

IS NEW PRODUCT DEVELOPMENT CULTURALLY BOUND?

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ABSTRACT

Changes in the business environment, responses of companies to these changes and the available information and communication technologies (ICT) pose a number of challenges to present and future product developers, as well as to educational institutions. An appropriate response to these challenges is to create a solid basis for strategies to combat stronger competition, since existing educational programs have provided this only to a small extent. Several European universities provided this basis with the development of an international design course European Global Product Realization (EGPR). The main objective of the EGPR course is to provide a stimulating working environment for students, where they can conquer the design competences needed for their future professional practice. The main focus is put on multidisciplinary, multinational and multicultural teams, using virtual technological developments in solving a new product development (NPD) problem at a global level. This paper studies how the growth of the course internationally affects the design process carried out. A survey was carried out among the students of the past four courses and the analysis shows that the cultural background of the students has significant effect on their perception of the courses' processes. This is a novel challenge that the developers of the course need to face in order to provide the highest level of knowledge possible to the students.

Keywords: Project work, interdisciplinary correlation, cultural diversity, creativity, virtual teams

1 INTRODUCTION

Contemporary organizations, faced with global competition and external environmental turbulence, require highly creative NPD teams to survive. To achieve the creativity in such environments the firms need to search outside the firm and use external resources of recruitment in order to achieve effective NPD. This trend, combined with geographic dispersion, technology development and increased growth of teamwork in organizations resulted in formations of virtual teams of people who work interdependently across space, time and organizational boundaries on solving NPD problems ([1]). Such teams are presumed to be more creative, because they are not bound by the local resources, organizational boundaries and climate. They are increasingly becoming crucial components of a firm's overall marketing strategy.

With the development of such teams the question of their effectiveness and creativity in NPD is therefore raised. Furthermore, as Hoffman [2] points out, there is a comparatively small body of research that has examined innovation across cultures. An in-depth literature study within this field has been performed by the authors, but studies examining cultural differences of NPD processes within innovation were not found. There is therefore a need to further study this phenomena and the presented paper is a response to this need.

It is based on a study of creativity within virtual teams, presented in the work of Nemiro [1], [3]. To provide argumentation for the studied model, we carried out a sample survey among the student teams participating in an international, multicultural design course EGPR in 2007, 2008, 2009 and 2010. The main focus of our study is to test the cultural aspects on virtual teams formed in design courses.

2 THEORETICAL FRAMEWORK AND HYPOTHESES

The theoretical framework, presented in this paper is based on the presumption that virtual teams allow companies to tap into the best talent to create the highest quality and fastest response to customer needs [4]. They can leverage their expertise by putting people together without relocating

them. Such structures are presumed to influence the levels of NPD effectiveness and team creativity as they offer openness, flexibility and diversity.

On the other hand, they are formed out of members that usually come from different cultural backgrounds, either organizationally or nationally. In almost all cultures creativity and innovation are viewed positively, but there is variability as to its relative importance, role and function and the domain of relevance [5]. With this notion in mind, we put forward our hypotheses.

2.1 Cultural aspects of creative NPD

Culture is the collective programming of the mind which distinguishes the members of one group or category of people from another [6]. In order to be able to measure different aspects of culture, [6] has conducted empirical research within the field and was able to determine four dimensions of national culture: power distance, uncertainty avoidance, collectivism vs. individualism and masculinity vs. femininity. These dimensions define a specific culture and consequently affect the performance level of teams. For the purposes of our study power distance and uncertainty avoidance are the two relevant dimensions of national cultures, due to the fact that virtual teams are formed as a type of temporary organizations, functioning under specific rules in order to perform a task/solve a specific problem. [6] defines several clusters of national cultures according to their index scores within these two dimensions. The national cultures studied within our case fall into two of these clusters: “village market” and “pyramid of the people”.

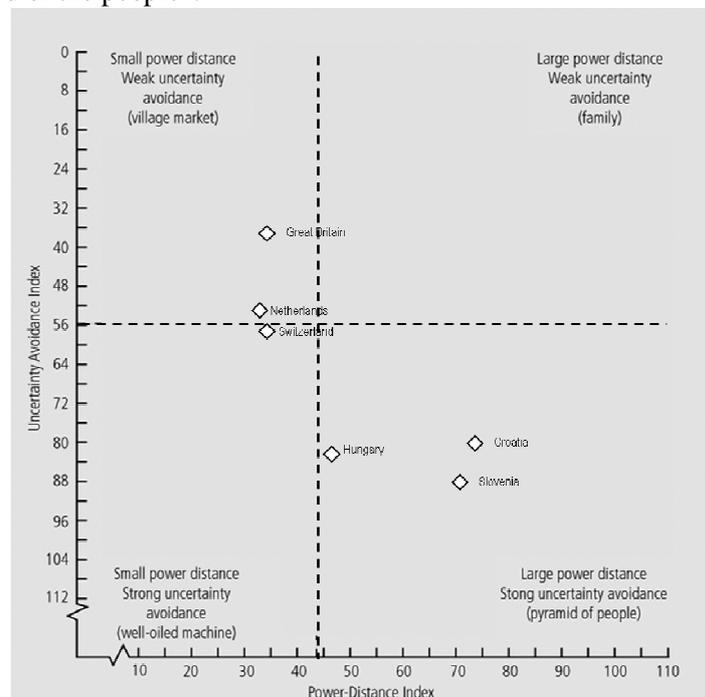


Figure 1. Cultural map for Uncertainty avoidance and Power distance for the studied countries (adapted from [6])

These two clusters differ according to the studied dimensions, i.e. “pyramid of people” type of national cultures are strongly oriented towards collectivism and have high power distance and uncertainty avoidance levels within their culture [6]. These characteristics put them opposite to the “village market” type of national culture where the orientation is individualist and the levels of power distance and uncertainty avoidance are low. Where on the continuum the national cultures represented within EGPR can be found is shown in figure 1.

We will test, how the perception of effectiveness and working in virtual teams varies within different national cultures. Due to the presented cultural differences, we therefore presume:

H0: The perception of effects of working in virtual teams on NPD effectiveness differs between types of national cultures.

To test this hypothesis regarding the effect of cultural diversity within the virtual teams, we followed [6] example and separated the data gathered with the questionnaire survey into two clusters with regard to the University origin – “village market” (Great Britain, Switzerland and the Netherlands) and

“pyramid of people” (Hungary, Slovenia and Croatia). On these two types of national cultures we tested the presumptions presented below.

2.2 Virtual teams and creative NPD

Virtual teams are defined as groups of individuals collaborating in the execution of a specific project while geographically dispersed, possibly beyond the boundaries of their parent organization ([1]; [4]; [7]). These teams are deemed to have the capability to solve the most complex problems due to the diversity in skills and competences of their members [8]. Combining the presented knowledge and the theoretical framework, our first hypothesis therefore presumes:

H1: Working in virtual teams has a direct positive effect on NPD effectiveness.

Such teams can work faster, smarter, more creatively and more flexibly [9]. Since creativity requires loose settings, free spirits and a lack of strict boundaries [5], such teams should foster creativity. We therefore hypothesize:

H2: Working in virtual teams has a positive effect on creativity in NPD.

Furthermore, organizations involved in NPD have to adopt flexible, dispersed methods of working to meet the numerous and varied demands of the global marketplace. Thus, virtual teams come together to perform a specific NPD task. Their NPD project meetings are carefully structured and planned in order to ensure highest effectiveness possible in this time. With this notion, we hypothesize:

H3: Working in virtual teams has a positive effect on the design process.

2.3 Creativity in NPD

The design process is defined as an innovative process, whereby the inputs into the process are creative ideas and the final result is a definition of the final product. Each phase of the design process requires specific knowledge and skills to assure a successful transition to the next phase, whereby creativity is essential to start it. It provides a critical point for a firm's performance in a complex and changing environment [10]. We therefore hypothesize:

H4: Creativity has a positive effect on the design process within the virtual environment.

The recognition and definition of the problem is an activity guided by an individual or group within a firm intending to identify a new business opportunity. The key activity in this process is idea generation, in which creativity plays a crucial role. As it is seen as one of the factors influencing the design process and its output, we consequently hypothesize:

H5: Creativity within virtual environments has a positive effect on NPD effectiveness level.

2.4 The phases of the design process

Nemiro ([1]; [3]) argues that virtual teams follow a path of four stages in the quest toward the production of creative results: idea generation, development, finalization and closure, and evaluation. It is crucial to realize that these stages may not be mutually exclusive and the activities can overlap and reoccur in another stage. However, the establishment of procedures and forums for team members to clarify their goals, get feedback from one another and ensure accountability has an important role in final NPD success [3]. On the basis of this notion, we hypothesize:

H6: A structured design process in virtual environments has a positive effect on NPD effectiveness level.

3 METHODOLOGY

3.1 Data collection

To test our hypotheses we collected data from students that participated in the EGPR course in 2007, 2008, 2009 and 2010. 81 participants out of 156 responded to the questionnaire, giving the effective response rate of 51,9 %.

3.2 Measures

The questionnaire consists of items that assess the design phases, creativity in the virtual teams and the overall NPD effectiveness (for details see [4]). All the items are taken from well-established and validated scales [3]. The questionnaire has been modified according to findings of [4]. A shorter questionnaire has also proven to be more user friendly and has produced a higher response rate.

All the items were measured on 7-point Likert type of scales. Each mechanism was given a composite score created by averaging the scores of the items. To be able to test the hypotheses among different cultural groups, the students were also asked to state their origin University. With regard to the cultural indexes [6] of the country of origin, two clusters of national culture types were formed for the analysis (as shown in figure 1) – “village market” (The Netherlands, United Kingdom and Switzerland) and “pyramid of people” (Slovenia, Croatia and Hungary).

4 RESULTS

To validate our hypotheses we utilized the structural equation modelling (SEM) for data analysis. We used the partial least squares (PLS) technique of SEM that utilizes a variance-based approach for estimation. We used SmartPLS 2.0 [11] for performing the analysis. Two assessments are supported by PLS: (1) the measurement model assessment, where item reliability, convergent and discriminant validities of the measurement scales are examined and (2) the structural model assessment, where information related to item loadings and the strength of the paths in models is presented. The path significance levels using t-values are estimated by the bootstrap method.

We have conducted two separate PLS analyses for both studied types of national cultures. The differences between the gained results will confirm/reject the postulated hypotheses.

4.1 Assessment of the measurement models

Internal consistency is demonstrated when the reliability of each measure in a scale is above 0.7. As shown in table 2 we assessed internal consistency by measuring composite reliability. All of the measured constructs have the composite reliability exceeding the recommended 0.7 indicating adequate internal consistency. The composite reliability of the construct virtual teams is 1.0 as this construct was measured by only 1 item. For “pyramid of people” type of national culture the composite reliability for creativity is also 1.0 as some items measuring creativity were taken out of the analysis, as the factor analysis showed they had loadings that did not exceed 0.6.

For adequate discriminant validity it has been recommended that the following three conditions be met: (1) the square root of AVE of all constructs should be larger than all other cross-correlations; (2) all AVE should have values above 0.5; and (3) the principal component factor analysis should have item loadings greater than 0.6 on their respective constructs, and no item should load highly on any other construct [12].

Table 1. Measure validation of the two national culture types

Construct	Composite reliability		AVE		1.	2.	3.	4.
	Pyramid of people	Village market	Pyramid of people	Village market				
1. Virtual teams	1,000	1,000	1,000	1,000	1,00	-0,071	-0,028	0,078
2. Creativity	1,000	0,746	1,000	0,500	0,211	1,00	0,029	0,566
3. Structured design process	0,940	0,942	0,641	0,673	0,275	0,774	0,97	-0,134
4. Perceived NPD effectiveness	0,875	0,902	0,780	0,757	0,064	0,654	0,666	0,94
								0,87

Note: (1) the bold fonts in the leading diagonals are square roots of AVE; (2) off-diagonal elements are correlations among constructs; (3) “Pyramid of people” sample correlations are above the diagonal; the “village market” sample correlations are below the diagonal.

Convergent validity is adequate if each of the constructs in the model has an average variance expected (AVE) of at least 0.5 [21]. AVE measures the percentage of the overall variance for indicators represented in a latent construct through the ratio of the sum of the captured variance and the measurement error [12].

The results in table 2 indicate that all correlations between constructs were lower than the squared root of AVE (the principal diagonal element) and all AVEs were above the 0.5 threshold. The SmartPLS confirmatory analysis also showed that all items included in the analysis loaded on the construct for which they were designed to measure. Thus, the discriminant validity of the scales used for this study is adequate.

4.2 Assessment of the structural model

SmartPLS 2.0 provided the squared multiple correlations (R^2) for each construct in the model and path coefficients (β) with other constructs also given. The R^2 indicates the percentage of a construct's variance in the model, while path coefficients indicate the strength of relationships between constructs [20]. The results of the PLS analysis are shown in figure 2 for both “village market” (**bold**) and “pyramid of people” (*italics*).

When comparing the results for “village market” with the original framework ([1]; [3]; [4]), it can be seen, that most of the original hypotheses were supported. Contrary to the testing of hypotheses for “village market” type of national culture, the results for “pyramid of people” type of national culture have not supported the original model. Only the fifth hypothesis (H5) was supported, as creativity has proven to have a direct positive effect on the perceived NPD effectiveness ($\beta=0,579$; $t=6,049$).

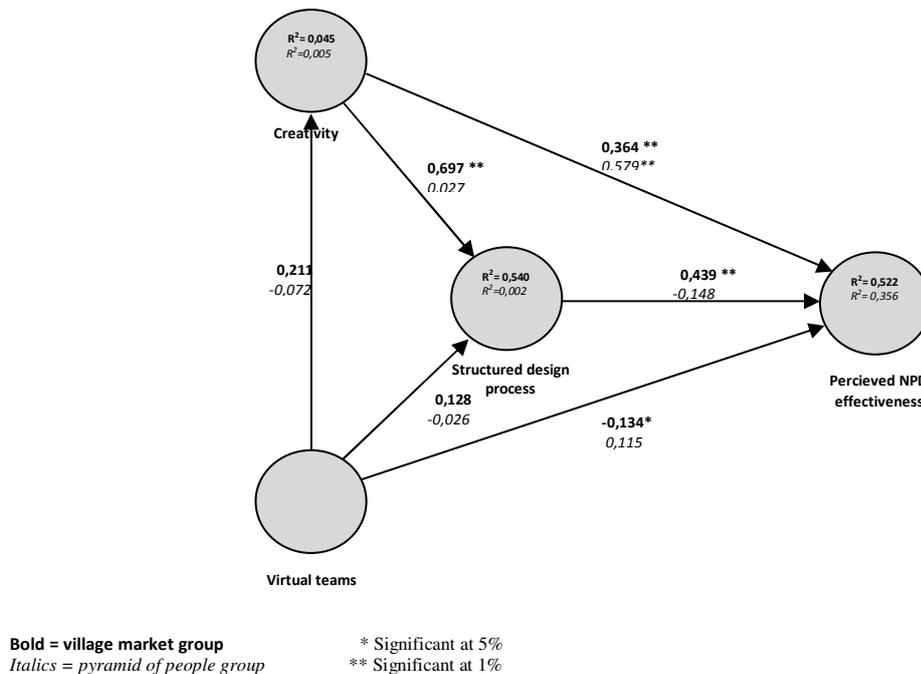


Figure 2. Summary of the two types of national cultures path model analysis

Testing the framework within different types of national cultures has proven to give very different results, thus giving support to our H0 - the perception of effects of working in virtual teams on NPD effectiveness differs between national cultures.

5 DISCUSSION

The results show that two distinct perceptions about NPD effectiveness have formed within the two national culture types. We find the explanation for this within the cultural characteristics of the studied national culture types. The students coming from the “pyramid of people” national culture have been raised within the environment where strict rules need to be followed and procedures, such as the design process, are strictly formalized and structured, whereby the students from “village market” national culture type were not faced with such strict rules and procedures. The students from the “pyramid of people” national culture type therefore do not perceive the structure of the process and organization of the team as relevant for NPD effectiveness, as these are part of their culture and they attribute all influence to creativity. On the other hand, the students from the “village market” national culture type perceive all, the softer aspects of NPD, such as creativity as important as following a certain structure. The two national culture types therefore differ in their perception of what are the relevant factors for NPD effectiveness.

These results show that special care needs to be placed on the cultural aspects of team forming, as different perceptions of team members can have a relevant effect on the outcome of the NPD process. We therefore propose that Nemiro's model is upgraded with the cultural dimensions, however further research is needed in order to define the novel model framework.

The presented study has some limitations that should be considered in future research. First of all, the research was done within educational environments, on a relatively small sample and the types of cultures were determined by taking into account only two of the relevant cultural dimensions.

As there are several clusters of national cultures the presented study should be repeated with their consideration. Also, the presented results are actually perceptions that the students have on their work, which calls for caution when applying the studied concepts to other contexts. Finally, the study defined the NPD process up to the prototype development, therefore terminating before the actual market introduction where the actual NPD effectiveness could be measured with validated measures. This calls for repetition of the study within other NPD environments. We however believe that the presented research combined good business practice with educational practice, therefore giving valid results.

6 CONCLUSION

The presented research aimed at testing if creative NPD functions differently within virtual environments that comprise out of different cultural backgrounds. Since the research was done on a design course, the results show the perception of students with regard to the model put forward by Nemiro ([1]; [3]) and their own cultural background. The results show that two distinct perceptions about NPD effectiveness have formed within the two national culture types, meaning that special care needs to be given to the cultural aspects of NPD.

As global competition has grown, the need for creativity, expertise and information has expanded beyond the boundaries of individual organizations and the creation of virtual teams has developed as a response to the need for changes in design practice. Virtual teams are developing as the optimal way to work in the 21st century to assist organizations in meeting the challenges of developing new products for the global market. Teaching the students such practice can be efficient and beneficiary for their future design work.

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