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**STUDIES CONCERNING THE ROLE OF  
PROJECT TEAMS IN THE VIRTUAL  
ENVIRONMENT ON THE  
INTERNATIONAL PROJECT  
MANAGEMENT PERFORMANCE**

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# KEYWORDS

International project management, project teams in the virtual environment, project success, team performance, neuromanagement, influence factors, principal component analysis, modeling, data mining, neural network, C5.0 algorithm.

## 1. INTRODUCTION

The phenomenon of globalization has determined the expansion of projects beyond national boundaries, generating changes in the global economy, the world's industries and societies, and at the same time also imposed a re-adaptation and updating of project management techniques and processes.

The need for the theme is that, although “international projects and virtual teams are a reality in recent years, as well as a growing phenomenon, there is a low degree of research in this area, which is why many of the international project managers are still quite intimidated by the use of teams in the virtual environment”<sup>1</sup>. The failure rate of international projects, according to the Standish Chaos report in 2009, is 80%<sup>2</sup>, this being confirmed by academic research and, of course, depending on different definitions that characterize the failure of a project (the desired results are not achieved, exceed the budget or the time period set). Instead, in the 2015 report, Standish Chaos changed the definition of success of a project, moving from a definition centered on meeting time, cost and purpose constraints, to a definition in which it suggests that success does not necessarily mean , achieving a predefined goal, but rather achieving a satisfactory result. This change led to a modification in the results of the report, from a success rate of 27-31% to 36-41%<sup>3</sup>. This reduced international project success rate is due to their complexity, high risk, changes that occur during the project, and the inability to accurately estimate time and cost. For this reason, we believe that evaluating the success of an international project should be reported, firstly, to meeting the quality requirements for deliverables and customer satisfaction. By presenting a complete and

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<sup>1</sup> Dumitrașcu, Iulia, Dumitrașcu, D., D., *How to face globalization challenges through international project management*, Revista de Management și Inginerie Economică, ISSN 1583-624X, Vol. 14 n° 3 (57), Todesco Publishing House, 2015, disponibil la <http://www.rmee.org>.

<sup>2</sup> Curlee, Wanda, Gordon, Robert, L., *Complexity Theory and Project Management*, p.61, John Wiley and Sons, Inc., Hoboken, New Jersey, 2011.

<sup>3</sup> Dunbar, Gordon, *Project Management Failures - Standish (Chaos) reports (1994-2015)*, 2016, disponibil la <https://www.linkedin.com/pulse/project-management-failures-standish-chaos-report-2015-dunbar>, accesat la 10 ianuarie 2018.

clear view of international projects and team management in the virtual environment, companies can be encouraged to engage in international projects and to invest more and more in virtual project teams, “for generating knowledge, stimulating creativity, creating innovations, having a direct impact on competitive advantage”<sup>4</sup>.

“As a result, the growing role of this type of project calls for a thorough study of its features and dimensions, as well as the changes it generates at the level of traditional project management structure”<sup>5</sup>. At the same time, to ensure the success of international projects, organizations need to know how to build a team in the virtual environment, understand how it works, know the advantages and disadvantages of using the team in the virtual environment, how to select the most appropriate virtual tools - supporting the collaborative processes within the team, as well as presenting specific motivation techniques, in order to increase the performance and the degree of involvement of the team members.

The theme proposed for research and titled „**Studies concerning the role of project teams in the virtual environment on the international project management performance**”, falls and contributes to the CNCSIS priority areas as follows: **Domain 9** – Socio-Economic and Humanistic Research, **Research Division 9.1** - New Managerial, Marketing and Entrepreneurial Methods for Organizational Competitiveness, **Research theme 9.1.1** – Knowledge based management, **Research theme 9.1.4**. Organizational Managerial Systems and Organizational Mechanisms Focused on Innovation and **Research theme 9.1.11**. Innovation and competitiveness through the international transfer of managerial know-how.

The central objective of the doctoral thesis is to identify the main challenges regarding the management of virtual teams in international projects as well as effective solutions to overcome them in order to increase the virtual team performance in order to increase the international projects success rate. As general objectives, we distinguish:

- presentation of the current state of scientific knowledge in the field of international project management;
- the systemic analysis of the international project system, the main elements of the system, as well as the forces of influence on its success;
- Influence analysis of the virtual project team's performance and the culture built within it, on increasing the international project success rate.

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<sup>4</sup> Dumitrașcu, Iulia, Dumitrașcu, D., D., *op.cit.* , 2015.

<sup>5</sup> Dumitrașcu, Iulia, Dumitrașcu, D., D., *op.cit.*, 2015.



Following some causes leading to the failure of international projects identified in the scientific literature, the starting point in the research is the idea that the lack of performance of project management is due to poor management and performance of the project team, especially, the project team in the virtual environment. Thus, the hypothesis of the research are as follows:

- **Hypothesis 1:** Virtual project teams efficiently managed determine a high performance of international project management, and thus an increase in their success rate.
- **Hypothesis 2:** The dimensions of the national culture, to which members of the international virtual project team belong, influence the team performance.
- **Hypothesis 3:** Appropriate selection of the online collaboration tools, taking cultural aspects into account, positively influence the performance of international project teams in the virtual environment.
- **Hypothesis 4:** The selection of international virtual project team members should be based, mainly, on their soft skills.
- **Hypothesis 5:** International projects with teams in the virtual environment have a culture characterized by the following dimensions: orientation towards objectives, balanced external orientation, relaxed discipline, professional dimension, team members orientation, closed system, high level of leadership style acceptance, high degree of identification with the project.
- **Hypothesis 6:** Appropriate selection of virtual platform and high degree of simulation of physical reality positively influence the virtual project team performance.
- **Hypothesis 7:** The neuromanagement techniques applied to virtual project teams management determines an increase in their performance.

The research methodology to be used includes different methods: bibliographic research, in-depth interview, questionnaire survey method, univariate, bivariate, multivariate statistical analysis and modeling technique.

Various secondary sources, such as books, scientific articles from different journals, research reports, specific management information found on the websites of specialized institutions in this field, will be used in the bibliographic research. Regarding the research methodology from primary sources, we will approach a mixed, qualitative and quantitative method through in-depth interview and opinion questionnaire, aiming at testing hypotheses, determining relationships between variables

and creating predictive models. The survey questionnaire will be structured in seven parts and will contain items in the form of a closed questions with standardized, in scale, dichotomous, polyhotomic answers, but also open questions to get richer responses from respondents . The questionnaire will mainly collect quantitative data. The collection of qualitative data will be mostly done through the semi-structured in-depth interview method, which will be addressed to a small sample of international project managers, belonging to different cultures and nationalities, in order to obtain richer information and different views on the management of international projects with teams in the virtual environment. To analyze the quantitative and qualitative data that will be collected through the questionnaire, we will use IBM SPSS Statistics and IBM SPSS Modeler. Univariate analysis involves presenting the characteristics of the variables measured in the research. In the bivariate analysis, the relationship between two variables will be analyzed through cross-tables. Multivariate, factorial analysis will allow for the identification of different correlations between several variables. The modeling technique will analyze the behavior of various factors of influence, which will allow the creation of predictive models.

Regarding the structure, the doctoral thesis is organized in three parts: I. Current state of scientific knowledge in the field of international project management; II. Systemic analysis of international projects with teams in the virtual environment; III. Study on the role of virtual project teams in increasing the success rate of international projects. To these will be added the chapter of final conclusions, personal contributions and future directions of research.

## **PART I. CURRENT STATE OF SCIENTIFIC KNOWLEDGE IN THE FIELD OF INTERNATIONAL PROJECT MANAGEMENT**

The main objective of the first part of the thesis is to present the current state of scientific knowledge in the field of international project management in order to establish the main research directions and the specific objectives are the following:

- Define the conceptual elements in the field of international project management and present the different opinions of the authors, who approached this field;

- Highlight the importance of using virtual teams in international projects, taking into account the advantages and disadvantages;
- Establish the dimensions and features of the team in the virtual environment;
- Identify the skills needed by the international project manager to efficiently manage a team in the virtual environment;
- Identify the challenges that international project managers encounter in managing teams in the virtual environment.

In the first part of the thesis we will analyze the conceptual elements of the international project and virtual project team management, based on the bibliographic research, from sources belonging predominantly to the foreign literature. Thus, in Chapter 2, will be presented the evolution of the international projects, will be defined the terms of the international project management, the types of international project and will be identified their characteristics and the challenges related to their management. Also, the presentation of the main differences between a standard and an international project, as well as the determining criteria for ensuring the international project success, are issues of particular importance. Within Chapter 3, will be approached the conceptual elements of virtual project team management, definitions of terms used in this field, will be presented the characteristics, advantages and disadvantages of the international virtual project teams, as well as the challenges of managing this type of teams project. At the same time, aspects related to highlighting the skills of the international project team manager, proposing a model for the abilities required for the international virtual project team members, as well as analyzing certain online collaboration technologies, represent elements of great importance in the development of empirical research. Chapter 4 contains conclusions on the state of scientific knowledge in the approached field.

## **PART II. SYSTEMIC ANALYSIS OF INTERNATIONAL PROJECTS WITH TEAMS IN THE VIRTUAL ENVIRONMENT**

Part II of the thesis comes to complete and deepen the results of the bibliographic research from the first part of the thesis, helping to clarify the way in which

international projects with teams in the virtual environment work, by proposing a theoretical model. It clarifies how it functions, explains how the system elements interact, and shows how the system interacts with the environment. At the same time, for a more accurate description of the system and to contribute to a better understanding, we will analyze the attributes that uniquely identify and differentiate the systems of the same category. In order to highlight the complexity of the international project system, we will represent the project management as a subsystem, through the subsystems that compose it, and we will analyze in detail the subsystem of the international project team from the virtual environment, considering the importance of human resources in system operation.

Thus, the general objective of the second part of the paper is to analyze the international project-system way of operation, the main elements of the system, as well as the forces of influence on its success. The specific objectives are:

- Establish how the national cultural dimensions of the virtual team members influence the team performance;
- Establish the type of culture to be built within the team from the virtual environment, according to the Hofstede and Waisfisz organizational cultural model, to ensure its high performance;
- Establish how virtual team members should be recruited;
- Identify the degree of virtual communication between team members so that this communication have a positive impact on team performance;
- Identify the most effective computerized communication tools, taking into account cultural aspects;
- Establish how the virtual platform should be chosen and identify the extent to which virtual reality needs to simulate physical reality to build an effective virtual team;
- Establish the implementation methods of neuromanagement techniques in the international virtual project team's management, in order to overcome the specific challenges and ensure the performance.

In Chapter 5 are presented the elements specific to the international projects in a systemic approach, with emphasis on the management process and highlighting its importance in ensuring the international project success. Chapter 6 addresses the project team in the virtual environment as a subsystem of the international project, focusing on intercultural communication and the analysis of the six national cultural dimensions

influence on preferences for certain online collaboration tools and on motivation for virtual work. Also of particular importance are the proposals regarding the cultural model of the international project with teams in the virtual environment and the introduction of some elements of neuromanagement for a better efficiency of the virtual project team. Chapter 7 contains conclusions on the aspects studied in the second part.

## **PART III. STUDY ON THE ROLE OF VIRTUAL PROJECT TEAMS IN INCREASING THE SUCCESS RATE OF INTERNATIONAL PROJECTS**

The results of the bibliographic researches carried out in parts I and II of the thesis represent the theoretical informational support base in constructing the hypotheses of the empirical study undertaken in part III of the paper, in order to analyze the relationships of influence, mainly, between the international project success, virtual team performance and the culture built within the international project. Through a combined research method, which includes the questionnaire survey conducted through electronic means, as well as the in-depth, semi-structured, online and telephone interview, we will collect quantitative and qualitative data that will be statistically analyzed , respectively, qualitatively interpreted, in order to validate the research hypotheses. We will also process the data obtained using the modeling technique to validate the proposed theoretical model.

The general objective of the third part of the thesis is to analyze the influence of the virtual project team's performance and the culture built within it, on the increase of the international projects success rate.

The specific objectives are:

- Highlight the importance of research regarding the management of the international project team in the virtual environment;
- Identify the factors that influence the success rate of international projects;
- Identify the factors that influence the international virtual project team performance;

- Highlight the positive influence of virtual project teams in increasing the international projects success rate;
- Identify the degree of awareness regarding the influence on the team performance of the dimensions of the national culture to which the international virtual project team belong;
- Establish the main factors that generate motivation and satisfaction in working in the virtual environment;
- Establish the main professional skills required for international virtual project team members;
- Identify the degree of virtual communication between team members so that this communication have a positive impact on the international virtual project team performance;
- Identify the most effective computerized communication tools, taking the cultural aspects into account;
- Validate the culture dimensions of the international project with teams in the virtual environment, which ensure high performance;
- Identify to what extent neuromanagement techniques are applied in order to enhance the international virtual project team performance.

The seven hypotheses of the study undertaken were presented in the introductory part of the paper.

Chapter 8 presents research methodology, qualitative and quantitative research methods, and analysis of collected data. Thus, the data collected through the in-depth interview will be qualitatively interpreted and the data collected through the questionnaire survey will be statistically analyzed using the IBM SPSS Statistics program to validate the research hypothesis. We will also process the data obtained using the modeling technique through IBM SPSS Modeler. Chapter 9 contains conclusions on the results of research on the role of international project teams in the virtual environment in increasing the international projects success rate.

## **10. FINAL CONCLUSIONS, PERSONAL CONTRIBUTIONS AND FUTURE RESEARCH DIRECTIONS**

This chapter summarizes the findings of the entire research, personal contributions, their dissemination through participation in conferences and their publication in recognized journals, as well as future research directions and research limitations.

## 10.1. FINAL CONCLUSIONS

The researches undertaken and presented in the previous chapters have contributed to the achievement of the central objective of the thesis, namely to identify the main challenges regarding the management of international project teams in the virtual environment, to identify solutions to overcome them in order to increase team performance and to establish a direct correlation between the virtual team's performance and the international project success, a result of a high performance project management. Thus, we can state that through the results obtained, the doctoral thesis makes important contributions to the development of the international project and virtual team management.

### **Within the research, the following hypotheses were validated:**

- **Hypothesis 1:** Virtual project teams efficiently managed determine a high performance of international project management, and thus an increase in their success rate.

Through the principal components analysis using the IBM SPSS Statistics program, we have obtained relevant information on the factors of influence on the international projects success and the decision to create a project team in the virtual environment as opposed to creating a traditional team is a component with a high weight within one of the two factors identified with major influence on the international project success. Also, through the modeling technique, using a data mining algorithm - a neural network in the IBM SPSS Modeler program, a predictive model has been created, where the most important predictor identified is 'Setting up a virtual team vs. collocated team'.

- **Hypothesis 2:** The dimensions of the national culture, to which members of the international virtual project team belong, influence the team performance.

Through the principal component analysis, we have identified that cultural aspects are one of the major factors influencing the international virtual project team

performance. The variable 'selection of virtual project team members, taking into consideration the characteristics of their national cultures' and 'selection of online collaboration tools, taking into account the project team members national culture aspects' registered a very high weight. Thus, Hypothesis 3 was also validated. At the same time, the predictive model created by the C5.0 data mining algorithm revealed that two of the most important fields underpinning the decision tree are: 'team culture' and 'selection of virtual project team members, taking into consideration the characteristics of their national culture'.

- **Hypothesis 3:** Appropriate selection of the online collaboration tools, taking cultural aspects into account, positively influence the performance of international project teams in the virtual environment.

This hypothesis has been validated, as we have explained above, through factorial multivariate analysis, the principal component analysis.

- **Hypothesis 4:** The selection of international virtual project team members should be based, mainly, on their soft skills.

The majority of respondents chose as the main skills needed for the international virtual project team members, the soft ones: collaborative skills (teamwork, patience, fairness, ethics), behavioral traits (self-confidence, creativity, tolerance to unpredictability) and interpersonal communication skills. At the same time, most of the respondents argued that the main aspect of influence on team performance is the selection of virtual project team members, based on the skills and abilities required in the virtual work environment.

- **Hypothesis 5:** International projects with teams in the virtual environment have a culture characterized by the following dimensions: orientation towards objectives, balanced external orientation, relaxed discipline, professional dimension, team members orientation, closed system, high level of leadership style acceptance, high degree of identification with the project.

Seven of the eight proposed dimensions were supported by the majority of the study participants. The two dimensions that registered a lower percentage are the flexible internal structure of a project and the fact that there is a focus on team members and responsibility for their well-being. The model has also been validated by analytical factors. By applying the principal component analysis, we found that the dimensions of the model proposed for analysis were validated through the following characteristics evaluated by the respondents through the



opinion questionnaire: the international virtual project teams pursues the client requirements, the team members are able to take risks , the selection of members is based on the skills required in the virtual environment, trust and connections between members are built at a slow pace and the fact that the international project has a flexible internal structure, low control and high degree of improvisation. These dimensions have the highest proportion in defining CMIP-TVE.

- **Hypothesis 6:** Appropriate selection of virtual platform and high degree of simulation of physical reality positively influence the virtual project team performance.

Most of the research participants responded that the performance of the virtual project team can be enhanced by advanced online collaboration tools that simulate as much as possible physical reality. Thus, we have found that online collaboration technologies still need to be improved to ensure greater communication efficiency and high socialization levels as close as possible to traditional teams. In addition to the question of the efficiency of collaborative technologies, video-conferencing with graphical support and desktop and file sharing functions has been found to be on the first place, as it brings together all means of communication. In this way the disadvantages of lack of physical presence could be limited.

- **Hypothesis 7:** The neuromanagement techniques applied to virtual project teams management determines an increase in their performance.

Following the factorial analysis on the data set obtained in the third question of the research, regarding the influence factors on the virtual project team performance, we identified three factors of major influence and the second one includes the variable regarding the techniques of neuromanagement, represented by the use of cognitive skills training programs for project team members, which has registered a high level of influence. Also, the predictive model generated by modeling technique revealed that the main predictor in the decision tree construction is the 'use of cognitive skills training programs for project team members'.

**The main conclusions regarding the current state of scientific knowledge in the field of international project management with project teams in the virtual environment:**

- Following the literature review, we found that there is insufficient research in the field approached as a result of the novelty on this topic. The lack of information limits and confuses the project managers who follow and apply the techniques and management methods appropriate to the traditional project, which leads, to a large extent, to the failure of the international project. Also, there are no studies on the influence of the project team in the virtual environment on the performance of the international project management and therefore, on its success.
- Romania's specialized literature approaches this field to a very small extent, which is why the construction of the theoretical basis of research has mainly been supported on foreign literature.
- We have found a need to highlight the complexity of international projects in order to raise awareness among organizations and international project managers, to understand the need to adapt traditional management techniques and methods. Thus, we have identified and presented the main features of international projects, their typology and the differences between the standard / traditional and the international project.
- We have identified the main criteria that underpin the success of international projects: the flexible approach to project management, which exceeds the triple constraint; the correct and clear definition of the purpose and objectives of the international project; the selection of the international virtual project team members must be done based on specific skills and abilities; effective communication between the international project team members, which depends on the selection of on-line collaboration tools and communication techniques specific to the virtual collaboration environment.
- We have highlighted the need to know the advantages and disadvantages of the decision to create a project team in the virtual environment and we have shown that the process of building such a team is complex and the profile of the project team members, in terms of skills specific to the virtual work environment, is an essential stage. However, we have found that the information on the necessary skills of virtual project team members is very

limited, most of them focusing on the skills of the international project manager.

- We have identified multiculturalism as one of the main challenges for international project managers in managing virtual teams. However, there are not enough studies to determine to what extent national cultural dimensions influence the performance of the project team in the virtual environment.
- The emergence of the virtual work environment as a result of the development of information and communication technology has led to new risks for safety and health at work. We have found that there is no research or information on this subject in the scientific literature, which is why we considered that identifying these risks may help project managers in establishing effective strategies to prevent them so that the performance of the international project from the virtual environment will not be affected. The main risks identified are psychosocial risks, stress being one of the most complex phenomena studied and analyzed, in line with the characteristics of the virtual work environment and the international project.

**The main conclusions regarding the systemic analysis of international projects with teams in the virtual environment:**

- As a result of the bibliographic research, we noted that there is no such approach to international projects, which would have contributed to greater clarity on how they work. The international project can be seen as a system of systems due to its complexity. Thus, we analyzed the specific elements, its subsystems, the transformation process, the system attributes, the environmental components and their influence on the system operation, as well as the system resources.
- The international project system, due to its complexity, must be a flexible system that can adapt to the changing environment, recreating the appropriate and necessary conditions for carrying out the specific activities.
- We noticed a special importance in the functioning of the international project system, of the virtual project team subsystem and its main results, represented by the team performance and the satisfaction of the team members. So we analyzed some relevant components of the dynamics process within this subsystem.
- In the specialized literature, multiculturalism and intercultural communication are some of the most important challenges regarding the international virtual project

team management, which led us to an analysis of the six national cultural dimensions (the power distance, individualism vs. collectivism, masculinity vs. femininity, avoidance of uncertainty, long-term orientation, indulgence vs. restraint), which allowed to determine how they can influence communication, by the trust that individuals of different cultural dimensions attach to electronic instruments. This analysis can help in selecting the most appropriate on-line collaboration technologies so that communication be as efficient as possible.

- Regarding the impact of national culture on the project culture, we can not speak of a dominant national culture, because project team members belong to several nations, being geographically dispersed. Thus, we can speak of dominant or preferred national cultural dimensions for working in the virtual environment.
- Challenges related to intercultural communication can be overcome by high interpersonal and intercultural communication skills. As a result of the bibliographic research we identified the most important characteristics that team members have to hold for an effective intercultural communication, among which we note the awareness and acceptance of cultural differences.
- Finding that the international project success can be influenced by the culture built inside it, we considered useful to propose a model of the international project culture with teams in the virtual environment, based on the organizational cultural dimensions proposed by Hofstede G. Thus, there is an eight dimensions model: objective orientation, balanced external orientation, relaxed discipline, professional dimension, orientation towards team members, closed system, high level of leadership style acceptance, high degree of identification with the project.
- The whole activity of the virtual team has the human factor at its core and high performance can also be translated by a high level of cognitive capabilities of the project team members. Thus, we have identified neuromanagement techniques that could be applied to increase the virtual project team performance, such as neurocognitive training and training for emotional self-leadership.

**Main conclusions on mixed methods research on the role of project teams in the virtual environment in increasing the success rate of international projects:**

- The research was based on a mixed method of data collection, quantitative and qualitative. Thus, the quantitative data were mainly collected through the in-

depth, semi-structured interview method and were interpreted qualitatively. Quantitative data and, to a lesser extent, qualitative data were collected through the questionnaire survey and were analyzed quantitatively. Following the univariate, bivariate statistical analysis, the principal component analysis and the modeling technique, we validated the hypotheses and the proposed theoretical models, and there were identified correlations between the analyzed variables, demonstrating a direct influence of the virtual project team performance on the international project success.

- Following the in-depth interview, some assumptions have been confirmed, but new information has also been gathered that we have not found in the literature, such as the identification of two specific categories of people working in the virtual environment, the fact that international project managers are not guided during the team members selection process by any model of competences and skills specific to the virtual working environment or a profile of the optimal culture, and that when there is a lot of diversity, the cultural element loses its influence on the international virtual project team performance.
- Following the principal component analysis method applied on the influence factors of the international project success, two main factors have been identified, which we have renamed: "Project Management" and "External Factors", thus demonstrating that the decision to create a project team in the virtual environment has a strong influence on the success of the international project. We also saw a high influence on aspects of leadership style, quality constraints, but also aspects related to the external environment of the project.
- Following the principal component analysis method applied on the influence factors of the virtual project team's performance, we identified three factors, which we have renamed according to their composition, as follows: "Communication in the virtual work environment", "Training programs, professional development and prevention of occupational risks", "Cultural influences", demonstrating that the dimensions of the national culture to which the project team members belong can influence to a large extent the team performance. At the same time, we have demonstrated that aspects of the communication frequency in the virtual environment, the proper use of electronic tools, cognitive training and development, the occupational risks specific to the

virtual work environment and the culture within the project have a high influence on the international virtual project team performance.

- Following the principal component analysis method applied to the dimensions of the international virtual project team culture, three main factors have been identified, which we have renamed as: "Closed Community", "Project Orientation" and "Flexible internal structure system". We have demonstrated that the dimensions characterized by the fact that the international project team aims to meet the requirements of the client, the members of the team are able to take risks, the team members selection is based on the skills specific to the virtual work environment, the trust and the connections between the members are built at a slow pace as well as the fact that the international project has a flexible internal structure, low control and high degree of improvisation, are those that have the greatest proportion in defining CMIP-TVE.
- Following the application of the modeling technique to the data set representing the respondents' answers to question one regarding the factors influencing the the international project success, a predictive model was created - a neural network. The most important predictors identified, as well as the network connection lines with the largest load, are: ' Setting up a virtual team vs. collocated team' and 'Organizational Culture'.
- With the help of the modeling technique was created a predictive model using the C5.0 data mining algorithm, in which two of the most important fields underlying the decision tree construction were identified as 'team culture'and 'Selection of online collaboration tools, taking into account the project team members national culture aspects'. Thus, we demonstrated the importance of culture influence on the performance of the international project team in the virtual environment.

## **10.2. PERSONAL AND ORIGINAL CONTRIBUTIONS**

As a result of our research, we can deduce the following original, relevant personal contributions:

- Critical analysis and formulation of personal opinions regarding the information found in the literature regarding the concepts, challenges and problems encountered in the field;
- Identifying the characteristics of international projects, international virtual project teams, as well as their advantages and disadvantages;

- Proposal of an adapted diamond model, which is a tool for assessing the project, from the planning stage, as well as during its development, in order to identify the various problems that may arise and take the necessary measures to correct them;
- Proposal of a theoretical model regarding the profile of the international virtual project team members, identifying the key competences needed for the work in the virtual environment;
- Proposal of a model for the profile of the international virtual project manager;
- Addressing the emerging risks that can affect the results of project teams in the virtual environment and their evaluation through the OiRA tool;
- The characterization of different online collaboration tools, depending on the classification of the communication means, the communication capacities, as well as their efficiency in relation to the activities of the international virtual project team members;
- Proposal of a theoretical model regarding the international project system operation, explaining how the elements of the system interact, and at the same time, presenting a model in an external view that reflects the interaction of the system with the environment;
- The proposal of the 'system of systems' terminology for the international project, representing the project management as a subsystem, through the subsystems that compose it and we analyzed, in detail, the subsystem of the international project team in the virtual environment;
- Presentation of 35 attributes that uniquely identifies and differentiates international projects systems;
- Proposal of a circular structure for the international virtual project team;
- Analysis of the six national cultural dimensions influence on motivation for work in the virtual environment;
- Proposal of an international project culture model (CMIP-TVE), based on the cultural dimensions of Hofstede G;
- Recommendation on the introduction of neuromanagement techniques to enhance the performance of the international project team in response to the challenges of the virtual work environment;

- Creation of extensive research tools, represented by the opinion questionnaire and the in-depth, semi-structured interview guide, which could be adapted or improved to carry out future research;
- Multiculturality of the study sample, identifying 19 different nationalities;
- Using the principal component analysis method in order to identify the factors that influence in a significant way the success of the international project, the virtual team performance, the determining characteristics of the project culture, which offers the opportunity to test and improve them in a simplified way, in order to increase the success rate of international projects with project teams in the virtual environment;
- Creating two predictive models using data mining algorithms through IBM SPSS Modeler software: a neural network to explain the factors of influence on international project success and the C5.0 algorithm to analyze the factors of influence on international virtual project team performance;
- Proposal for future research directions in order to develop the specialized literature in the field.

### 10.3. DISSEMINATION OF RESEARCH RESULTS

So far, research results have been disseminated by presenting scientific papers at national and international conferences and their publication in specialized journals, one of which is classified as ISI Proceedings category and six papers are indexed in international databases (BDI). Two papers are also in process of publication in recognized scientific journals.

- **Dumitraşcu, Iulia**, Dumitraşcu, Dănuţ, Dumitru, *Analysis of the behaviour of factors influencing the success of international projects using data modeling technique*, in process of publication.

- **Dumitraşcu, Iulia**, Dumitraşcu, Dănuţ, Dumitru, *Research on the behaviour of factors influencing the international virtual project team performance, using data modeling technique*, in process of publication.

- **Dumitraşcu, Iulia**, Dumitraşcu, Dănuţ, Dumitru, *A systemic view of international projects with virtual teams*, The 24<sup>th</sup> International Scientific Conference Knowledge-Based Organization, 14-16 iunie, Sibiu, 24(1), pp. 289-295, 2018, publicat online 2018-07-26 | DOI: <https://doi.org/10.1515/kbo-2018-0046>.



• **Dumitrașcu, Iulia**, Dumitrașcu, Dănuț, Dumitru, *Skills and competences international project managers need to be successful in a virtual work environment*, Bulletin of the Transilvania University of Brașov Series V: Economic Sciences • Vol. 10 (59) Special Issue No. 2 – 2017, p. 63-71, Proceedings of The International Conference for Doctoral Students ( IPC 2017), Third Edition, June 22-23, 2017, ISSN 2065-2194 (Print), ISSN 2065-2208 (CD-ROM), available online: [http://webbut.unitbv.ro/bulletin/Series%20V/2017/BULETIN%20I%20SI/08\\_DUMITRASCU.pdf](http://webbut.unitbv.ro/bulletin/Series%20V/2017/BULETIN%20I%20SI/08_DUMITRASCU.pdf)

• **Dumitrașcu, Iulia**, Dumitrașcu, Dănuț, Dumitru, *Occupational emerging risks affecting international virtual project Team Results*, 8<sup>th</sup> International Conference on Manufacturing Science and Education – MSE 2017 “Trends in New Industrial Revolution”, MATEC Web Conf., Volume 121, 2017, Article number 07003, section Management and Economic Engineering, published online 09 August 2017, DOI <https://doi.org/10.1051/mateconf/201712107003>.

• **Dumitrașcu, Iulia**, Dumitrașcu, D., Dumitru, *Creating Effective International Virtual Project Team*, 23rd International Economic Conference – IECS 2016, Revista Economică, ISSN: 1582-6260, Volume 68, Issue 3.pp. 46-56, 2016, available online: <http://economice.ulbsibiu.ro/revista.economica/archive/68304dumitrascu&dumitrascu.pdf>

• **Dumitrașcu, Iulia**, Dumitrașcu, D., Dumitru, *How Culture and Motivation Interact in an International Virtual Project Team*, De Gruyter Online, 27 iulie 2016, DOI: 10.1515/kbo-2016-0073, available online: [degruyter.com](http://degruyter.com).

• **Dumitrascu, Iulia**, Dumitrascu D.D., “*How to face globalization challenges through international project management*”, Revista de Management și Inginerie Economică, ISSN 1583-624X, Vol. 14 n° 3 (57), 2015, Todesco Publishing House, available online: [http://www.rmee.org/abstracturi/57/05\\_sin\\_Articol\\_280\\_%20Dumitrascu%20Iulia\\_MS\\_E\\_2015\\_paper1.pdf](http://www.rmee.org/abstracturi/57/05_sin_Articol_280_%20Dumitrascu%20Iulia_MS_E_2015_paper1.pdf)

• **Dumitrascu, Iulia**, Dumitrascu D.D., “*Virtual Teams management in global international projects*”, Revista de Management și Inginerie Economică, ISSN 1583-624X, Vol. 14 n° 4 (58), 2015, Todesco Publishing House, available online: [http://www.rmee.org/abstracturi/58/05\\_sin\\_Articol\\_279\\_%20Dumitrascu%20Iulia\\_MS\\_E\\_2015\\_paper2.pdf](http://www.rmee.org/abstracturi/58/05_sin_Articol_279_%20Dumitrascu%20Iulia_MS_E_2015_paper2.pdf)

## 10.4. LIMITATIONS OF ACTUAL RESEARCH AND FUTURE RESEARCH DIRECTIONS

Regarding the limitations of current research, we enumerate the following aspects:

- The bibliographic research is based on foreign scientific literature, which does not address, in particular, the situation of international projects involving Romanian organizations or virtual project teams where can be found Romanian members;
- Bibliographic research is limited and dependent on existing documentary sources and financial resources, given the costs of accessing them;
- Regarding the empirical research, sampling is non-random, which is why the sample volume can not be calculated nor the maximum admitted error (precision);
- High amount of time allocated to in-depth interviews in relation to the low number of respondents involved;
- Limited time and information resources (databases) for conducting the survey based on questionnaire;
- The answers of the study subjects can be influenced by the level of training, the understanding of the terms used and the mental state from the moment of filling in the questionnaire;
- The sample obtained from the questionnaire survey consists, mainly, of respondents of Romanian nationality, the other nationalities being unable to form a critical mass. Thus, cross-sectional analyzes based on this variable did not show a statistically significant result and could not be included in this paper.

In order to develop the specialized literature in the field, we propose as future directions of research the following aspects:

- Validation of the proposed model on the optimal culture profile for working in the virtual environment, analyzing the characteristics of each proposed cultural dimension;
- Validation of the theoretical analysis of the preferences for different online collaboration technologies according to the national cultural dimensions, through statistical crosstab analyzes;

- Conduct an empirical research on emerging risks in international virtual project teams in order to validate identified risks, based on which an OiRA tool, specific to the virtual work environment in international projects, can be developed using the OiRA tool generator;
- Continuing research on neuromanagement techniques and their applicability in order to increase the international project team performance;
- Starting from the factors identified through the principal components analysis, simplified models can be created in order to create strategies or make decisions to ensure the international project succes, a high performance or an optimal culture of the international project.

Concidering the final conclusions presented, it is worth noting the actuality, the importance of the theme studied and the originality of its approach through the proposed methodology, the data analysis methods, the validated theoretical models, representing a complex scientific approach, through which we demonstrated that efficiently managed virtual project teams can contribute to increase the success rate of the international project and thus, to a high performance of international project management.

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