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CROSS-CULTURAL COLLABORATION IN DESIGN ENGINEERING – INFLUENCE FACTORS AND THEIR IMPACT ON WORK PERFORMANCE

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ABSTRACT

Design engineering has become a global business. Accordingly, design engineers are confronted with a need to collaborate with other design engineers, coming from different countries from all parts of the world. So engineers with entirely different cultural backgrounds have to successfully work together in design teams. Some of them succeed better in this task, some worse. An unsolved question is why there are these differences in performing cross-cultural collaboration. This paper presents an approach to determining factors in the backgrounds of design engineers, which influence their way of performing design tasks in cross-cultural collaboration. A qualitative study has been deployed therefore. Study design, conduction and results are presented in this paper.

Keywords: cross-cultural design teams, national culture, work performance

1 INTRODUCTION

Design engineering companies face increasing market and competition pressure forcing them to offer innovation in ever-shorter cycles for ever-lower prices. In their struggle to keep profit margins up, companies more and more have to broaden their horizon for resource acquisition – both human and material – to a global level [1]. Their pursuit for the best conditions has started with globally distributing and outsourcing production of less complex parts and products a few decades ago, but has reached product development and design engineering workload in the last years of the twentieth century [2]. The search for design engineers offering the best trade-off between required skills and labour costs, as well as international cooperation and growing migration, have made global design teams and distributed design engineering a reality [3]. Design engineers are confronted with a need not only to perform their work effectively and efficiently, but to do so in collaboration with other design engineers from all parts of the world, which hence have entirely different cultural backgrounds [4]. Cross-cultural collaboration of this kind requires design engineers to have additional social skills. In order to provide a foundation for properly defining these skills, this paper focuses on the identification of factors in the backgrounds of design engineers that influence the ways they perform cross-cultural design engineering collaboration. This paper shows how some of these factors were determined using a socio-scientific approach, i.e. design, conduction and analysis of a study among design engineers performing cross-cultural collaboration in their company.

2 STUDY DESIGN

This comprehensive study consists of elements allowing for the

- Comparison of design engineers' behaviour in cross-cultural collaborative work
- Explanation of differences in performance and behaviour
- Establishment of relations between these differences in performance and behaviour (present) and factors in the background (past) of the design engineers

In the design of the study, several constraints had to be met. First, the factors that had to be determined lie in the past, whereas the engineers' performance in collaborative work is influenced in present. So information from the past had to be matched with present information, requiring the deployment of methods for acquisition of both past events and present events. As suitable methods for the study

purpose we detected observation for present events, questionnaires for past events and interviews for both time horizons.

2.1 Characteristics of cross-cultural design engineering collaboration

The performed study aimed to explain differences in the ways design engineers perform cross-cultural collaborative work. The following paragraphs show an approach to defining a set of relevant characteristics of cross-cultural design engineering collaborative work. This set of characteristics will be used to define differences in the design engineers' way of performing collaborative work, as each engineer will exhibit different values of the various characteristics. Literature review provides a set of relevant characteristics of cross-cultural design engineering collaborative work. Given that there is much more literature on teamwork than on collaborative work and given the similarity of the two concepts, also literature on teamwork has been reviewed. Literature offers an abundance of influence factors on design engineering collaboration, but most publications are focused on technical influences, whereas the centre of attention in this research is on the social side of the design engineering process. A practicable set of characteristics of cross-cultural design engineering collaboration is hardly described in the literature reviewed. However, there are publications dealing with the issue, so a set of characteristics was derived from ideas framed by Badke-Schaub and Frankenberger [5], Barak and Maymon [6] and Strohschneider [7]. The influence of technical issues is neither denied nor neglected, but clearly not the main focus in our research. The five characteristics of cross-cultural design engineering collaborative work utilised in this study are named below.

Leadership style

This characteristic includes the engineer's behaviour towards subordinates, but is explicitly not limited to that dimension. It is also meant to apply to the general demeanour and attitude of the engineer in all situations he has to coordinate other people (regardless of seniority) in order to perform his work properly.

Coping strategies

The engineer's way of dealing with personally challenging situations, especially when something does not work out the way predicted, anticipated or desired. This characteristic is meant to apply both to interpersonal relations and to work topics that do not develop in a way the engineer wanted them to.

Problem solving strategies

Rather focusing on the technical aspect of design engineering, this characteristic refers to the way(s) the engineer deals with technical problems in his work. Special focus is placed on the strategies applied to solve the task resulting from the problem.

Decision making

Describes the way the engineer makes decisions regarding time planning, task planning and alternatives for solving a design task. Here, an emphasis is put on the decision strategy for planning the time schedule according to the tasks that have been performed.

Perception of cross-cultural issues/collaboration

It is very difficult to obtain a palpable concept of culture. Hence, this characteristic comprises everything that will be said and done within a very broad definition of culture. The restriction to the relevant aspects will be performed in the data analysis after data acquisition.

For the context of this study, this described set of five characteristics is regarded as comprehensively describing the process of cross-cultural design engineering collaborative work.

2.2 Data acquisition concept

Three different means of data acquisition were deployed in this study. Questionnaires were utilised to acquire data on the personal, educational, professional and corporate backgrounds of the study participants. Interviews provided information on participants' family background, their perception of engineering collaboration, their perception of cross-cultural collaboration/issues, and additional information on aspects covered by the questionnaire. Observations were deployed in order to obtain data on the actual way the study participants perform design engineering work and collaborative work.

The acquisition of data by the means of questionnaire, interview and observation had to ensure that the actions surveyed in the observations were not biased. It appeared to be reasonable to schedule the parts of the interview concerning cross-cultural issues at some time after the observation. On the other hand, it was very important for the person conducting the data acquisition to have to his disposition information on the participant's background by the time the work observation was performed. Having this background information ready, the researcher can judge the relevance of his various observations in a much better way. Hence, there were sensible reasons for both placing the interview before the observation and vice versa. So the interview part of the data acquisition process was split into two parts. The first interview was preceded by the questionnaire part of data acquisition. The questions on the perception of cross-cultural issues and collaboration, which is dealt with in a second interview, placed after the observation. Filling in the questionnaire and conduction of the first interview were scheduled to 45 minutes, the final interview to 30 minutes and the observation in between to between a minimum of one hour and a maximum of one working day. The entire data acquisition concept is pictured in Figure 1.

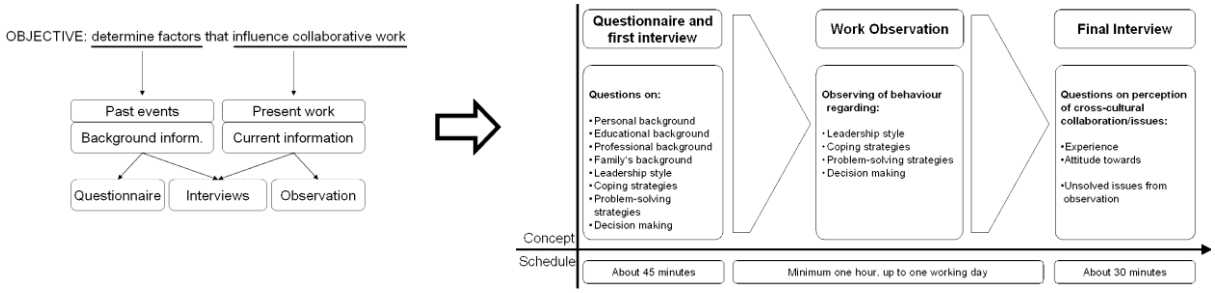

Figure 1: Data acquisition concept

To eliminate the influence of possible differences in corporate structures, the research team decided to acquire the field data for the study from design engineers within one company. In the survey conducted, cross-cultural issues in design engineering were focused, so data sources (design engineers) working in a cross-cultural environment were obligatory. A Western Australian, middle sized, internationally working mechanical engineering company was selected according to this constraint. In the selected company, five design engineers were selected to act as data sources for the survey. There were two main selection criteria – the country/countries where the design engineers spent their lives so far (centre of live), and the country/countries where the design engineers' parents had their centres of lives (family origin). These two criteria were applied to all the engineers at the selected company. The selection objective was to build up a sample of five engineers with a maximum possible variation according to the criteria "centre of life" and "family origin".

2.3 Levels of analysis

Information obtained in interviews was analysed with respect to what the interviewed engineer said during the interview. Centre of attention were statements concerning the engineer's perception of cross-cultural collaboration/issues as well as leadership style, coping strategies, problem solving strategies and decision making. Another level of analysis is discourse analysis, which is a text and speech analysis method first introduced in the 1960s by Foucault [8]. It is described as the study of the relationship between language and the context in which it is used, by McCarthy [9]. The approach deduced for this study is as following: Study participants do not necessarily say what they mean for various reasons. Especially in the context of national cultures, some people may tend to reflect stereotypes in order to be perceived as liberal and cosmopolitan. So in the context of this study, discourse analysis was used to reveal the true attitudes of study participants whenever there is suspicion regarding statements given in the interviews. The data gathered during observation sessions was on hand in the form of detailed step-to-step descriptions of design work processes and collaborative work processes. These descriptions were analysed with respect to passages illuminating the observed engineer's leadership style, coping strategies, problem solving strategies and decision making. A further level of analysing the acquired field data was finding discrepancies between statements given in the interviews and contrasting actions documented in the observation. This served as another approach to identify (unconsciously) untruthful information by the participant, given in the interviews.

Also various fields of background information on the participants were acquired by the questionnaire and parts of the first interview. This set of information about the engineer's past was compared with the present focused information. A detailed description of the entire data analysis model is depicted in Figure 2.

2.4 Data analysis model

The first step in the analysis process is the setting up of a coding table allowing for a classification of the acquired field data for further steps in the analysis. For this study the coding table will be derived from the characteristics of cross-cultural design engineering collaborative work (as defined in chapter 2.1) and the levels of analysis (defined in chapter 2.3). The elements of those two dimensions were used for creating a matrix. Each element of this matrix constitutes one code of the coding table, which is presented in Figure 2.

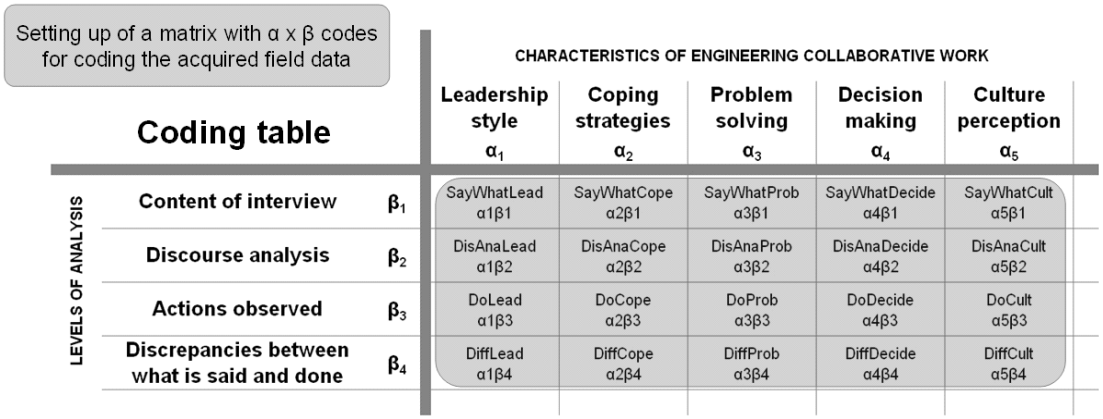

Figure 2: Coding table

The code names are mnemonics derived from a combination of the respective level of analysis and work characteristic. Additional to these codes for analysing the present oriented information, a code for background information occurring in the interviews is created for each participant in the study. The information collected in those background codes (mnemonic: ToAddToBg_[Person]) was added to the respective background information acquired through the questionnaire. In a second step, the field data acquired in interviews and observations was coded, i.e. assignment of applicable codes to respective text passages. This task was fairly time consuming, as it takes a reasonable level of accuracy from the coding person's side to scan field data text for about 20 different possibilities to match one of the codes.

After coding all interview and observation field data, a "super code" was assigned to the entirety of codes referring to each particular characteristic of cross cultural design engineering collaboration each. The thus obtained coded field data (describing cross-cultural design engineering collaboration) was then analysed according to the different analysis levels specified in chapter 2.3 and subsequently matched with the background data acquired in questionnaire and interviews. This comparison aimed to identify patterns of background factors and corresponding behaviour and performance in cross-cultural design engineering collaboration. This process of pattern identification offered first conclusions regarding factors influencing cross cultural design engineering collaboration. The entire process is pictured in Figure 3.

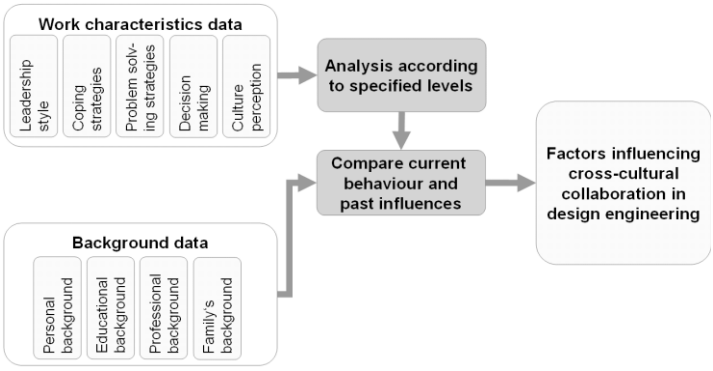

Figure 3: Process of pattern identification

3 FIELD DATA ANALYSIS

Qualitative analysis is a complex process with an abundance of interactivities and dependencies. Various codes have to be assigned to various primary documents forming various coded text passages. Taking this study as an example, more than 20 codes were assigned to 15 primary documents, resulting in about 600 coded text passages. Many of them were coded with even more than one code. These coded text passages had to be thoroughly combined again and again in order to identify certain patterns of coherency regarding different approaches for cross-cultural design engineering collaborative work of study participants. The process of field data analysis is also shown in Figure 4. Memos are used throughout the process for explaining quotes, relations between different quotes, and noting assumptions or ideas. The real analysis process is highly iterative, so Figure 4 shows an idealisation.

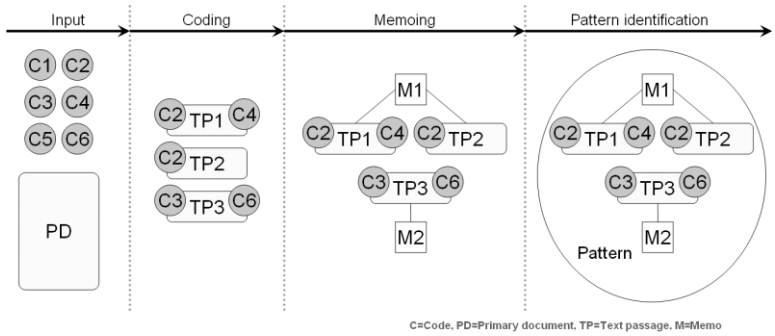

Figure 4: Field data analysis process (simplified and without iterations)

The way the analysis was performed is shown below by presenting some exemplary parts of the analysis. However, these parts are not just to be considered example, as they are chosen in a way to also illustrate the main conclusions of the study. Each level of analysis will be illustrated by the most information-prone attempt(s) to derive background patterns that affects cross-cultural design engineering collaboration.

3.1 Analysis of interview content

Information acquired through interviews normally states a person's selection of facts. Even though the interviewed person may often claim to state objective facts, the information obtained may be a subjectively biased view of facts. That must not be forgotten during the analysis of interview discourse. In the course of this research, the interview content analysis described in this chapter is supported by additional types of analysis in order to try and objectify the analysis results as much as possible (see chapters 3.2 and 3.4).

The first analysis unit presented aims to identify factors that influence the decision making process of design engineers. This analysis element sources in quotes coded with the code a4b1 (combination of interview content analysis and decision making; see Figure 2). Quotes assigned to this code contain several references with respect to factors that trigger decisions, stated below. The A XX numbers are codes for the study participants.

A31: We have to make a balance of time between all the things that are demanding time… dealing with the most urgent… and usually there's plenty to do.

A22: So it's a question of getting jobs finished, ah… on time.

A22: If you don't get the thing out in manufacturing anyway, if you don't get it out of your business and get it invoiced, you don't get money in, so the business can't… ahm, survive, ok?

A21: And you're driven by the schedule really in terms of the gearbox, you know when you gotta have [inaudible] and you know when you've gotta do certain things by, so that's what's [inaudible: driving?] you.

A21: But you gotta look at the schedule each day "Ah, ok, we gotta put those in, because otherwise we gonna run out of time".

These quotes suggest that the dominating factors in decision making are not to be searched in the background of engineers, but in very present factors as time constraints and schedules.
The second presented element of interview content analysis deals with the interviewed engineers' perception of cross-cultural differences (code a5b1). In the two quotes below, one study participant expresses his opinion that differences in behaviour are rather grounded in a person's personal attitude than in its country of origin. He distinguishes open people from arrogant people instead of a distinction by origin and emphasises the individuality of people.

A32: For someone who travels with certain frequency, it's easy to get along with… with other cultures. I wouldn't say that it's… It's not about cultural issues. It's about the personal attitude… It's not an issue if the person is aware of it. / Interviewer: It's not an issue? / A32: It's not an issue at all. / Interviewer: Personal attitude in which respect? / A32: I don't know. If you're an arrogant person, you won't accept other… other points of views, or other ways to do the same things. If you're not an arrogant person you will be trained to discover something else, if that makes sense, I don't know… (…) For arrogant people it will be 'the wrong way or my way', whereas open people will be trained to look for something new or something else to do…

A32: And I found that it's a… absolutely mandatory to understand culture, if you wanna deliver your message properly: It's not about culture… it's more about attitude. It would be absolutely unfair to say: Americans are this way, Australians are this, Europe people are this way. I think you can find tendencies, because these people live in community, but we still are individuals who have particular characteristics.

In another quote, an engineer states that the common interest in engineering is to be considered as stronger than cultural differences, in his opinion:

Interviewer: What would you consider being the major differences between working together with people in South America and Australia?

A51: You know amazingly not so many differences. As technical people we…we have a tremendous common interest.

A third engineer limits the extent of cultural differences to private issues and claims that there are no cultural differences affecting engineering work due to the shared commercialised world. He also mentions that engineering problems are of the same kind all over the world:

A22: I think the mentality is very similar, you know, ahm… it's commercially driven, so… ahm, you know, people are aware, that, you know… money is an issue, cost is an issue, and I just think it's a common, fairly common… melting pot, really. When the languages and all those things are just side issues, you know. You're in a commercial world. You're doing engineering in a commercial world, and you'll find… I find that people the world over think pretty much the same in the commercial world you know… The mentality of the Japanese people is not very similar from mine apart from the cultural differences… different food…the engineering… scientific, if you like, approach was the same, you know. And in Belgium I found, it was almost like being in Australia, you know. The mentality and so was the same, and I assume it's the same in Germany.

A22: I think so, I mean, if you work with mining companies in Australia, and you work with

mining companies in south America, the problems are all the same.

So the majority of the interviewed engineers perceive an irrelevance of cultural issues. Furthermore, it was not possible to find a background pattern of any kind applicable for all three engineers, which suggests that engineers generally do not perceive cultural differences as relevant in their jobs. This perception is by no means a proof for the irrelevance of cultural differences in design engineering, but still a pointer into this direction.

3.2 Discourse analysis

Discourse analysis aims revealing unconscious expressions hidden in discourse. The message a sentence delivers always depends on two components, namely on what is said and on the way it is said. There are several possibilities to vary the message of a sentence even with the objective meaning of the words used is similar. For the discourse analysis performed in this context focus is placed on variation of the words used to assemble a sentence.

One of the most interesting patterns in this analysis has been discovered by applying discourse analysis. The root code for this part of the analysis is a2b2, the respective analysis element is described below.

A32: I think that there is always a better way to the things and the critics from other persons will be absolutely helpful. … Only figures talk by itself, but some other experience, some other perspective, some other opinion will be helpful, as well…

In the context of learning new way of doing his job and being criticised by other engineers, this engineer repeatedly uses the word "helpful". "Helpful" is a word with a positive connotation, which is associated to the other people he asks for advice and for their honest criticism.

A32: At the beginning of my career, I was more focusing processes and the more cold side of engineering, and at the end I was realising, that engineering is absolutely related to people…

The word "cold" is presented with an implication of social isolation, i.e. undesirable. The "people" are presented as a desirable extension to compensate the "cold" side of engineering. So the engineer associates "warm" with people, suggesting that he appreciates dealing with other people's opinions in his job.

A51: Ahm, part of that is learning the new job, and eventually I become more capable in this area… because my comfort zone from general engineering and filters is lost.

In the quote above the engineer openly states that he had "lost his comfort zone", because he has to adjust to a new job within the company. The use of the phrase "comfort zone" shows that he is well aware of the difficulties that come with having to adjust to new people and new tasks. By saying that he will "eventually become more capable in this area" he reveals that he has a quite stoic or even embracing attitude towards those changes. These changes include getting plenty of advice from other people, which he is obviously open to ask for.

A31: Especially when you're talking technical, and you say something, and then someone in the audience might ask you a question… and you can't answer or you made a mistake and you've said something, and they know more about it than you, and you're suddenly on the back foot. So as well as being… you're now in the spot light… you've got all these eyes focusing on you, and you can't…

"You've got all these eyes focusing on you" symbolises the perception of other people and their opinion/advice as kind of a danger. So the engineer who said so apparently exposes a certain negative attitude towards being corrected by other engineers.

A22: Well, I think when I did it, it was more practical… more practical and hands-on than it is today.

The terms "practical" and "hands-on" have a strong positive connotation. So the engineer suggests that engineering education today is worse than it was during his studies without explicitly saying so. The seemingly neutral comparison is essentially not neutral at all. For this engineer the pattern described above occurs several times, which also manifests in the next quote.

A22: Well, if you go into a… any team situation with an open mind… and you're willing to be part of the team, then... ah, it just happens… providing the other team members have got the same approach…

For the understanding it is necessary to know that the engineer – at an earlier stage of the interview – had stated that he did not know any approach to team work different to his own and despite working. So the quote above appears like a neutral description of what it takes for good teamwork. But "the same approach" means his approach in this context. So, discourse analysis implies that this engineer is not a good team player, contrarily to what his statements suggest by the objective meaning of their words. In fact, apparently he does not consider the possibility that other people's work approach could also bear advantages. A correlation between the attitude towards other people's help or points of view or work approaches on the one side and the engineers' centres of life seems to exist. The engineers having had their centre of life in one country for the biggest parts of their lives apparently tend to discard their colleagues' opinion, whereas those with a very international background tend to embrace their colleagues' judgement.

3.3 Analysis of actions observed

The observations conducted in the course of this study were used to verify the respective interviews as well as to cover aspects that cannot be covered by interviews. The element of analysis described below bases on code a3b3. It aims to identify a background pattern correlating with the engineer's quotas of collaborative work and single work. In this part of observation analysis, quotes have been searched revealing how each engineer tries to influence his collaborative/single work ratio and how his actual overall ratio is. The available data shows various different attitudes towards collaboration: From one engineer trying to maximise the share of collaborative work to two trying the opposite. Also for the actual collaboration/single work ratio, there are values from one extreme to the other. However, it was not possible to identify a pattern in the background information on the engineers. So this element of observation analysis could not bring any evidence for an influence of engineers' past on their attitude towards collaborative work. Another try to find a pattern in the age structure also failed.

3.4 Analysis of discrepancies

Discrepancies between what engineers said during the interviews and the actions observed during their observations were quite rarely found. This is mainly due to the fact that such discrepancies are inherently less frequent than non-contradictory statements, provided that participants do not lie intentionally. Another factor promoting the rare occurrence of documented discrepancies is the need for extremely time-consuming analysis for detecting the subtler ones among these discrepancies. However, several discrepancies have been exposed and provide interesting insights in the respective engineer's way of thinking. The element of discrepancy analysis presented below, sources in code a1b4 and aims to contribute to an identified pattern that links social skills for cross-cultural collaboration to the habit of travelling and/or (repeatedly) changing one's centre of life. The original inconsistency is as follows: An engineer repeatedly did not listen to ideas or judgements of his subordinates. This behaviour contradicts one of his statements made while being interviewed:

A22: It never seizes to amaze me what people can come up with, if they have the opportunity.

Along with other observations and interview quotes that lead to the conclusion that this engineer's leadership approach has little to no focus on the social facets of leadership, but a very strong focus on the technical side. In the background information on the respective engineer, backing evidence can be found, as presented in Figure 5. The course of analysis suggested that the engineer has a closed-minded technical view of engineering. This result was linked to other elements of analysis identifying patterns that suggest a correlation between open-mindedness and travel activities and/or repeated changes in one's centre of life.

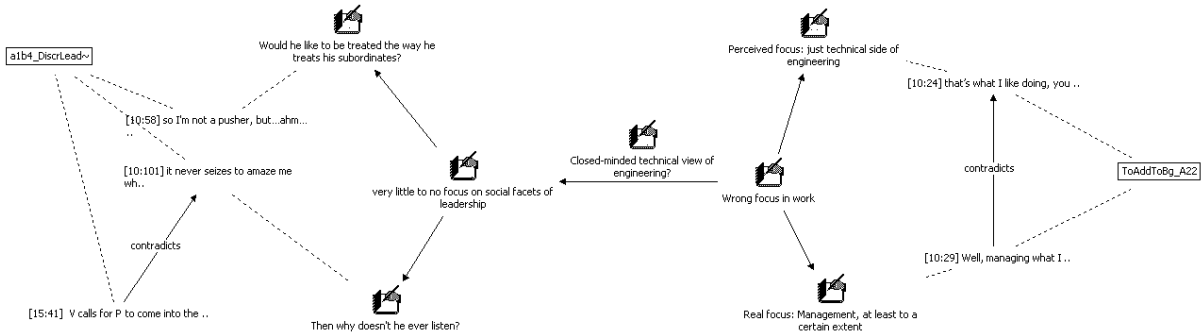

Figure 5: Analysis of discrepancies with respect to leadership style

3.5 Identified background patterns

The objective of all analysis efforts in this study was the derivation of patterns in the background information on design engineers with respect to information on current cross-cultural design engineering collaboration of these engineers. Some of most relevant derived patterns have been introduced above. The list presented below gives a comprehensive overview of all derived patterns, arranged according to the different characteristics of cross-cultural design engineering collaboration.

Identified patterns with respect to the perception of cross-cultural collaboration/issues

- The existence of cross-cultural differences seems neglected by engineers whose backgrounds are strongly constricted to one country
- The acquired data suggests that cross-cultural differences are perceived as being negligible compared to other differences between people by engineers whose backgrounds have a strong international orientation
- Engineers with an international background tend to interpret cross-cultural differences as a strong form of individual differences

Identified patterns with respect to leadership style

- Engineers who chose engineering out of passion gave the impression of being less aware of the social components of leadership style than engineers who consider engineering "just" a profession
- Engineers with a background constricted to one country appear to be less aware of the social components of leadership style than engineers with an international background
- The acquired data suggests that engineers with a background constricted to one country achieve less in motivating their collaborators than engineers with an international background do

Identified patterns with respect to coping strategies

- Engineers with an international background seem to be more open to accepting other people's opinions and their help than engineers with a background constricted to one country
- Engineers with an international background seem to be more open to valuing other people's view and work approaches than engineers with a background constricted to one country

It is important to notice that these patterns base on a total of five datasets and can hence not be considered to be verified and/or validated. Therefore a supplementary survey with much more participants will have to be deducted. The analysis efforts performed failed to provide any background patterns with respect to decision making. The main factors determining the way decisions are made seem to be time constraints and schedules. With respect to problem solving strategies has been shown that there is no correlation between the participating engineers' attitude towards teamwork and background factors on the other side.

4 RESULTS

The analysis efforts described above have provided a number of patterns linking background information on engineers to certain behaviour in cross-cultural design engineering collaborative work.

The study outcomes presented here are drawn from the patterns identified above. These patterns are condensed to a few classes of outcomes, which are listed below:

- International experience raises design engineers' awareness of and their ability to deal with cross-cultural/ social concerns in the design process
- The type of motivation for being a design engineer influences the setting of priorities regarding the focus of design engineering work (design engineers who "love engineering" centre technical issues, design engineers who consider engineering "a job" rather centre social issues)
- Design engineers deal with cross-cultural differences in the very same way as with individual differences

These study results were used to deduce factors influencing cross-cultural collaboration in design engineering, based on the available data acquired during the study. It is important to note that the qualitative analysis of this data has only comprised of five complete data sets, so a verification of the results cannot be effectuated with the acquired data. Several influence factors have been deduced:

- Individual qualities and values unique to each person
- Level of international experience (high-low)
- Type of motivation for being an engineer (engineer by vocation – engineering as a job)
- Level of open-mindedness (high – low)

On the other hand, this study shows fairly clear that national culture – i.e. an engineer's origin – is not one of these influence factors. National culture turned out to be a concept that cannot be applied to small groups in design engineering collaboration as the ones observed during this study. Consequently – in this context – it cannot be a sufficient concept for describing differences in behaviour and performance in cross-cultural design engineering collaboration.

The results presented have been derived from a purely qualitative study with just five complete datasets. However, these datasets are very extensive and provide a deep insight into cross-cultural collaboration in design engineering. Due to the limited number of datasets – which is attributed to the time constraints for this thesis – no quantitative (i.e. statistical) analysis could be performed. This makes a very common problem of qualitative analysis evident: people (especially engineers) tend to trust study outcomes like figures or percentages from statistical analysis more than the rather verbal outcomes of qualitative studies. The belief that a higher number of datasets in quantitative analysis provides much more reliable results than "those few personal opinions" in qualitative research is a common thinking pattern. But on the other hand – unlike quantitative analysis with its requirement for numerous, possibly subjectively biased assumptions – qualitative analysis does not determine a very tightly constricted field of possible outcomes. Contrarily, the most interesting and valuable outcomes of qualitative analysis are the ones that had not been anticipated. In case of this research, the study results regarding "open-mindedness" have been unexpected by the authors, but finally make up an important part of the obtained results. "Open-mindedness" is an aspect not mentioned in both questionnaire and interview questions, and has been independently brought up by three of the interviewed engineers.

5 CONCLUSION

What are the consequences of these findings for the selection of productive and innovative design teams? First, the idea of a team combined of people from country A and B being more likely successful than a team combined of engineers from country A and C can be dismissed (given the same level of education). In small design teams, individual differences between the team members appear to be much more prominent than cultural differences. However these personal differences can give human resource managers and senior engineering management staff support in filling their design team with the right engineers, as recent research shows. Robins [10] argues a general predictability of – among others – academic success and job performance according to persons' individual predisposition of five defined domains. One of these domains is openness to experience, which is by definition closely related to "open-mindedness". The study results presented in this paper suggest making allowance for Robins' "openness to experience" domain when selecting staff for cross-cultural collaboration in design engineering.

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