
- Luimstra, J. (2017, April 22). *"Nederlandse bedrijven kunnen wat leren van andere culturen"*. Consulted from <https://www.nu.nl/ondernemen/4634409/nederlandse-bedrijven-kunnen-leren-van-andere-culturen.html>
- May, D.R. & Harter, L.M. (2004). *The psychological conditions of meaningfulness, safety and availability and the engagement of the human spirit at work*. Journal of Occupational and Organizational Psychology, 77, 11-37.
- Microsoft. (n.d.). *Chat, Meetings, Calling, Collaboration | Microsoft Teams*. Consulted on April 16, 2020, from <https://www.microsoft.com/en/microsoft-365/microsoft-teams/group-chat-software>
- Nam, C et al. (2009). *The process of team communication in multi-cultural contexts: An empirical study using Bales' Interaction Process Analysis (IPA)*. Consulted on May 12, 2020, from <https://www.sciencedirect.com/science/article/abs/pii/S0169814109000493>
- Office (n.d.). *Teams Basis Tutorial*. Consulted on June 2, 2020, from <https://teamsdemo.office.com/#/0/1>
- Raub, W. (1997). *Samenwerking in duurzame relaties en sociale cohesie*. Amsterdam: Thesis.
- Remmerswaal, J. (2004). *Handboek groepsdynamica, een inleiding op theorie en praktijk*. Soest: Uitgeverij H. Nelissen.
- Slack (n.d.). *Where work happens*. Consulted on April 20, 2020, from <https://slack.com/intl/en-nl/?eu-nc=1>

Sweerts, L. I. T. (2013). *Samenwerking tussen Nederlandse en Zuid-Koreaanse bedrijven verbeteren door het overbruggen van cultuurverschillen*. Consulted from <https://www.researchgate.net/publication/299497210-Samenwerking-tussen-Nederlandse-en-Zuid-Koreaanse-bedrijven-verbeteren-door-het-overbruggen-van-cultuurverschillen>

The Hague international centre. (n.d.). *Dutch work culture*. Consulted from <https://www.thehagueinternationalcentre.nl/relocating/work-in-the-netherlands/dutch-work-culture>

Tuckman, B.W. (1965). *Developmental sequence in small groups*. Psychological bulletin, 63, 384-399.

Tuckman, B.W. & Jensen, M.A.C. (1977). *Stages of small-group development revisited*. Group and Organizational Studies, 2, 419-27.

Van der Meer, M.A. (2007) *De invloed van Leiderschap en Teamontwikkeling op Teamprestaties*. Consulted on April 16, 2020, from <http://www.meermetteams.nl/app/webroot/files/Onderzoek-Martijn-van-der-Meer.pdf>

Viber Media S.à r.l. (2019, March 27). *Features*. Consulted on April 22, 2020, from <https://www.viber.com/en/features/>

Wheelan, S.A. (1994). *Group processes: A developmental perspective*. Boston: Allyn and Bacon.

Whereby. (n.d.). *Pricing*. Consulted on April 22, 2020, from <https://whereby.com/information/pricing/>