Understanding the Cultural influence on Creativity in Distributed Product Development

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Abstract: Tasks that involve creative problem-solving are especially challenging in distributed teams since virtual communication doesn't stimulate the human senses the same as face-to-face interaction. Culture as category of influencing factors on creativity is therefore the focus of this contribution. A questionnaire is used to see if the need for supporting specifically cultural aspects of creativity is confirmed by the 101 participants. Two expert surveys follow to understand if models describing culture can be used to support creativity and to find potential starting points for such an integration.

1 Introduction

For product development teams it has become increasingly common to work in a distributed setting (Kern, 2016). Distributed not only due to New Work practices and home office rules (Helmold, 2022) but also due to the need to get talents from all over the world on the team because of a shortage of skilled workers especially within Europe (Kern, 2016; Peichl et al., 2022). This leads to teams often being composed of product developers from different cultural backgrounds. Distributed development brings its challenges and advantages, as well as multicultural team compositions (Duehr et al., 2020). To be able to use the advantages arising and overcome the difficulties their origin has to be understood. Especially tasks involving creativity when solving problems are seen to be difficult in distributed settings (Alahuhta et al., 2014; Brucks and Levav, 2022). But exactly on the aspect of creativity, culture has an influence as well (Bastian et al., 2023b). When addressing culture, respect to each person's individual understanding of culture is given and therefore these contributions understanding of culture is not based on a definition from literature. The understanding us as authors were able to agree on is the following. Culture is people's different implicit assumptions about what they take for granted. Culture is expressed in the way people act and interact. Furthermore, culture encompasses all collectively shared beliefs, lifestyles and knowledge acquired through socialization and serves as the basis for the distinct identity of a society. With this understanding given, the reader own understanding is directed but not absolutely limited, since doing so simply not possible and ones understanding will always be defined by what is already there.

This contribution aims at finding models describing culture, proving that the cultural aspects of creativity need support, and finding starting points on how to integrate those models in the context of creativity in distributed product development.

1.1 The role of humans in product development

Product development based on the understanding of the system theory by Ropohl (1975) can be seen as the continuous and iterative development of three subsystems: The system of objectives, the operation system, and the system of objects. Figure 1 shows the subsystems and their interconnections.
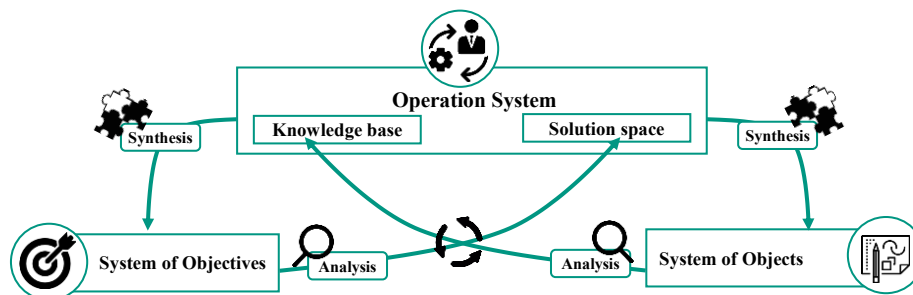

Figure 1. The extended system triple of product engineering in Albers et al. (2011)

The objectives, requirements, boundary conditions, and their interrelations are defined within the system of objectives. The system of objects is developed to achieve those objectives. All results are part of the system of objects. These results can be for example early prototypes or the final result itself. Both of these subsystems are continuously developed further

by the operation system. The operation system performs all analysis and synthesis steps and contains all resources required to do so. Part of those resources are not only product development, engineering skills and creativity methods but computers, financial resources as well as the engineers themselves. This development of the subsystems continues throughout the entire engineering process. The connection between the system of objects and the system of objectives is made through the operation system. (Albers et al., 2011)

Understanding the cultural influences on creativity within this perception of the product development process requires a closer look at the subsystems. When developers from different cultures come together to creatively solve a problem within the development process, be it the product development itself as the major goal or small problems to be solved to get there, different understandings of the goal can be problematic. Being from different cultures can for example lead to setting different priorities when looking at the same goal within the system of objectives. When looking at the operation system and understanding the developers themselves as resources with their different competencies, experiences and perspectives we see a second part of the development process that is influenced by cultural differences. The way developers solve problems, the creativity techniques they apply and the ones they are open to are also influenced by what they know, what they are comfortable with, what they've experienced and therefore by their culture.

It is crucial for enabling efficient engineering processes to understand how cultural influences work. Understanding the influence of culture on creativity when problem-solving helps when designing targeted support for the operation system and therefore improves the product development process.

1.2 Distributed product development settings

In this contribution, distributed product development is understood as follows: "Distributed product development describes the form of product development in which collaboration in the activities is characterized by at least one individual being spatially separated from the other individuals. The geographic separation can be extended to organizational and temporal separation. Information and communication technologies (ICT) have to be used for collaboration. Collaboration can take place both synchronously and asynchronously." (Albers et al., 2022). Distributed settings for product development tasks give the flexibility to source knowledge from all over the world but pose challenges that can occur in multiple dimensions. These dimensions are technology, as well as organization, and the people with their interpersonal relationships. In all the dimensions negative effects on the efficiency and effectiveness of product development activities can arise. (Duehr et al., 2020)

Collaboration and creativity are part of the main factors for teams to solve their development problems successfully (Stempfle and Badke-Schaub, 2002). But especially the tasks that involve creativity are seen as challenging in distributed settings (Alahuhta et al., 2014). Whether communication takes place virtually versus in person is proven to influence human creativity and personal contact can lead to a better problem-solving process. Furthermore, the setting in which a team collaborates, either virtual or in person, can also influence the quality of ideas generated in creativity processes. The reason for this effect is seen in the higher amount of information transmitted through personal contact. (Brucks and Levav, 2022)

The creative creation of ideas in distributed product development teams needs to be supported to ensure that the specific requirements in the distributed setting are met so that the quality and quantity of results produced by distributed teams can compare with the ones of in-person teams, making tasks involving creativity critical activities in distributed product development (Albers et al., 2022).

1.3 The influence of culture on creativity

Supporting creativity in distributed settings requires a thorough understanding of the influencing factors of creativity. Bastian et al. (2023b) found through a comprehensive systematic literature review seven categories of influencing factors an creativity: Team, Individual, Organization, Culture, Technology, Leadership, and Time. Within the categories, further barriers to creativity have been added leading to a total of 72 success factors and 47 barriers to creativity in distributed product development. The influencing factors are interconnected on the individual level as well as on the level of the categories. To show these complex interconnections an impact model has been created, that depicts the factors and their interconnections on both levels. (Bastian et al., 2023a) With the focus of taking a closer look at the operation system combined with the need to support creativity in increasingly multicultural distributed teams, the category culture is explained in more detail. *Heterogeneity*, *cultural difference*, *different background*, *diversity*, *organizational culture*, *geographical distance*, *social dispersion,* and *psychological dispersion* are the success factors within this category (Bastian et al., 2023b). Again *Cultural differences*, *language differences*, *different expectations* and *conflict-solving* are the barriers (Bastian et al., 2023a). The category culture is interconnected as a whole with the categories Organization, Leadership, Team, and Individual. When looking at the factors on the individual level, interconnections have been found to the categories Organization and Team. The model with the interconnections between the categories can be seen in Figure 2 with a focus on the category culture. (Bastian et al., 2023a; Bastian et al., 2023b)

Figure 2. Success Factors and Barriers to Creativity and Interconnections between Categories with focus on the category culturebased on (Bastian et al., 2023a; Bastian et al., 2023b)

The influencing factors originate form a variety of contributions as well as the interconnections on both levels and are marked within the model. According to Shao et al. (2019) there are three different ways in which culture can impact creativity. Firstly, because people from different cultures have different conceptions of creativity. The second aspect is that individuals from different cultural backgrounds prefer different creativity processes and modes (especially if individuals from individualist cultures come together with individuals from collectivist cultures). Lastly, the way creativity is assessed can vary between cultures. (Shao et al., 2019)

To broaden the understanding of the influence of culture on creativity this contribution looks at different models that describe culture and includes an empirical data collection to add to previous findings to overcome barriers and enhance success factors of the cultural influence of creativity in distributed product development.

2 Research Profile

2.1 Research Goal and Questions
The overall goal of this contribution is to gain an understanding of different models to describe culture, proving that the cultural aspects of creativity need support and finding starting points on how to integrate those models in the context of creativity in distributed product development.

RQ1: Which models capture and describe the concept of culture?

RQ2: What are the differences and similarities between these models?

RQ3: Is there a need for supporting cultural aspects of creativity in distributed product development teams?

RQ4: Can the models be used to support culture in the context of creativity in distributed product development?

2.2 Research Approach

This research follows the stages of the Design Research Methodology (DRM) by Blessing and Chakrabarti (2009). To gain an understanding of the different models that describe culture, a **literature review** (chapter 3) has been carried out following the snowballing procedure (Wohlin, 2014) to gain an initial understanding of the existing model as Research Clarification (RC). The start set of the search was Dubina and Carayannis (2016) and Tang and Werner (2017). To also include research from more recent years, the database of the Design Society was searched for additional results with the search string "+culture +creativity" from the years 2017 to 2023.

With the three main models for understanding culture at hand, a **survey** (chapter 4) was designed and distributed. The questionnaire was developed to reach two goals: understanding how the participants feel about the cultural influence on creativity in teams and if there is room for improvement concerning this factor. This quantitative research method was chosen to get a broad perspective when gaining an initial understanding of the need for support for cultural aspects of creativity within the Descriptive Study I. The survey contains 18 questions starting with questions on the participant's cultural background through the languages spoken and the team settings in which the participant has experience. The following questions were to be answered on a scale from one to five following the MECE (mutually exclusive, collectively exhaustive) rule. LimeSurvey (LimeSurvey: Free Online Survey Tool, 2024) was used as the survey tool and the survey was distributed over the LinkedIn network of the researchers. 315 participants answered the survey, from which 101 answers were complete and therefore used for the evaluation.

With the initial understanding gained through the survey, the potential of using the models describing culture to support creativity in distributed product development was evaluated through two structured interviews with product development experts in international teams (**Expert survey** chapter 5). A structured interview was chosen to make the two individual experiences as comparable as possible as part of an initial Prescriptive Study. The stages and their results are presented in Figure 3. The blue arrows pointing back from descriptive and prescriptive studies represent that the learnings within later stages improved the understanding for the earlier stages as well.
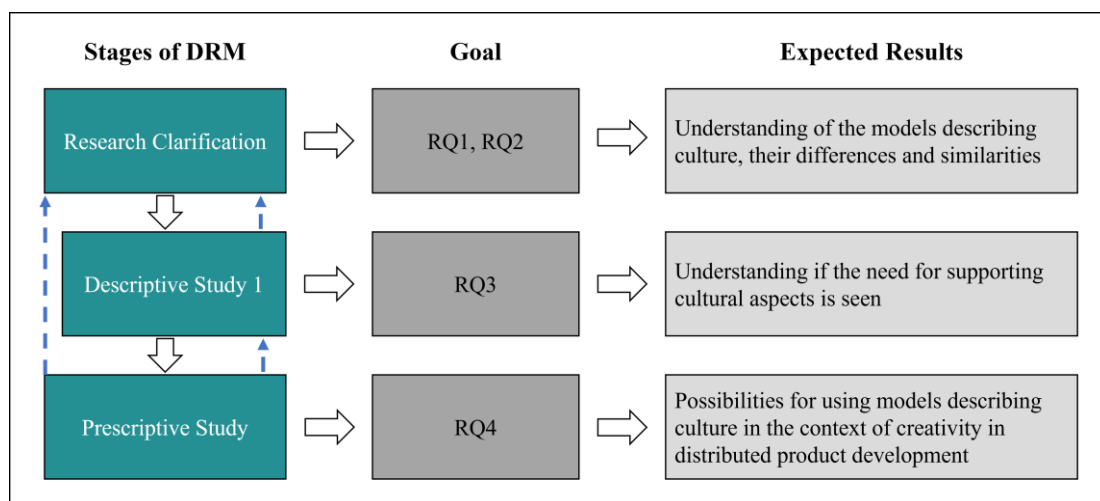

Figure 3. Research approach broken down into the research questions and expected results within the framework of the Design Research Methodology

With the given degree of detail within the different stages of the DRM this research is classified as type two: review-based research clarification, comprehensive descriptive study I, and initial prescriptive study (Blessing and Chakrabarti, 2009).

3 Literature review: Models describing culture

The results of the literature review gave three main models to answer the first research question: The Hofstede Model, Edward T. Hall's theory of culture, and the MIPO Model. With the models at hand, their potential for helping in supporting cultural influences on creativity in distributed product development can be analyzed.

The Hofstede model is based on the most comprehensive study of cultural differences from an organizational theory perspective that has been conducted up until today. He defined five dimensions with which culture can be described: Power distance, uncertainty avoidance, individualism-collectivism, masculinity-femininity, and short-vs. long-term orientation. The model's goal is to give a framework for understanding cultural differences across countries. (Hofstede, 2011)

In the 2000s, Minkov developed the model further and added a sixth dimension to Hofstede's model: Indulgence vs. restraint (Hofstede et al., 2010). Edward T. Hall's theory of culture is used to explain cultural differences in communication and the understanding of messages (Hall and Hall, 1994; LAVRITS, 2022). The third model is the MIPO model by Petra Köppel. It facilitates process management by identifying potential conflicts and synergies (Bolten and Barmeyer, 2020; Köppel, 2007).

The three cultural models of Hofstede, Hall, and the MIPO model offer different perspectives on cultural differences.

Hofstede's model focuses on identifying and measuring the five cultural dimensions and was initially developed in a worldwide survey with the employees of IBM between 1967 and 1973. The model is often used in the fields of international management, organizational culture, and cross-cultural research. (Hofstede, 2011)

Hall's model focuses on communication and interaction between people from different cultures (Hall, 1976; Hall and Hall, 1994). The model distinguishes between four dimensions: Proxemics, kinematics, paralinguistics, and time perception. The model is particularly important for intercultural communication and the understanding of social interactions in different cultural contexts (LAVRITS, 2022).

The Multicultural Input-Process-Output model (MIPO model) provides a comprehensive and detailed description of intercultural and virtual processes in multicultural working groups and their impact on team effectiveness. It serves as a basis for embedding the intercultural and virtual problems (Köppel, 2007). It is a framework that describes the interactions between the input factors (e.g. team, individual, organization), the process factors (e.g. intercultural conflicts, intercultural synergies, virtual conflicts and virtual synergies) and the output factors (e.g. performance, satisfaction) in multicultural teams. The three building blocks of the MIPO model are interlinked and influence each other (Köppel, 2010). For example, conflicts in team dynamics can lead to reduced group effectiveness Köppel uses Steiner's formula (1972) to record the effects of culture and virtual collaboration on effectiveness. This formula has already been applied to multicultural groups by Adler (2002). It states that the actual effectiveness of a group results from its potential, minus the conflicts, plus the synergies. Group effectiveness = potential - conflicts + synergies. (Adler, 2001; Köppel, 2010; Steiner, 1972)

Although the three cultural models of Hofstede, Hall, and the MIPO model are different, they also have overlapping characteristics. All three models are interdisciplinary and draw on concepts and findings from different scientific disciplines. They all emphasize the importance of culture in the interaction between people in teams and society in general and focus on identifying and dealing with cultural differences.

All three models can be used to gain understanding and manage intercultural challenges and communication between people from different cultural backgrounds and overcome misunderstandings and conflicts, answering research question two.

4 Survey: Relevance of cultural aspects

As detailed in Chapter 2.2, a questionnaire was developed to understand how participants evaluate the cultural influence on creativity in distributed teams and to find out whether it is necessary to support specifically the factor culture when supporting creativity to answer research question three. For the following data, 101 complete answers are analyzed. The participants speak English (85 participants), French (9 participants), German (48 participants), Turkish (63 participants) and/ or Spanish (6 participants) at a professional level and ten participants have answered, that they even speak further languages at a professional level. This shows that the participants are qualified to participate in teams with different cultural backgrounds. Even though not every participant can speak English at a professional level, only one considered it *not important at all* and one *a little important*. 81% of the participants have people from different countries in their team or environment, making the participants relevant respondents on the questionnaire. They are from different backgrounds, consider being able to have English as a common language as relevant and most of them have currently a team member from a different country in their team. For better readability percentages are mathematically rounded (number behind decimal point < 5 round down, number behind decimal pint ≥ 5 round up) in the following evaluation.

Misunderstandings in the communication of group members can hinder information exchange and thus task completion. This applies to all phases of the work process, from problem discussion to idea generation to implementation (Köppel, 2007). Communication styles can vary significantly depending on culture, according to Hofstede. In individualistic societies (e.g., the United States, the United Kingdom, Canada, France, the Netherlands, Italy, and Germany), a direct and factual communication style is preferred. In collectivist societies (e.g., Turkey, Russia, and China), a more indirect and context-dependent communication style is preferred (Hofstede et al., 2010). Hall also distinguishes between high-context and low-context cultures. In high-context cultures, communication is indirect and relies on context and nonverbal cues. In low-context cultures, communication is direct and relies on explicit words (Hall, 1976). According to Hall, communication is also very important and is one of the key pillars of his model. Such culturally determined communication differences can make it difficult to understand colleagues from other cultures and lead to misunderstandings. To avoid bias, a

preliminary question was asked to assess whether participants felt comfortable communicating with colleagues from different cultures. Prejudices can elicit negative feelings in the holder, which can manifest themselves in the form of avoidance, irritation, or other behaviors (Köppel, 2007). These can also affect communication, which is why the question was asked to clarify the existence of prejudice before getting to the questions that focus on the different types of communication. The questions thereafter focus on the communication differences and can be seen including their results in Figure 4.
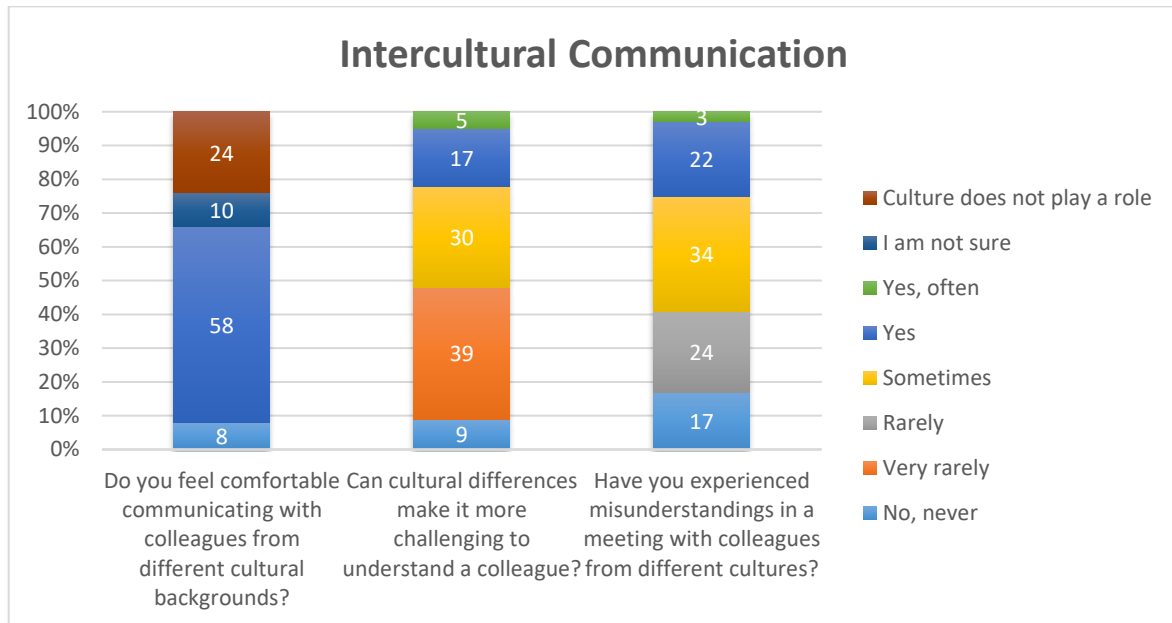
Figure 4. Questions for understanding intercultural communication within the survey

The answers to the first question show that bias towards colleagues from different cultural backgrounds does not play a big role for the participants. The results of the following questions suggest that a majority of participants find it at least in some instances more difficult to understand colleagues from other cultures. This suggests that the different communication styles described by Hofstede and Hall may be a fundamental cause of misunderstandings in these groups.

According to Steiner's formula (Steiner, 1972), which is also used by Köppel (Köppel, 2007), it is important to increase synergies and reduce conflicts to increase group effectiveness. Conflicts arise from three main reasons: misunderstandings, prejudices, and ethnocentrism (Köppel, 2010; Köppel, 2007). The participants were therefore asked about communication issues when not speaking their native language and their relationships with their leaders and colleagues. They were also asked whether internationalization can have a positive impact on creativity, to focus on the synergies part of the equation (Figure 5). To eliminate disruptive factors such as ethnocentrism, the question on native language was asked first.

Most of the participants do not see a problem when communicating with colleagues who do not speak their native language which makes it possible to assume that ethnocentrism is not a major problem, but since some participants decided to rather not answer this question it should not be completely ignored. Although most participants indicated that they have good relationships with both their colleagues and their leaders, which can have a positive impact on collaboration and synergies, it is important to note that approximately 23 % of participants did not answer this question or indicated that they do not have good relationships with their colleagues and their leaders. This confirms the suspicion that there is room to improve intercultural teamwork. The final question in this section on the other hand shows, that the participants see the potential of interculturality especially when solving problems creatively, showing that improving the influencing factor of culture on creativity is worth working on.
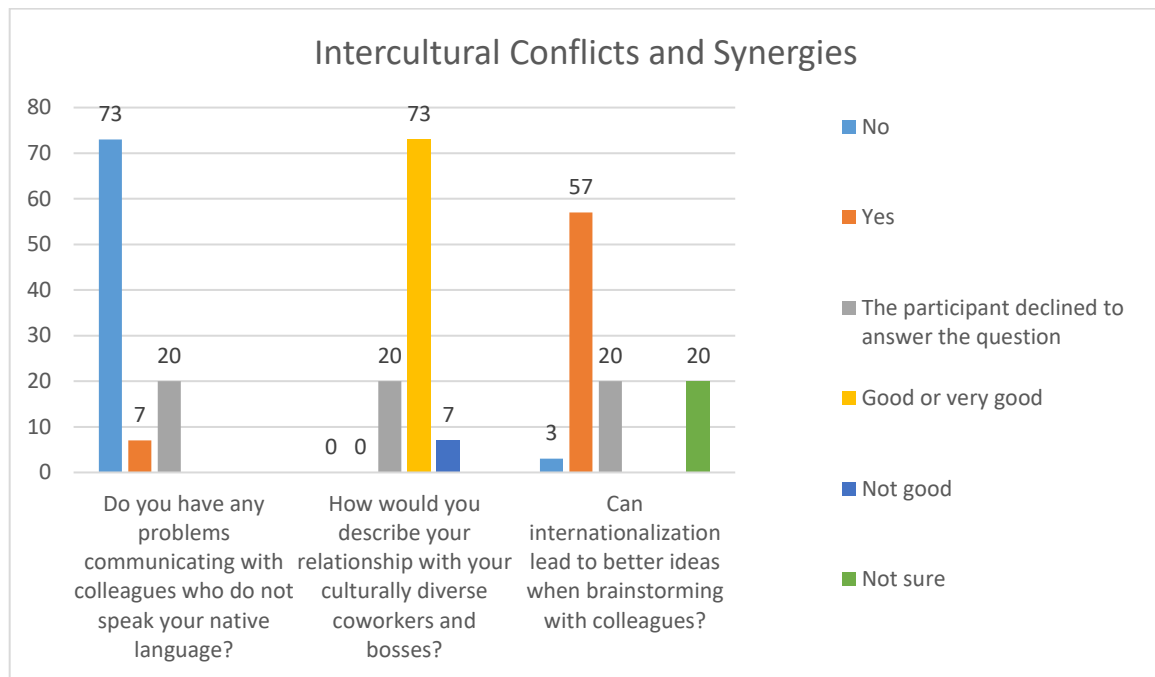
Figure 5. Questions for understanding intercultural conflicts and synergies

The final part of the survey asked about the positive and negative effects of intercultural teamwork to ensure the necessity of supporting the cultural aspect within teams and to understand the effect seen by the participants. The participants were asked whether cultural differences can lead to more successful outcomes. Half of the respondents believe there will be a positive impact. However, half of the respondents believe that there will be neutral or no positive effects. When asked if group effectiveness increases in diverse teams, a little over half of the participants stated that this is the case, whilst 28% do not see a difference and 17% see little to no positive effects. The question, of whether diversity reduces intercultural conflicts, was answered with yes by more than half of the respondents, whilst 31% see no effect and 16% answered no. A large majority of respondents (more than 70%) also believe that cultural differences can lead to more innovative ideas or products and that intercultural teams develop cultural synergies. Around 18% consider this impact to be neutral or could not decide. Answers in this section state that participants see potential for intercultural teams, but give away, that there is room for improvement and for supporting the positive effects of intercultural teamwork.

5 Expert survey: Possibilities to use models describing culture for supporting problem-solving processes in distributed product development

Based on the results of the questionnaire described in Chapter 4, two experts working in intercultural teams were interviewed to assess how cultural models and the impact of culture on creativity can best be applied in product development. The requirements where at least 20 years of experience in product development and experience in leadership of intercultural teams. The experts were interviewed with open-ended questions. The first expert, who was a product developer at Siemens in Turkey for five years and has been a project manager for 25 years, reported on a ten-year stint at an electronics company in the USA. Interviewee one speaks English and Turkish. The second expert has been working in product development in his own company in Turkey for 33 years. He has worked in various teams for more than 25 years and speaks English, German, and Turkish.

The survey was divided into introductory questions and understanding diversity, Hofstedes model, Halls model, and MIPO model.

5.1 Introductory questions and understanding diversity

In the survey described in Chapter 4, most respondents believed that cultural differences can lead to more successful outcomes. However, about half of the respondents considered this to be neutral or not true. Therefore, experts were asked to evaluate this statement based on their practical experience. The first expert said quite succinctly that different cultures lead to more diverse ideas. He added that language was not a problem and that there would be no language conflicts in the workplace if everyone accepted English as a common language.

The second expert, on the other hand, concluded that it "cannot be generalized" that diverse teams can achieve more successful results. He based his statement on three examples from his practical experience. In two cases, collaboration with teams from other countries led to a doubling of the project duration. In a third case, however, it led to a huge success.

5.2 Hofstedes model

Hofstede's model describes cultural differences in different societies using six dimensions. These dimensions are explained in more detail in Chapter 3. To examine the application of the model in practice, the experts were asked about the four different dimensions of the model in detail. The dimension masculinity vs. femininity cannot be taken into consideration here, since the introduction to the dimension's aspects have been explained faulty.

Individualism vs. collectivism: The experts were asked whether product development differs according to individual and collective wishes and how much influence creativity has on product development. The first expert pointed out that product development must adapt to the cultural differences of the target groups. Creativity is essential to develop products that take these differences into account and can assert themselves on the market. The second expert emphasized that this is one of the most important factors.

Power distance: In societies with high power distance, children are taught hard work and subordination as important characteristics. For example, people from high power distance countries tend to agree with the statement that employees lose respect for their manager if they are asked for advice before making a decision. (Hofstede, 2001) This example was presented to the experts. They recommended that such findings should be taken into account more often in companies, as they could significantly increase team success.

Uncertainty avoidance: In cultures with low uncertainty avoidance, people are more willing to take risks and try new things. In cultures with high uncertainty avoidance, people are more concerned with avoiding risk and sticking to best practices. How does this cultural difference affect the creativity of product developers? To this question, the first expert responded that having individuals on the team with cultural differences concerning uncertainty avoidance and risk-taking can increase the creativity of product developers. He argued that product developers who have to adapt to the needs of people from different cultures need to be more creative to develop products with a structure and diversity that fulfill these needs. The second expert emphasized as well that cultural differences on this dimension and supporting teams on the knowledge concerning it can lead to positive results.

5.3 Halls model

Communication and the associated misunderstandings are an important issue in intercultural teams that can limit the efficiency of the teams (Hall and Hall, 1994; Ivanaj and Bozon, 2016). Hall's model, which is described in Chapter 3, emphasizes the importance of these aspects. Therefore, the two experts were asked about the role of language in collaboration in intercultural teams and whether misunderstandings occur in such teams. The first expert concluded that language is not an obstacle to creativity. Language barriers can even help teams to become more creative. They can strengthen team cohesion. However, the expert also recognizes that English plays an important role as a global language. The second expert also noted the importance of English and believed: "That the team should speak the same language fluently to overcome cultural barriers and misunderstandings".

5.4 MIPO model

The experts were then asked various questions about the interpretation of the MIPO model. The first question related to their relationship with colleagues from different cultural backgrounds and the impact of this relationship on the quality of work and company synergy. The first expert thought that this leads to an improvement in the quality of work and said: "The team spirit is strengthened by the realization that our differences make up our value". The second expert, on the other hand, claimed that cultural differences do not necessarily lead to a change in the quality of work; in his opinion, this is more down to the manager and how they deal with conflicts that arise.

The MIPO model was then explained to the experts and the formula: group effectiveness = potential - conflicts + synergies (Steiner, 1972) was shown. According to the knowledge of the first expert, the potential of intercultural teams is already higher and the synergy is also greater in these teams. Concerning conflicts, he said: "Conflicts, on the other hand, decrease as the level of education of the team members increases, in proportion to the number of those who are free of prejudice." In contrast to the first expert, the second expert found that cultural differences do indeed cause problems in the problem-solving process and impair team synergy. He also emphasized the importance of consistent and work-oriented leadership in line with the organizational culture.

However, both experts found that there is a need to use virtual teams in product development.

The expert survey shows, that cultural differences can be advantageous when handled mindfully. Knowledge of differences and an understanding of the differences is crucial to use them as advantages. The answer to research question four was

given in this section: The differences that can be displayed over the dimensions in Hofstede's model are seen by the experts making the dimensions an option for integration in a support for intercultural creative teamwork. Furthermore, the MIPO-model was understood as a potential basis for making similarities and differences visible. When considering Halls model, communication was declared important but the model has not been discussed on a level that gives away if the model directly can be used to support intercultural teamwork.

6 Conclusion and Outlook

Cultural values and norms influence how people solve product development problems creatively (Dubina and Carayannis, 2016; Tang and Werner, 2017). Understanding the cultural influence on creativity comprehensively is therefore an important concern in intercultural cooperation. Understanding which models can be used to describe culture resulted in three main models that are broadly used, and have been developed further over the years but continue to build the basis for describing culture: Hofstede's cultural dimensions, Halls' model for cultural communication, and the MIPO-model (RQ1). All three models are based on interdisciplinary findings and draw on concepts from different scientific disciplines. They all stress the importance of culture in the interaction between people in teams and society in general and focus on identifying and dealing with cultural differences. When the goal is to understand individuals from different cultures better and manage challenges arising from intercultural difficulties' all of the models can be used in their individual expression. Supporting communication between individuals from different backgrounds and overcoming misunderstandings and conflicts are common goals as well. The models differ in the fields they are usually applied in, they are based on different amounts of research and have different levels of detail (RQ2).

The 101 participants see mainly potential in intercultural teams, but potential challenges are seen as well. Communication can be more difficult when individuals from different cultures interact and the potential to support intercultural teamwork on this matter became clear. Furthermore, intercultural teams are seen to be capable of performing well but these positive aspects need to be supported as well to ensure that a team's potential can be used to its maximum extent (RQ3). The importance of reducing conflicts and increasing synergies was confirmed by the participants.

The aspects that are tackled within the three different models are aspects that are seen as relevant by the experts. Concerning Hall's model, the evaluation did not get as detailed as with the other two models. Communication as the main aspect within the model is still seen as one of the major factors for successful intercultural teams. Malfunctions in communication can lead to decreasing efficiency of the team. When evaluating the potential of the MIPO model another important aspect has been discussed. Both of the experts see distributed teams as the future and therefore focus research on those team settings as specifically relevant. Concerning the models' characteristics, the experts the formula group effectiveness = potential - conflicts + synergies as valid and increasing the information flow on these matters as a way to increase effectiveness, emphasizing again, that communication is key. The realization that differences make up a team's value was also mentioned as a positive aspect that could be achieved through the integration of the MIPO model. When talking about Hofstede's Model only three of the four dimensions that were discussed in the interview were evaluated since one was introduced falsely by the interviewer. The effects of having team members that differ within the dimension of individualism vs. collectivism, power distance, and uncertainty avoidance were seen by the experts. The first dimension was evaluated as one of the most relevant dimensions, whilst for the power distance dimension it was also mentioned that this category is not taken into account enough and should be in companies focus more often. For the dimension of uncertainty avoidance, it was seen as an advantage when having team members with different characterization on this dimension. Therefore, Hofstede's model has also the potential when implemented to support intercultural teams' creativity. The results are based on the evaluation of two experts only, which is an additional limitation for the results. A broader study to prove the findings is a relevant next step.

As a next step, the potential of Hall's model and the missing dimensions of Hofstede's model should be investigated in more detail. A follow-up study should focus on how one or more models or their features can be used to support creative problem-solving in intercultural teams. Furthermore, Hofstede's study is the most comprehensive study of cultural dimensions to date. However, it "only" covers 72 countries and has therefore been criticized by several authors as it may show variations in other circumstances and with other participants. It is therefore important to emphasize that the study described in Chapter 4 could also show certain deviations, as most of the participants came from Europe and Turkey. Therefore, an assessment of the relevance of supporting intercultural aspects should also be given to Asian cultures to cover as broad and diverse cultural groups as possible.

Acknowledgements

References

Adler, N., 2001. International dimensions of organizational behavior, 4th ed. South-Western Cincinnati, OH, Cincinnati, OH.

Alahuhta, P., Nordbäck, E., Sivunen, A., Surakka, T., 2014. Fostering Team Creativity in Virtual Worlds. Journal of Virtual Worlds Research 7. https://doi.org/10.4101/jvwr.v7i3.7062.

Albers, A., Duehr, K., Zech, K., Rapp, S., 2022. The EDiT method guideline - enabling distributed teams through situation-adequate method application, in: Procedia 32th CIRP Design Conference: Design in a Changing World, Gif-sur-Yvette, France. 28. - 30. March 2022, pp. 155–160.

Albers, A., Lohmeyer, Q., Ebel, B., 2011. Dimensions of objectives in interdisciplinary product development projects, in: Proceedings of the 18th International Conference on Engineering Design (ICED 11): Impacting Society through Engineering. 18th International Conference on Engineering Design (ICED 11), Lyngby/ Kopenhagen, Dänemark. 15.-19. August. The Design Society, Lyngby/ Kopenhagen, Dänemark, pp. 256–265.

Bastian, A., Kassem, Y., Kempf, C., Albers, A., 2023a. Barriers to Creativity in Distributed Product Development, in: Proceedings of the International Conference on Industrial Engineering and Operations Management. The 2st Australian Conference on Industrial Engineering and Operations Management in Sydney, Melbourne, Australia. 14.11.2023 - 16.11.2023. IEOM Society International, Michigan, USA.

Bastian, A., Wasserbäch, M., Albers, A., 2023b. INFLUENCING FACTORS ON CREATIVITY IN DISTRIBUTED TEAMS — SYSTEMATIC LITERATURE REVIEW. Int. J. Innov. Mgt., 2340009. https://doi.org/10.1142/S1363919623400091.

Blessing, L., Chakrabarti, A., 2009. DRM, a Design Research Methodology. Springer, London.

Bolten, J., Barmeyer, C.I. (Eds.), 2020. Interkulturelle Personal- und Organisationsentwicklung: Methoden, Instrumente und Anwendungsfälle. Duncker & Humblot, Berlin, 324 pp.

Brucks, M.S., Levav, J., 2022. Virtual communication curbs creative idea generation. Nature 605, 108–112. https://doi.org/10.1038/s41586-022-04643-y.

Dubina, I.N., Carayannis, E.G. (Eds.), 2016. Creativity, innovation, and entrepreneurship across cultures: Theory and practices. Springer, New York, NY, 163 pp.

Duehr, K., Hirsch, M., Albers, A., Bursac, N., 2020. A METHODOLOGY TO IDENTIFY AND ADDRESS IMPROVEMENT POTENTIALS IN COMMUNICATION PROCESSES OF DISTRIBUTED PRODUCT DEVELOPMENT – AN INITIAL APPROACH. International Design Conference - Design 2020 1, 541–550. https://doi.org/10.1017/dsd.2020.35.

Hall, E.T., 1976. Beyond culture. Anchor Press Garden City, N.Y, Garden City, N.Y.

Hall, E.T., Hall, M.R., 1994. Understanding cultural differences : Germans, French and Americans, 8th ed. Intercultural Press Yarmouth, Yarmouth.

Hofstede, G., 2001. Culture's consequences : comparing values, behaviors, institutions, and organizations across nations. Sage Publications Thousand Oaks, Calif, Thousand Oaks, Calif.

Hofstede, G., 2011. Dimensionalizing Cultures: The Hofstede Model in Context. Online Readings in Psychology and Culture 2. https://doi.org/10.9707/2307-0919.1014.

Hofstede, G., Hofstede, G.J., Minkov, M., 2010. Cultures and organizations : software of the mind ; intercultural cooperation and its importance for survival, 3rd ed. McGraw-Hill New York, NY, New York, NY.

Ivanaj, S., Bozon, C., 2016. Managing Virtual Teams. Edward Elgar Publishing, Cheltenham, UK.

Kern, E.M., 2016. Verteilte Produktentwicklung, in: Lindemann, U. (Ed.), Handbuch Produktentwicklung. Hanser, München, pp. 455–481.

Köppel, P., 2007. Konflikte und Synergien in multikulturellen Teams: Virtuelle und face-to-face-Kooperation. Deutscher Universitäts-Verl., Wiesbaden, 1 Online-Ressource.

Köppel, P., 2010. Virtuelle Teams: Die Rolle der Führung, in: Barmeyer, C.I. (Ed.), Interkulturelle Personal- und Organisationsentwicklung Methoden, Instrumente und Anwendungsfälle. Verl. Wiss. & Praxis Sternenfels, Sternenfels, pp. 145–167.

LAVRITS, P., 2022. DIE UMSETZUNG DER KULTURELLEN DIMENSIONEN VON EDWARD T. HALL IM UNTERRICHT. Professional Communication and Translation Studies 15, 149–160. https://doi.org/10.59168/CRUL3616.

2024. LimeSurvey: Free Online Survey Tool. https://www.limesurvey.org/de (accessed 15 January 2024).

Peichl, A., Sauer, S., Wohlrabe, K., 2022. Fachkräftemangel in Deutschland und Europa – Historie, Status quo und was getan werden muss. ifo Schnelldienst 75, 70–75.

Ropohl, G., 1975. Einleitung in die Systemtechnik, in: Systemtechnik – Grundlagen und Anwendung. Carl Hanser Verlag, München Wien, pp. 1–77.

Shao, Y., Zhang, C., Zhou, J., Gu, T., Yuan, Y., 2019. How Does Culture Shape Creativity? A Mini-Review. Frontiers in psychology 10, 1219. https://doi.org/10.3389/fpsyg.2019.01219.

Steiner, I.D., 1972. Group processes and productivity. Academic Press, New York, N.Y., 204 pp.

Stempfle, J., Badke-Schaub, P., 2002. Thinking in Design Teams – An Analysis of Team Communication. Design Studies 23, 473–496.

Tang, M., Werner, C.H., 2017. Handbook of the management of creativity and innovation: Theory and practice. WORLD SCIENTIFIC, New Jersey, London, Singapore, Beijing, Shanghai, Hong Kong, Taipei, Chennai, Tokyo, 393 pp.

Wohlin, C., 2014. Guidelines for snowballing in systematic literature studies and a replication in software engineering, in: Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering. EASE '14: 18th International Conference on Evaluation and Assessment in Software Engineering, London England United Kingdom. 13 05 2014 14 05 2014. ACM, New York, NY, pp. 1–10.

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