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Prioritizing Cultural Influencing Factors – An Impossible Task?

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Abstract

The prioritization of cultural influencing factors on creativity in distributed product development teams is the aim of this contribution. Utilizing the KANO model, success factors and barriers are classified and prioritized through expert discussions and KANO questionnaires in two test groups. Results indicate that while all cultural factors are relevant, their prioritization is highly individual and context-dependent. The findings suggest that tailored support for creative problem-solving in distributed teams should consider the unique cultural dynamics of each team.

Keywords: supporting intercultural teams; creative problem-solving; distributed product development; culture sensitive support

1. Introduction

Intercultural team settings pose challenges but can also have specific opportunities [1,2]. To ensure that opportunities can be used and the challenges overcome, it is necessary to understand the cultural influences. Especially when it comes to creative problem-solving, cultural differences can play a major role [3]. Communication differences and difficulties in understanding why somebody is behaving a certain way can hinder creative processes. If the creative processes, then additionally take place in a distributed setting and need to be supported by technological tools, it can get even more difficult [4,5].

Since a multitude of development teams are working in a distributed setting [6,7] with the need to solve their development tasks creatively, understanding the cultural influences on these creative processes can help shed light on how to appropriately support this aspect. Different cultural influences have been found [8,9] and finding out how to evaluate and prioritize them, is the goal of this contribution.

1.1. Creativity in Distributed Product Development

Distributed Product Development in this contribution is understood as the form of product development in which the collaboration is characterized by a team in which at least one individual is spatially separated from the other individuals [10–12].

Creativity and collaboration are essential for teams to successfully reach their goals [13]. This importance extends beyond teams working in a distributed setting, as collaboration and creativity pose unique challenges for distributed teams. Research indicates that collaboration tends to be more seamless when teams are in the same location compared to when they are distributed [5]. In particular, creative processes may be perceived as more challenging in virtual teams [14]. [4] examined how different modes of communication (virtual or face-to-face) influence creativity. The conclusion is that face-to-face communication leads to better idea generation, highlighting the significant influence of communication and human interaction on creativity. However, the quality of the ideas and the decision of which idea to pursue may be independent of the mode of collaboration [4]. This finding is attributed to differences in the amount of information conveyed through screens compared to face-to-face communication and a narrowed visual focus that makes branching out and generating new ideas more challenging in a virtual setting. The need to support creativity is further confirmed by Dühr, who emphasizes that creative teamwork, an integral part of the

product development process, requires specific support in a distributed setting [15].

One way to support creativity is through the use of creativity techniques also called creativity methods. Previous research suggests that employing these techniques in a virtual environment can lead to different results than in person. The outcomes vary depending on the suitability of the chosen creativity method for a virtual environment [16].

Transferring creativity methods to virtual environments requires more than merely imitating local team workshops, as virtuality introduces new challenges and opportunities [17]. While these methods serve as valuable references for fostering creativity in (distributed) teams, there remains an opportunity to adopt a method explicitly focused on enhancing creativity in distributed contexts. To adopt a support method aimed at enhancing creativity while considering influencing factors, it is necessary to analyze and evaluate the success factors and barriers to creativity in distributed product development, as these aspects influence creativity in distributed teams.

The literature identifies 72 success factors, which are grouped into seven categories: *Team*, *Individual*, *Organization*, *Technology*, *Culture*, *Leadership*, and *Time* [9]. Additionally, 47 barriers have been identified, most of which fall into the Team and Individual categories [8].

1.2. Cultural Influences on Creativity in Distributed Product Development

Since the focus of this contribution is understanding the cultural influencing factors in the category *culture* better, they are listed in this chapter.

Success Factors:
- Heterogeneity
- Diversity
- Organizational culture
- Geographical distance
- Cultural difference
- Different background
- Social dispersion
- Psychological dispersion

The detailed explanation, which also part of the KANO questionnaire can be found in [9], as well as the literature in which each success factor was found.

Barriers:
- Cultural Differences
- Language Differences
- Different Expectations
- Conflict Solving

The detailed explanation as well as the literature in which each barrier is mentioned was also part of the KANO questionnaire and can be found in [8].

The collection of cultural influencing factors was done based on two systematic literature reviews, based on product development experience additional factors might be found. Some of the influencing factors are quite broad and include a lot of different aspects to them. *Heterogeneity* is one of these factors. *Cultural differences* can be seen as success factors and as a barrier to creativity in distributed product development

depending on the expression. Therefore, this factor is part of both lists. Both of the lists are not in a specific order and are not sorted by relevance.

Cultural influences on creativity are also relevant in non-distributed teams. The focus on distributed teams is due to these settings increasing popularity and relevance.

2. Research profile

2.1. Research aim and questions

The objective of this study is to prioritize the influencing factors based on their relevance, thereby identifying where support can most effectively enhance the creative problem-solving abilities of distributed product development teams. Given the diversity of these factors, a systematic organization of the various influences may serve as a basis to supporting intercultural teams.

- RQ1: How can the relevance of cultural influencing factors on creativity in distributed product development teams be evaluated?
- RQ2: How can cultural influencing factors on creativity in distributed product development teams be prioritized?

2.2. Research approach

The success factors and barriers to creativity were initially validated and discussed with the goal of prioritizing them, to be able to later on, build targeted support for creative problem-solving in intercultural distributed development teams. Here, an expert discussion was conducted with 14 experts for design methods in product development using a Miro tool [18]. As a basis for the discussion on the relevance of the different influencing factors, the categories of the KANO model [19]: Basic, Performance and Excitement Requirement were given as assistance for evaluating the relevance.

The expert discussion resulted in the wish for a structured approach to facilitate the prioritization of the influencing factors. Therefore, a questionnaire with precise descriptions of all the influencing factors was designed, including an explanation of the connotation within the Kano Model categories. Taking the advice of the experts into consideration that a structured KANO questionnaire would lead to clearer results, the second iteration was carried out with a Kano questionnaire instead of an expert discussion. The questionnaire was improved after this second iteration and the Kano questionnaire was sent to a second test group. This group consisted of 37 people experienced in working in a distributed and multicultural setting.

The KANO questionnaire consists of two main sections. The first section evaluates both cultural success factors and cultural barriers that impact creativity. These factors are individually assessed through functional and dysfunctional questions. Respondents are presented with five distinct response choices: 'I like that,' 'This must/needs to be so,' 'I don't care,' 'I can live with it,' and 'I don't like that.' The second section of the questionnaire presents a prioritization

table for a comprehensive assessment. Each cultural influencing factor is described briefly, and respondents rate its importance on a scale from 1 (indicating complete unimportance) to 7 (indicating utmost importance). In the revised version of the Kano Questionnaire, demographic details such as country of origin and field of study/profession are included at the beginning to enhance the analysis.

The Kano Model's categories—Basic, Excitement, and Performance Requirements—serve as a framework for classifying cultural influencing factors. Basic requirements represent fundamental necessities, performance requirements enhance satisfaction, and excitement requirements encompass unexpected features that contribute to high satisfaction. Additional categories can be derived from specific combinations of responses, as outlined by [19] p. 121: Indifference indicates that the characteristic is perceived as irrelevant by the respondent. Questionable arises when the question was either asked incorrectly, misunderstood by the respondent, or the wrong answer was marked by mistake. Reverse signifies that the criterion is undesired, and the opposite is expected by the respondent.

The evaluation process involves analyzing responses based on their frequencies and classifying the cultural influencing factors under basic requirements (M), excitement requirements (O), performance requirements (A), or indifferent requirements (I). If individual requirements cannot be clearly assigned to the different categories, the evaluation rule "M > O > A > I" (Bailom et al., 1996, p. 123) is applied.

The responses to the prioritization table are evaluated by computing the median. The median for each cultural influencing factor is determined by organizing and sorting the data from smallest to largest. To find the midpoint, the number of datasets collected is divided by two and the value lying at the midpoint is the median. In the first iteration, there was an even number of datasets therefore two values lying in the middle of the dataset were taken, added and divided by two. In the second iteration, the number of datasets was even, so the value in the middle of the dataset was taken directly.

3. Results

A critical aspect of developing a culture-based support method that assists with creative problem-solving is the comprehensive evaluation of the cultural influencing factors existing in the literature [8,9]. Special attention is to be paid since the support method is supposed to assist distributed product development teams. This section explores the methodology employed, explicitly using the KANO classification to examine the influence of diverse cultural factors on creativity within a distributed and multicultural setting.

KANO is the method of choice since it provides an approach that is supposed to make classification and prioritization possible. The KANO model has been adapted to suit the question in the following way: Customer satisfaction is not considered, but the satisfaction of each team member. In the Kano Model, product characteristics are categorized into three distinct groups: Basic, Performance, and Excitement [20,21]. These categories provide a clear framework for understanding

the classification system. According to [19] p. 118, basic requirements are mandatory criteria. Failure to meet these requirements results in extreme dissatisfaction, whereas their fulfilment is assumed by team members and does not enhance satisfaction. The fulfilment of a basic requirement merely achieves a state of "non-satisfaction." Basic requirements are inherently assumed by team members, taken for granted and not explicitly demanded. In contrast, performance requirements exhibit a proportional relationship between satisfaction and the degree of fulfilment: the higher the degree of fulfilment, the greater the satisfaction, and vice versa. Performance requirements are typically explicitly requested by team members [19]. Lastly, excitement requirements are the criteria that most significantly influence satisfaction. These requirements are not explicitly articulated by team members and are not anticipated. Meeting these requirements results in disproportionately high satisfaction, while their absence does not lead to dissatisfaction [19].

Utilizing this model, the discussion aims to differentiate between cultural influencing factors that are essential prerequisites (basic requirements), those that bring joy or exceed expectations (excitement requirements), and those that directly impact performance levels (performance requirements).

3.1. Expert discussion based on KANO

Given the multinational composition of the teams, product developers individually assessed the cultural success factors and cultural barriers using Miro [18]. These factors were then categorized into the Kano Model categories previously mentioned. The classification relied on the expertise of the product developers. For a more precise understanding, the following instruction was provided: barriers deemed imperative to overcome at any cost should be categorized as basic requirements. This initial assessment primarily focused on extremes, such as homogeneous versus diverse team composition.

However, the discussion underscores a critical challenge in aligning the categories of the Kano Model with cultural success factors and cultural barriers. Significant differences of opinion emerged regarding the appropriate classification of these influencing factors, illustrating the complexity of the issue even within an expert group of product developers.

As a result of the discussion, a structured approach for improved prioritization and classification is recommended. This approach would involve formulating a questionnaire with concise descriptions of the cultural success factors and cultural barriers, along with explicit clarification of the connotations within the Kano Model categories. The questionnaire aims to enhance precision and clarity in assessing cultural elements that influence creativity in distributed teams.

Based on the discussion with product development experts, it is concluded that a conventional Kano Questionnaire would be preferable. This questionnaire would allow experts to rate the cultural success factors and cultural barriers to creativity on a graduated scale.

3.2. Kano Questionnaire first Iteration

The first iteration of the KANO questionnaire was sent to the 14 experts, resulting in 10 fully completed answers which are evaluated in the following section. Furthermore, their feedback to the questionnaire was collected, to refine it and sent a second iteration to the second test group of experts for working in intercultural distributed settings.
Fig. 1 shows the results of the first section, the classification of the influencing factors in the KANO categories.
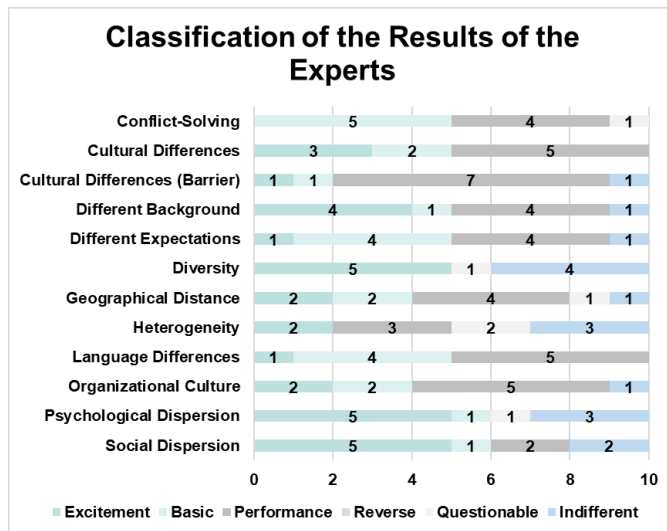

Fig. 1. Individual classification of results by participant of the first iteration of the KANO questionnaire

The second section of the questionnaire includes a prioritization table. Participants rate each cultural influencing factor on a scale from 1 (indicating minimal importance) to 7 (indicating maximal importance). The results are evaluated using the median. The findings show that there is no influencing factor with a median below 4. *Different Backgrounds* has the highest median of 7. *Diversity* and *Geographical Distance* with a median of 4 and *Cultural Differences* with a median of 4,5 are the ones rated lowest. All other influencing factors have a median between 5 and 6,5. The results of the second section can be seen in Fig. 2.

Requirement	1	2	3	4	5	6	7	Total	Median	Type	Abbreviation
Different Backgrounds		1			2	1	6	10	7,0	Performance Requirement	O
Heterogeneity	1			2		2	5	10	6,5	Performance Requirement	O
Conflict-Solving			1	2		4	3	10	6,0	Basic Requirement	M
Social Dispersion	2				2	6		10	6,0	Excitement Requirement	A
Organizational Culture	1	1	1		2	3	2	10	5,5	Performance Requirement	O
Different Expectations	1	1	1	3	2	2		10	5,0	Basic Requirement	M
Language Differences	1	3	1			1	4	10	5,0	Performance Requirement	O
Psychological Dispersion	2		2	3	3			10	5,0	Excitement Requirement	A
Cultural Differences	1	2	2	3	1	1		10	4,5	Performance Requirement	O
Diversity	1	1	3	1	4			10	4,0	Excitement Requirement	A
Geographical Distance	3	1	3	1	1	1		10	4,0	Performance Requirement	O

Fig. 2. Results of the prioritization table in the first iteration with the experts

3.3. KANO Questionnaire second Iteration

The questionnaire in the second iteration, adapted to the feedback from the experts in the first iteration, was administered to highly experienced individuals in distributed and intercultural settings. The results present a perception shift. None of the factors is classified as a basic requirement as seen in Fig. 3.
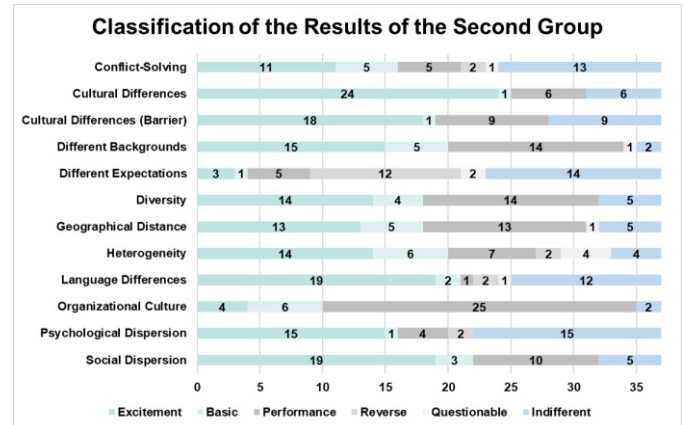

Fig. 3. Individual classification of results by participant of the second iteration of the KANO questionnaire

The results in the second section are evaluated just like in the first iteration. The findings show that all influencing factors either have a median of six (*Heterogeneity, Different Backgrounds, Organizational Culture, Language Differences, Diversity* and *Conflict-Solving*) or a median of five (all other factors) see Fig. 4.

Requirement	1	2	3	4	5	6	7	Total	Median	Type	Abbreviation
Heterogeneity			1	2	8	8	18	37	6,0	Excitement Requirement	A
Different Backgrounds				2	12	8	15	37	6,0	Excitement Requirement	A
Organizational Culture				3	10	11	13	37	6,0	Performance Requirement	O
Language Differences	1	2		3	4	11	16	37	6,0	Excitement Requirement	A
Diversity	1		1	6	9	6	14	37	6,0	Performance Requirement	O
Conflict-Solving		2	4	2	8	15	6	37	6,0	Indifferent Requirement	I
Social Dispersion			1	6	14	8	8	37	5,0	Excitement Requirement	A
Cultural Differences	1			7	14	11	4	37	5,0	Excitement Requirement	A
Different Expectations			7	4	11	11	4	37	5,0	Indifferent Requirement	I
Psychological Dispersion			7	6	12	11	1	37	5,0	Excitement Requirement	A
Geographical Distance	2	2		13	14	3	3	37	5,0	Performance Requirement	O

Fig. 4. Results of the prioritization table in the second iteration with the experienced individuals in intercultural settings

4. Discussion

The results of the KANO questionnaire for the first iteration show that a categorization in the categories of basic requirements, performance requirements, and excitement requirements is possible for the influencing factors but also that quite some factors are seen as reverse requirements by some respondents. Furthermore, for only having ten datasets the number of answers indicating indifferent and questionable requirements seems quite high. The answers stating this are spread across all factors. The number of answers indicating reverse requirements makes it visible, that even more factors

than literature states can be seen as success factors and as barriers at the same time.

The results of the second iteration of the KANO questionnaire show a similar picture. The factors can be allocated to the categories but not without quite some answers indicating indifferent as well as reverse requirements.

When comparing the results, only four out of ten influencing factors are categorized as the same kind of requirement within both iterations. Some factors that were seen as basic factors in the first iteration, the second iteration shows the indifference of the participants towards this factor. Here it becomes very clear, that these factors and how important an expert sees them, is not only dependent on the definition of each factor but very much on the personal assessment and experience. When looking at the individual results it seems to be a falsely accurate evaluation to even consider the categorization of factors that have been categorized the same in both iterations generally valid.

When looking at the median values in group one there was some variation in the answers with medians between 4 and 7. These were the results obtained by the group of experts in product development with a sample size of only ten participants. When looking at the results from the second group which is composed of 37 individuals working in multicultural team settings regularly, all factors either have a median of 5 or 6. In none of the groups, an influencing factor has received a result below 4. All of the factors seem relevant for both groups of experts answering the questionnaire.

Alternative ways of systematically analyzing possibilities to prioritize cultural influencing factors should be discussed as well. One alternative would have been to hold a panel discussion with experts to come to a shared conclusion on a prioritized list. We decided against this option due to the fact that communicating about these factors in discussions is difficult. Since this prioritization is very personal participants might not be willing to share their true opinions in a face-to-face discussion and only state what they consider to be socially acceptable. This can happen in questionnaires like our KANO questionnaire as well but is less likely since the results are treated anonymously.

A different style of questionnaire is another alternative that has been taken into consideration. More open questions asking for the cultural influencing factors have been used in prior contributions. Difficulties faced with questions focused on the individual factors led to difficulties in systematically analyzing the results which brought the author team to decide on the KANO questionnaire style.

After the results have been generated, the question if cultural influencing factors on creativity can be prioritized has also been raised in the special interested group for design creativity of the design society. The intercultural experts see a personal ranking as possible but dependent on the team, situation and organization. Also, the personal ranking can change and is influenced by more than just the cultural influencing factors. Furthermore, the interrelations between factors in the category culture and factors in other categories have been highlighted,

stating that these interrelations also influence a potential prioritization.

The try to prioritize the cultural influencing factors can be a hint but should not be rated very highly. With the experience of the questionnaire, the results are too individual to not be ranked differently by different groups of experts. The factors might even be ranked differently when asking the same experts again, just after they had different experiences. The categorization of cultural influencing factors is too personal and individual to be generalized. Therefore, the author team answers the research questions as follows:

RQ1: How can the relevance of cultural influencing factors on creativity in distributed product development teams be evaluated?

An evaluation of the results from Chapter 3 can be found in Chapter 4 but since the results are very divergent on the one side but consider all factors to be relevant on the other side, all cultural influencing factors can be considered relevant and should be taken into consideration.

RQ2: How can cultural influencing factors on creativity in distributed product development teams be prioritized?

A prioritization was made in Chapter 3 but the author team themselves recommended to not prioritize cultural influencing factors strictly. The relevance of cultural influencing factors is very much dependent on personal experience and should therefore be considered individually for a team instead of in general. It is to be made clear, that all factors are relevant and dependent on the team's situation some might need to be prioritized. This is the take that the author team would recommend after this study.

5. Conclusion and Outlook

The expert discussion with 14 experts for design methods in product development quickly resulted in the wish for a more structured KANO questionnaire, to be able to classify the cultural influencing factors on creativity in distributed product development appropriately. The KANO questionnaire was designed systematically and answered by 10 of the fourteen experts. They additionally gave feedback for optimizing the questionnaire. In the second iteration, the questionnaire was distributed to and answered by 37 individuals with experience in multicultural distributed team settings. The questionnaire contained two sections, in the second iteration a section on demographic details was added additionally.

The results of the two iterations with different experts on the topic were evaluated following the procedure shown in Chapter 2.2.

The results were unexpected but made one conclusion clear: a universally valid prioritization of cultural influencing factors is not possible since the evaluation of the relevance is very personal and depends on each individual's experiences.

It is important to know and consider the different cultural influencing factors, but which ones are most important should be decided individually for each team. The reevaluation of the relevance might also be done regularly since the relevance might change with the experiences of the individuals and the team as such.

Acknowledgements

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