

Design Teamwork Approach in Intercultural Binational Teams

Competition, Collaboration, Cooperation

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Abstract: Design teamwork has been taken into account as a key process with different culture in international design teams. The objective of this research is to explore the effect of different teamwork approaches and facilitate design course in the context of distributed and intercultural teams. In this research, three teamwork approaches (competition, collaboration, cooperation) are introduced as independent variables to investigate the effect on design teamwork in binational design teams. Meanwhile, project factor and team factor are introduced as dependent variables to measure design teamwork. In the sequence of competition, collaboration, cooperation, it was obvious to show that design course was improved with sequential teamwork approaches. With regard to time sequence, the results show that team factor and project factor with different uncertainties need different teamwork approaches during design process. This study has investigated the importance of three teamwork approaches and the sequence of their usage. In order to motivate and improve intercultural design teamwork, the results of this study indicate that it is important for designers to be aware of intercultural differences and make use of different teamwork approaches.

Key words: *design teamwork, binational interculture, teamwork approach*

1. Introduction

Over the past decades, as the development of global industry and economy, there has been an increasing interest in the field of international teamwork. It is becoming increasingly important to realize the intercultural impact in the teamwork approach. Design teamwork has been taken into account as a key process with different culture in international design teams.

In the context of globalization, teamwork plays an important role in industrialization [3]. Due to product development for different markets, it is necessary to collaborate with people from different background [4,5]. Considering the complexity of product development, teamwork is put into practice to solve the complex problem and meet the requirement of different markets. In the view of global industry, western countries and eastern countries have much more potential to collaborate with each other [6]. Teamwork usually comes with mutual benefits and shared learnings [7]. Due to the globalization of the economy and industry, design teamwork has become culturally and geographically distributed [8]. Design teamwork in different cultures requires an understanding of cultural context. Therefore, it is necessary to identify the influence of cultural differences and the requirement of design teamwork.

This research explores design course and investigates teamwork approach in the case of bi-national team of Netherlands and China. The objective of this research is to explore the effect of different teamwork approaches

(competition, collaboration, cooperation) and facilitate design course in the context of distributed and intercultural teams. Therefore, it is attempt to show the effect of teamwork approaches on design course with the intercultural differences.

2. Theoretical background

2.1 Design teamwork in international context

Teamwork is a complicated activity and difficult to establish and sustain in an international team. Teamwork is successful when an international project is accomplished by a collective team instead of a set of individual [9]. Therefore, design teamwork requires high effectiveness and efficiency of working together in order to achieve the design project. As to design teamwork, it has been undertaken to support distributed project both for education and industry context [4]. That means design teamwork is becoming more important in both education and industry.

Design teamwork requires multidisciplinary knowledge and multiple skills and expertise [10]. Designers have to recognize their capacity for contributing to effective teamwork and concept generation in design process. However, designers with different background cannot guarantee a successful teamwork if their ideas, perspectives, and knowledge are not properly shared with each other [7]. For teamwork, designers undertake collective projects via internet and interact on shared digital files. Online applications are developed to support and facilitate the teamwork [9]. Technical equipments for communication and visualization are set up to facilitate distributed teamwork. Designers are motivated to interact with communication tools and deal with the technical issue. Considering the best fit between design teamwork and technology, such as communication and visualization, technical methods should be tailored to specific project and team, rather than a general solution [4].

2.2 Teamwork approaches

In this research, it is investigated three different teamwork approaches, which are cooperation design, collaboration design and competition design. Design teamwork approaches are used to support designers to construct an understanding of design problems and potential solutions [11].

Throughout this research, the terms of three different teamwork approaches refer to competition, collaboration and cooperation. More specifically, competition means work separately for same tasks; collaboration means work together for common tasks; cooperation means work apart for divided tasks. In this research, three different teamwork approaches as independent variables are implemented to analyze the effect on design course of process and result. An earlier empirical case study was conducted to investigate the effect of three different teamwork approaches in distributed and intercultural design teams. In this case study of design course, Dutch and Chinese student designers are assigned to work in three different teamwork approaches, so as to examine the effectiveness and efficiency of intercultural design.

Base on the preliminary result of earlier research, three teamwork approaches were applied in sequence during the design course. In the first iteration, competition was used to get to know each other. In the second iteration, collaboration was used to facilitate the design project. Finally, cooperation was used to accomplish the design teamwork.

In the binational design teams, hereby a joint design course is taken. With the cooperation design approach, one sub-team collects information from target market and another sub-team dominates the design ideation. Afterwards, the first sub-team gives feedback and suggestion to these preliminary design ideas. Finally, the second sub-team

makes improvement and final decision and the first sub-team works out the prototype. With the collaboration design approach, both sub-teams collect data in a collaborative way, and then make a collaborative ideation for target market. After discussion, the design solution is improved and the final case will be chosen. With the competition design approach, both sub-teams collect data separately. Then, designers from each sub-team make an idea generation independently. Next, they present and discuss to choose the better idea or to mix them into a final design idea, and improve it together as the final solution.

2.3 Project factor and team factor

With regard to the effect on design course, two factors are introduced as dependent variables, namely project factor and team factor. Project factor is to what extent the design project with brief and task is understood. Team factor is to what extent the team members know the strength and weakness of each other. In order to find applicable teamwork approaches for different situations, this research compares the advantage and disadvantage of them.

The success of design teamwork depends on the definition of project, team composition and proper design method and process, especially team composition and project definition, in accord with the common target and expectation [4]. Considering the influence on design teamwork, project factor and team factor are the main factors have the effect on design teamwork.

Project factor includes project definition and project management. Project definition is a crucial factor for project factor. The brief and requirement of design project can lead to variety of design teamwork and designers have to choose the suitable teamwork approaches. Project management has an effect on design teamwork. Due to the diverse of target group and design process of different projects, project factor has to be taken into account to choose the suitable teamwork approaches in design ideation. The tasks of design project and process management are also the factors of project management, which should be considered in design teamwork as well.

Team factor includes team dynamics and team communication. Team dynamics is an important factor of design teamwork. It is found that team dynamics is crucial to design process and design teamwork [12]. The research about team dynamics also can be found in the field of teamwork [13]. Team composition and personal character are related to team dynamics. Furthermore, team communication is also a crucial factor of design teamwork. Designers are required to share information and also communicate with each other [9]. Distant communication between designers supports distributed design teamwork. Communication tools facilitate designers to collaborate more conveniently and make it possible for designers to benefit from sharing information and working together [4]. Considering the communication for design teamwork, the most important issue is interaction, both interaction with the communication tools and interaction between designers.

2.4 Cultural differences influence

Culture has impact on all kinds of aspects of design, because culture is closely related to design. Culture insight can be integrated into product development consciously and unconsciously [14]. For the conscious way, designers deliberately aim to find design solutions according to cultural preferences of the users. For the unconscious way, designers put their own cultural concerns into design solutions. Due to the diversity and change of user needs and preferences, design gets more complicated. It is necessary for designers to be aware of cultural differences in their design, as well as enhance the cultural appeal for users [14]. Due to the cultural differences of designers and users, development of design teamwork depends on their norms, rules and languages [11]. Designers make efforts in

understanding cultural differences and increasing their experiences in global product development. When products and services are exported, the foreign consumers get an insight into cultural identity of the original producers, even their lives, needs, wishes and habits.

Culture is considered to be a significant issue in industrial design. Cultural values play influential roles over all aspects of life and designers are not exempt from the cultural effects. Therefore, it is worth noticing that designers are required to meet the needs of users, and culture needs are among those requirements. Designers have been aware of that cultural value and symbol is becoming more significant than physical products [14]. Therefore, cultural differences play an important role in the product development process. The concepts created by designers are partly based on their cultural background and social value. In other words, their own culture can influence their works.

The importance of cultural awareness has been recognized by designers; however, it is often neglected in the design process by companies due to some reasons [14]. Because of time and budget constraints, it is hard for designers to pay enough attention to cultural insight into the design process. In addition, people with diverse backgrounds act as hindering factor of cultural differences and lead to misunderstanding and contradiction. However, cultural differences can act as a source of change and innovation [7]. The hindering factors of cultural differences are limited and most of them could be reduced. Although hindering factors have negative influence on design teamwork, they have the potential to become a driving force for supporting factors and improve design teamwork. Teamwork in international design team plays an important role to transfer the hindering factors to the supporting factors. This research is about understanding the cultural differences in design teamwork and support more effective design teamwork in binational teams.

In the international team, people from different countries with diverse cultural backgrounds have different meanings of the same word in communication. Cultural differences affect the design teamwork in international teams. It is found that cultural differences have influence on design process [14]. Some researchers have explored cultural differences for design teamwork [15,16]. Distributed design teamwork in different cultures requires an understanding of cultural context in communication. Communicating with people in different cultures also requires an understanding of the cultural context. Thus, it is important for designers to draw attention to design teamwork and understand the cultural differences in collective design ideation, which requires designers to learn not only design skills and also intercultural communication for design teamwork. Unfortunately, cultural differences act as barrier to improve design teamwork and limited research has been found to solve design teamwork problems in the context of cultural differences. There exist problems of design teamwork with people from different culture. Design teamwork has to confront the cultural differences, which hinders distributed communication [11].

2.5 Case selection: China and Netherlands

In the context of globalization, distributed teamwork is become popular and necessary for global market. More and more companies value their global strategy and pay more attention to the distributed 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. Considering the situation of industrialization in China and globalization in the world, distributed design teamwork plays an important role in

transnational teamwork [17]. This research focuses on design teamwork in the case of bi-national team of Dutch and Chinese designers.

China is on the way of industrialization, and has become a leading manufacturer in the world [17]. There were four stages on the history of Chinese industrialization: materials exportation, cheap labor for manufacturing, expertise of manufacturing, and from manufacturing to creative design. In the first stage, due to the availability of resources, the output of raw materials was predominant, such as steel, coal, wood, cement, chemical fertilizer, etc. In the second stage, as the result of large and rapidly growing population, there existed abundant cheap labors for manufacturing. In the third stage, the industrial technology was developed in order to get sufficient technology. In the fourth stage, as the manufacturing technology was improved and design education was developed as well, “made in China” is in the process of becoming “Designed in China”.

China has large market in the world [18], while Netherlands has good quality of design. Design in the Netherlands, namely Dutch design, is famous for design esthetic and particularly product design, which is characterized as experimental, innovative and humorous. Dutch designers have the ability to make design simple and playful and they are good at making use of materials and give them new value. Dutch design are primarily known for graphic design and identified for product design as well. Dutch design is strongly supported by design education and many well-know designers are recognized in the world. Furthermore, Dutch design is effectively supported by government. As design has become an integral part of product development, companies pay more attention to design value and put design at a significant position.

3. Methodological approach

3.1 Research design

In the context of distributed design teamwork, the joint design courses with cultural and geographical difference in distant communication are increasing and becoming popular. In order to answer the research question, a joint design course was conducted as a case to study in-depth the design teamwork (design result and team process) in the context of cultural differences. It is an effective way to observe design process and interview design team to explore supporting and hindering factors of cultural differences in design teamwork. The analysis focuses on the relation between cultural differences and design teamwork. The experiences of the joint design course have clarified the significance and usefulness of design teamwork. The joint design course involving Dutch and Chinese designers explored significant cultural differences in the way of concepts ideation. While the diaries recorded their cultural differences reflected on design process and linked to their own cultural values. The observation and analysis of the diaries indicates that Dutch and Chinese designers solved the design problems in culturally divergent ways.

Furthermore, a revised case study was conducted to investigate the influence of three different teamwork approaches in binational design teams. In this design course, Dutch and Chinese student designers work together in three different teamwork approaches to investigate the possibility and efficiency of cross cultural design. By considering the supporting and hindering factors of design teamwork approaches, it is useful to investigate the influence of three different teamwork approaches in binational design teams. The interaction between Dutch and Chinese student designers is a crucial element for distributed design teamwork. The quality of interaction between Dutch and Chinese student designers is concerned to investigate the influence of different teamwork approaches.

Cultural measurements and value survey are used to investigate the team composition and personal character of designers. For distant communication, it is different between information distribution and interaction. After that, co-creation is used in a joint design project to explore design opportunities and solutions to support designers in design teamwork. In addition, the design solutions are applied with evaluation and reflection.

3.2 Research model

As shown in research model (figure 1), the effect of different teamwork approaches on design teamwork course is considered as the main research object. In this research, three teamwork approaches (competition, collaboration, cooperation) are introduced as independent variables to investigate the effect on design teamwork in binational design teams. Meanwhile, project factor and team factor are introduced as dependent variables to measure design teamwork. Furthermore, distributed and intercultural teams are considered as extraneous variables in the context of binational design teams.

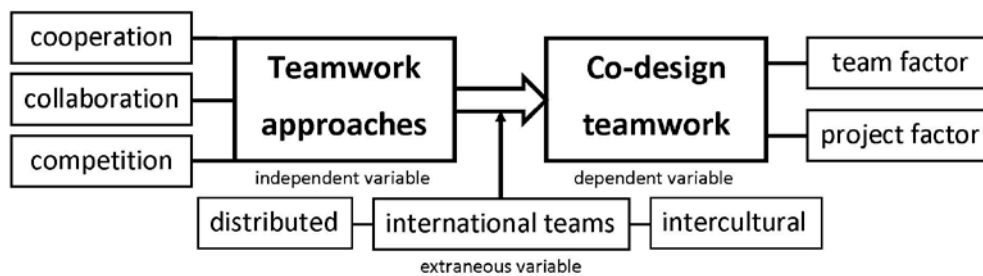


Figure 1. Research model

3.3 Case approach

In this research project, a joint design course is conducted to investigate the influence of three different teamwork approaches in bi-national design teams. A case study approach is chosen to study in depth the teamwork quality and design result in the context of cultural differences. Both Dutch student designers and Chinese student designers take part in this design course. Since both designers are located at different time zones, they have to work at unusual time and communicate in their joint hours. Due to the geographic difference, designers use web communication tools for discussion and presentation. In this design course, both Dutch and Chinese designers work together in different teamwork approaches.

Before the design course, some cultural measurements are used for team composition. Considering the cultural diversity and balance of designers in each team, both Dutch designers and Chinese designers are divided into teams on average. Culture and value survey is used to measure designers' personal cultural character. Team role questionnaire is used to identify their suitable team position. In the process of design course, self-reflection diary was used to study in depth the change process of design teamwork. It requires designers to manage both design teamwork and design process. Participant observation is implemented with note taking to get the first data in design process. It is also complemented by semi-structure interview to get more impression and reflection from designers. During the course, project plan and weekly diary are made in each team so as to record the specifics in design process. They are helpful to improve the course design and integrate research into design education. At the end of design course, design teamwork is evaluated measured, containing teamwork process and design result. User acceptance model is used for design result.

The design case is to design for elderly with aging problem, to facilitate elderly independent living and motivate them to stay active, healthy and social. This design course takes six weeks, including two iterations. At the beginning of design course, all the designers are divided into teams, and each team contains both Dutch and Chinese designers. Meanwhile, it is considered the diversity and balance of cultural differences in each team, which are assured by grouping student designers based on their cultural measurements beforehand. The detailed learning activities are listed below. The first week is for kick-off and preparing for design teamwork. Each design team is designated a teamwork approach. Afterwards, they choose a specific target group and consider the problems and product opportunities for the target group. The second week is in the first iteration. Each design team works in their own teamwork approach, and considers the solution of problems and design features. They create several possible ideas and original solutions. The third week is the middle presentation. All the design teams present their conceptual design, and get feedback and suggestion with each other. The second iteration contains the fourth week and fifth week. Each team still works in their own teamwork approach. They improve their design concept and design details in the fourth week and make usability evaluation of final design for target market. They make final decision and reach an agreement on design solution. In the last week, all the teams write design report and make prototype, and then present their final design. In the end, the evaluation is given, including comments from lecturer and feedback from panel.

In this joint design course, Dutch and Chinese designers are divided in to three team categories to reflect three different teamwork approaches in bi-national design team.

- Cooperation design approach: In a joint team, Chinese designers collect information of target group first, and then Dutch designers dominate the design ideation. Afterwards, Chinese designers give feedback and suggestion to these preliminary design ideas. Finally, Dutch designers make improvement and final decision and Chinese designers work out the prototype.
- Collaboration design approach: In a joint team, both Chinese designers and Dutch designers collect data in a collaborative way, and then make a collaborative ideation for Chinese market. After they discuss and improve the design solution, the final case will be chosen.
- Competition design approach: In a joint team, both Chinese designers and Dutch designers collect data separately. Then designers from each nation in the design team make an idea generation independently. Next they present and discuss to choose the better idea or to mix them into a final design idea, and improve it together as the final solution.

3.4 Data Collection

In the case study, data are collected during the design process (table 1), which contain reflection diary and panel feedback. Accordingly, videoconferencing was used for the formal sessions with presentation, and email and Skype were used as the team communication media. In the beginning, some cultural measurements are used for team composition. Cultural value survey is used to measure personal character of designers. Team role questionnaire is used to identify their suitable team position. In the process, self-reflection diary is used to study in depth the change process of design teamwork. Participant observation is implemented with note taking to get the first data in design process. It is also complemented by semi-structure interview to get more impression and reflection from designers [2]. Moreover, project plan and weekly diary are made in each team so as to record the

specifics in design process. In the end, design teamwork is evaluated, containing team process and design result. Finally, user acceptance model is also used to test design result.

Table 1. Data collection

Phase	Data collection
Overall process	Reflection diary, Panel feedback, Videoconferencing, Email and Skype
Begin phase	Cultural measurements: Cultural value survey, Team role questionnaire
Process phase	Self-reflection diary, Participant observation, Semi-structure interview, Project plan and Weekly diary
End phase	Team process and Design result, User acceptance model

3.5 Data Analysis

Based on the data from case study, the grounded theory method was used for data analysis of each team (table 2). According to the reflection diary, 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. Meanwhile, Maturity Index on Reliability (MIR) model [1] was used to investigate the process output and the quality of information flow. MIR was used here to measure the capability that each team reacted to comments and took improved actions in their design process.

Table 2. Data analysis

Data collected	Data categories
Reflection diary	Activities, Teamwork, Communication, Cultural differences
Panel feedback	Design concept, User research, Presentation, Report

4. Results

4.1 Research results

The joint design course was a considerable complex course for student designers. It required not only to work together with distributed binational design teams, but also to design for target group in different cultural context. In addition to cultural differences, three teamwork approaches were introduced to guide the distributed binational teamwork. Consequently, the participants had to take into account the project information from design brief and division of teamwork approaches. For the project, they had to work with another culture and also work for another culture.

Based on the data and analysis from case study, the following results regarding teamwork approaches can be found. First of all, competition approach is applicable to team factor with high uncertainty to lower it. Subsequently, collaboration approach is applicable to project factor with high uncertainty to lower it. Last but not least, cooperation approach is applicable to both team factor and project factor with low uncertainty in design course. In the sequence of competition – collaboration - cooperation, they made progress and improved the design in the end. Compared first iteration with second iteration, it was obvious to show that design course was improved with sequential teamwork approaches.

As shown in research results (figure 2), with regard to time sequence, the results show that team factor and project factor with different uncertainties need different teamwork approaches during design process. In the initial stage with high uncertainty of project factor and team factor, competitive approach could be used to decrease uncertainty of team factor. In the middle stage with high uncertainty of project factor and low uncertainty of team factor, collaborative approach could be used to decline uncertainty of project factor. In the final stage with low uncertainty of project factor and team factor, cooperative approach could be used efficiently and effectively during the process.

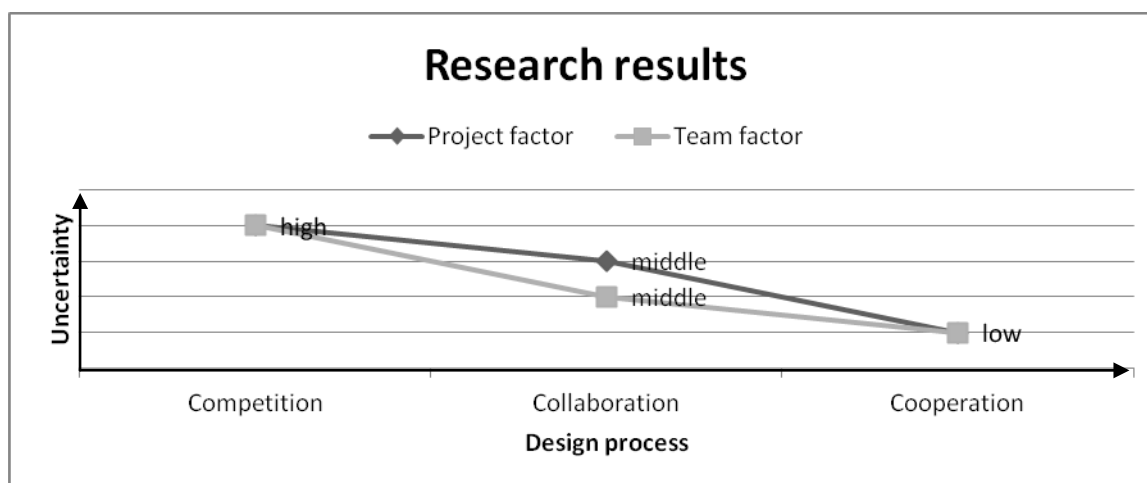


Figure 2. Research results

During the design course, design interaction between the student designers was investigated for the nature of design process and design outcomes, in order to clarify the influence of cultural differences on design. In the beginning with high uncertainty of project factor and team factor, the student designers had different cultural backgrounds and design skills for design teamwork, as well as the uncertainty of requirement and expectation of design project. They desired to work in competitive approach, so as to know the strength of each other. In the middle with high uncertainty of project factor and low uncertainty of team factor, the student designers were eager to work in collaborative approach, so as to make the project details clear with mutual understanding. In the final with low uncertainty of project factor and team factor, the student designers were able to work in cooperative approach, in the way of work division and design interaction. In these three sequential stages, three teamwork approaches have different influence on design process and design outcomes.

4.2 Reflection on diary

In the joint design course, reflection diary is used to record the specifics in collective design process. The diary is designed to investigate the design teamwork, culture insight, and design process. In the context of cross culture, designers are supposed to have the awareness and understanding of the cultural differences.

The reflection diary is written by both Dutch and Chinese student designers in each team. In this joint design course, three different teamwork approaches are used to study the teamwork process and design result in joint design team. According to their teamwork approaches, the student designers use weekly diary to record their design activities and communication.

In the beginning, both Dutch and Chinese student designers set up connection and get to know each other. On the other hand, they read the design brief and understand the design requirement. Due to the time difference, some

teams make a plan to divide the tasks and make an appointment for internet meeting. The advantage of time difference is that the binational team can work for the whole day in turn; while the disadvantage is that it is hard to communicate synchronously and get feedback from the other side immediately. As a result of time difference, Chinese student designers collect data for target group of Chinese market, and Dutch student designers study the literature to find potential design opportunities. Due to the cultural differences and language barrier, they have to take more time for explanation and make group meeting inefficient. The quality of internet connection also affects the efficiency of discussion. For some teams, it is not easy to understand each other when the signal is weak and voice is low. However, some teams establish smooth communication and interact in design teamwork, when both Dutch and Chinese student designers take awareness of cultural differences and have patience to hear from the other side.

4.3 Reflection on case study

During the design course, reflection diary is made in each team so as to record the specifics in design process and give feedback. It is helpful to improve the course design and integrate research into design education. This course gives opportunity to both Dutch and Chinese student designers for cross cultural design teamwork, and it is also field study of cross cultural research for designers. In the framework of cross cultural research, Dutch design student designers and Chinese design student designers work together in three different teamwork approaches to investigate the possibility and efficiency of cross cultural design.

According to cultural differences in binational design team, different teamwork approaches affect design result and team process. The purpose of cross cultural research is to motivate and improve the collective design for designers from different cultures and countries. For the different teamwork approaches, they take the different way of design teamwork, and also meet the different problems in communication. Cooperative design team can work continuously and the task of each side is clear, but one side has to wait for the other to finish the previous step. Collaborative design team can take timely feedback and adjust the design direction, but it requires much time to work together with discussion. Competitive design team can keep independent idea generation and lead to outstanding design solution, but it leads to some work overlap and difficulty of choosing or combining design concepts. During the course, cultural differences and personal character also affect the execution of teamwork approach. For example, one team in collaborative approach is also encouraged with each other in competitive way, which leads to more interaction in design process. While one team in competitive approach also share the data in collaborative way, which gives the team members abundant design material.

5. Conclusions

This study has investigated the importance of three teamwork approaches and the sequence of their usage. Consequently, the following conclusions can be drawn from this study. According to the research question of this study, it could state that different teamwork approaches affect design course in binational design teams. Besides different teamwork approaches, this study have also shown that intercultural differences also have impact on design course of process and result for binational teamwork. In order to motivate and improve intercultural design teamwork, the results of this study indicate that it is important for designers to be aware of intercultural differences and make use of different teamwork approaches. Therefore, the results of this study have a number of important implications for future practice.

In this research, it is found that different teamwork approaches affect design results and team process in binational teams. In addition, cultural differences also have influence on design teamwork. In order to improve design teamwork, it is important for designers to be aware of cultural differences and make use of teamwork approaches in design process.

As the research progresses it is expected further design exploration of cultural differences and establishes the strong links between culture and design. This research takes the initiative for further study of design teamwork in other countries and cultures.

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