

Effect of Teamwork Modes in Distributed International Design Teams

Man, J., Lu, Y., Alblas, A., Brombacher, A.C.,
Eindhoven University of Technology, the Netherlands

Abstract

Over the past decades, the creation and development of new products has become a truly global activity. This requires people from different cultures on different locations to closely work together. This paper investigates, using actual case studies as a basis, the effect of different teamwork modes on the efficiency and effectiveness of bi-national design teams.

A case study was designed and conducted to investigate the effect of three different teamwork modes in distributed design teams with Dutch and Chinese students. In the case study, panel feedback and reflection diary were used to measure design quality and team satisfaction. Then, grounded theory method was used for data analysis of each team. In this research, it is found that different teamwork modes have effect on design teamwork in distributed bi-national teams. In addition, it is also found that different teamwork modes fit for different design teams and projects. With regard to time aspect, it is also found that different project uncertainty and team uncertainty need different teamwork modes during design process. In order to improve design teamwork, it is important for designers to be aware of culture factor and make use of teamwork modes in design process.

Keywords: Teamwork modes, design teamwork, cultural differences.

Introduction

Background

In the view of global industry, western and eastern countries have much more potential to collaborate with each other. Considering the complexity of product development, team collaboration is put into practice to solve the complex problem and meet the requirement of different markets [3]. However, due to the globalization of the economy and industry, design teamwork has become culturally and geographically distributed [1]. Therefore, design teamwork requires high effectiveness and efficiency of working together in order to execute the design project. Designers have to recognize their capacity for contributing to effective teamwork and concept generation in design process [5]. However, designers with different background cannot guarantee a successful teamwork if their ideas, perspectives, and knowledge are not properly shared with each other [4]. Limited research has been found related to teamwork for design process in distributed bi-national teams. There is a clear need for practical implications to improve design teamwork in distributed bi-national teams. This design research investigates the effect of different teamwork modes on design teamwork and explores the suitable teamwork modes to support designers to improve design teamwork.

Research question

In this research, three different teamwork modes are investigated, which are cooperation design, collaboration design and competition design. According to the definition, cooperation means work along with others on division of tasks to get mutual benefit, collaboration means work together on common tasks to solve joint problems, and competition means work separately on same tasks to compare with each other [6]. In order to improve design teamwork, design quality and team satisfaction are introduced as elements to measure the aspects of design teamwork.

The research question is how different teamwork modes (cooperation, collaboration, competition) affect design teamwork (design quality and team satisfaction) in distributed bi-national design teams of Dutch and Chinese?

Objective

This design research objective is to support cross cultural design teamwork. The aim of this research is to explore the effect of different teamwork modes (cooperation, collaboration, competition) on design process and support designers to improve design teamwork (design quality and team satisfaction) in the context of distributed bi-national design teams.

Methodology / Approach

Research design

In order to answer the research question, a case study was designed and conducted to investigate the effect of three different teamwork modes in distributed bi-national design teams. In this case study, Dutch and Chinese design students worked together in three different teamwork modes to investigate the possibility and efficiency of cross cultural design teamwork. The interaction between Dutch and Chinese design students is a crucial element for distributed design teamwork.

In the globalization of the economy and industry, it is increasingly important for westerner design practitioners and education to draw a closer view on the characteristics of Chinese design education. It is known China has a very large market in the world with the development of design education, while Netherlands has a good reputation in design. Considering the situation of industrialization in China and globalization in the world, distributed design teamwork plays an important role in transnational teamwork. This research focuses on teamwork in the case of bi-national team of Dutch and Chinese design students.

As the research design framework, the effect of different teamwork modes on design teamwork is considered as the main research object. In this research, teamwork modes (cooperation, collaboration, competition) are introduced to investigate the effect on design teamwork in distributed bi-national teams. Two cultural measurements were used for team composition. Value survey module was used to measure designers personal cultural character. Team role questionnaire was used to identify their suitable team position. With the two cultural measurements, very different Dutch and Chinese were teamed up.

In order to improve design teamwork, design quality and team satisfaction are considered as the main elements to measure the design teamwork. Based on panel feedback, design quality focuses on final result, which is a measurement of design solution. Based on self-reflection diary, team satisfaction focuses on design process, which is a measurement of teamwork quality. Given culture factor in distributed bi-national design teams from China and Netherlands, the research focuses on how different teamwork modes affect design teamwork (design quality and team satisfaction).

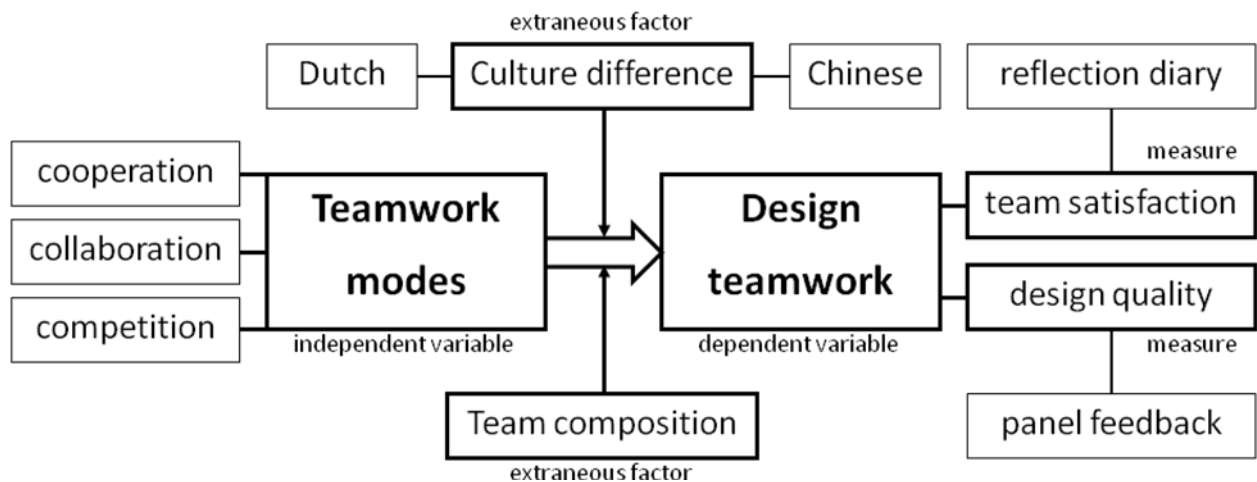


Figure 1. Research model (the effect of different teamwork modes on design teamwork)

Case description

In this joint design course, Dutch and Chinese design students were divided into three team categories to reflect three different teamwork modes in bi-national design teams. Mode 1 was cooperation design. In a joint team, Chinese design students collected information of Chinese elderly people first, and then Dutch design students dominated the design ideation. Afterwards, Chinese design students gave feedback and suggestions to these preliminary design ideas. Finally, Dutch design students made improvements and final decisions, and Chinese design students worked out the prototype. Mode 2 was collaboration design. In a joint team, both Chinese design students and Dutch design students collected data in a collaborative way, and then made a collaborative ideation for the Chinese market. After they discussed and improved the design solution, the final case would be chosen. Mode 3 was competition design. In a joint team, both Chinese design students and Dutch design students collected data separately. Then, design students from each nation in the design team made an idea generation independently. Next, they presented and discussed to choose the better idea or to mix them into a final design idea, and improved it together as the final solution.

This design course took six weeks, including two iterations. The design case was to design a display to facilitate the after-stroke recovery period and motivate elderly recovering from a stroke to move. The joint design course was a considerable complex course for design students. It required not only to work together with distributed bi-national design teams, but also to design for target groups in different cultural contexts. In addition to cultural differences, three teamwork modes (cooperation, collaboration, competition) were introduced to guide the distributed bi-national teamwork and allocated to all the teams. Consequently, the participants had to take into account the project information from the design brief and division of teamwork modes. For the project, they had to work with another culture and also work for another culture.

In the design course, there are 15 Dutch students and 15 Chinese students. All of the 30 design students are divided into 6 teams, and each team has both Dutch and Chinese students. That means three teams comprise 2 Dutch students and 3 Chinese students, while other three teams comprise 2 Chinese students and 3 Dutch students. Both Dutch and Chinese designers work together in different teamwork modes.



Figure 2. Design course in bi-national teams

Data collection

In the case study, data were collected during the design process, which contain panel feedback and reflection diary. The panel feedback was given by client designers work in multinational company for the first iteration and by assigners with expertise in social cultural collaboration for the whole design process, which was used to measure design quality. The reflection diary was written by design students for every week and two iterations, which was used to measure team satisfaction.

Data analysis

Based on the data from case study, the grounded theory method was used for data analysis of each team. Grounded theory method is a research methodology in social sciences, which operates in a reverse way to find the results and conclusions. After data collection from panel feedback and reflection diary, all the data were put into order for each team. From the original text of feedback and diary, the key points were marked and gathered with codes separately. Then the codes were grouped into relevant concepts with similar content. According to these concepts, categories were formed from similar concepts. Based on these categories, the results could be found and would draw the conclusions.

In the case study, diary was used to measure team satisfaction. Every week, the design students wrote diary to record their teamwork. For the two iterations, the design students also wrote diary to reflect on their design.

In the case study, feedback was used to measure design quality. In the first iteration, the client gave feedback to each group. During the design process, the assigner also gave feedback to each group. Meanwhile, Maturity Index on Reliability (MIR) model is introduced to investigate the process output and the quality of information flow. MIR is used here to measure the capability that each team reacts to comments and takes improved actions in their design process. MIR level 1 and MIR level 3 are of interests, MIR level 1 means heard comments but no action and MIR level 3 means heard comments also improve.

According to the reflection diaries, the data were grouped into categories: activities, teamwork, communication, cultural differences. According to the panel feedback, the data were grouped into categories: design concept, user research, presentation, report.

Team 1 and team 4 were working in cooperative design mode. During the first iteration, their design concept was difficult to understand and more evidences were needed to backup statement. During the second iteration, they combined two concepts and designed a device, and also made scenario and prototype for design concept. Team 2 and team 5 were working in collaborative design mode. During the first iteration, their design concept was good with user profile. During the second iteration, they designed interface and made user test, and then

designed a platform with the demo video. Team 3 and team 6 were working in competitive design mode. During the first iteration, they made an interview and abstracted user demands. Their design concept could be deeper and clearer. During the second iteration, they made games to motivate and help the users with proper guidance and good feedback. During the process of case study, we observed that all the teams were at MIR level 1 in the beginning. After the comments and feedback, they were improved to MIR level 3 in the end.

Results / Findings

In this research, it is found that different teamwork modes have effect on design teamwork in distributed bi-national teams, including design quality and team satisfaction.

1. In cooperation mode, it is required to divide the work in order to work continuously and efficiently. Team members take advantage of their skills to develop design solution and improve design quality. Team communication is based on explanation and understanding, which leads to team satisfaction during design process.
2. In collaboration mode, it is required to have more time to work together during design process. Team members have more chance to share information and discuss ideas. Team communication play an important role in teamwork and team satisfaction is improved accordingly. As a result, design quality is also developed and design solution is more acceptable by team.
3. In competition mode, it is required to work in parallel to have different solutions for same task. Team members work separately during design process and compare with different solutions in order to know each other better. As a result, it is difficult to make final decision, but design quality is improved accordingly. Team communication and team satisfaction is based on competition.

Table 1. The effect of different teamwork modes on design teamwork (design quality and team satisfaction)

teamwork modes	attribute	design quality	team satisfaction
cooperative design	divide the work, work continuously and efficiently,	take advantage of skills,	explanation and understanding,
collaborative design	work together, share information and discuss ideas,	acceptable design solution,	team communication,
competitive design	work in parallel, work separately,	different solutions for same task,	know each other better,

With regard to the effect on design teamwork, two additional factors were identified: project uncertainty and team uncertainty. Project uncertainty is to what extent the team understands the design challenge. Team uncertainty is to what extent the team knows each other's strength. Compared with different teamwork modes, the research investigates the strength and weakness of them, so as to find suitable teamwork modes for different situations with project factor and team factor. Based on the data from case study, the following results regarding teamwork modes can be found.

1. Cooperation mode better fits teams and projects with low uncertainty. Cooperative design team can work continuously and the separate tasks are clear, but one side has to wait for the other to complete the previous step.
2. Collaboration mode better fits teams with low uncertainty but projects with high uncertainty. Collaborative design team can take timely feedback and adjust the design direction, but it requires much time to work together for discussion.

3. Competition mode better fits teams with high uncertainty. Competitive design team can keep independent idea generation and outstanding design solution, but it leads to repetitive work and difficulty of choosing or combining design concepts.

Table 2. The strength and weakness of different teamwork modes (cooperation, collaboration, competition)

teamwork modes	strength	weakness
cooperative design	work continuously, clear tasks,	wait for the other,
collaborative design	timely feedback, adjust design direction,	much time to work together
competitive design	independent idea generation, outstanding design solution,	repetitive work, difficulty of choosing,

Conclusions

This research has found that cooperation is fit for design process with both low team uncertainty and low project uncertainty. As to low team uncertainty and high project uncertainty, it is better to use collaboration mode in the first part and then for cooperation mode. While turning to low project uncertainty and high team uncertainty, it is better to use competition mode in the first part and then for cooperation mode. Design process with both high team uncertainty and high project uncertainty is most difficulty. Competition mode could be used in the beginning and then collaboration mode could be used subsequently, after that cooperation mode is fit for the last part. According to these results, it is also found that competition has benefit to decrease team uncertainty and collaboration can facilitate to decline project uncertainty.

Table 3. Different teamwork modes for project factor and team factor

factor	high project uncertainty	low project uncertainty
high team uncertainty	competition → collaboration → cooperation	competition → cooperation
low team uncertainty	collaboration → cooperation	cooperation

With regard to time aspect, it is also found that different project uncertainty and team uncertainty need different teamwork modes during design process. In the initial with high project uncertainty and high team uncertainty, competition mode could be used to decrease team uncertainty. In the middle with high project uncertainty & low team uncertainty, collaboration mode could be used to decline project uncertainty. In the final with low project uncertainty & low team uncertainty, cooperation mode could be used during the process.

Table 4. Different teamwork modes during design process

time	factor	teamwork modes
initial	high: high project uncertainty & high team uncertainty	competition
middle	middle: high project uncertainty & low team uncertainty	collaboration
final	low: low project uncertainty & low team uncertainty	cooperation

Practical implication

From the findings, the practical implication of this research is to support designers to improve design teamwork in distributed bi-national design teams.

In order to improve design teamwork, it is important for designers to be aware of culture factor and make use of teamwork modes in design process. This research is a step towards define design guideline of future interactive system to support designers to improve design teamwork in distributed bi-national teams.

Acknowledgement

The authors would like to thank all the people who contributed to this study. Thanks to Philips research Shanghai for their support in the design case. Thanks to all the students participate the design course.

References

- [1] Schadewitz, N. Design patterns for cross-cultural collaboration. *International Journal of Design*, 3(3), 37-53, 2009.
- [2] Razzaghi, M., Ramirez, M. and Zehner, R. Cultural patterns in product design ideas: comparisons between Australian and Iranian student concepts. *Design Studies* 30, 438-461, 2009.
- [3] Christensenl, T. and Yasar, S. Paradigms and Protocols in the Study of Creative Collaboration: Implications for Research of Design Team Process and Product. *IASDR*, 2007.
- [4] Kleinsmann, M. and Valkenburg, R. Barriers and enablers for creating shared understanding in co-design projects. *Design Studies* 29, 369-386, 2008.
- [5] Kleinsmann, M., Buijs, J. and Valkenburg, R. Understanding the complexity of knowledge integration in collaborative new product development teams: A case study. *Journal of Engineering and Technology Management* 27, 20–32, 2010.
- [6] Hutter, K., Hautz, J., Füller, J., Mueller, J. and Matzler, K. Communitition: The Tension between Competition and Collaboration in Community-Based Design Contests. *Creativity and Innovation Management*, Volume 20, Issue 1, pages 3–21, 2011.
- [7] Sander, P.C. and Brombacher, A.C. MIR : the use of reliability information flows as a maturity index for quality management. *Quality and Reliability Engineering International*, 15(6), 439-447, 1999.