Effects of Culture on Project Management Contributing to the Success of Managing Culturally Diverse Engineering Teams in a Global Environment

L.L. Meyer[3], J.H.C. Pretorius[1], L Pretorius[2]
[1]Faculty of Engineering and the Built Environment, University of Johannesburg, Johannesburg, South Africa
[2]Faculty of Engineering and the Built Environment, University of Pretoria, Pretoria, South Africa
[3]Faculty of Engineering and the Built Environment, University of Johannesburg, South Africa, Aurecon International, Qatar
(larno.meyer@gmail.com)

Abstract – **The research in this paper measured the Cultural Intelligence capability of engineering project leaders and team members from around the world, and their awareness of cultural influences on project management. The focus was on comparing South African engineers to those in other countries. It was concluded that intercultural communication and differences in decision-making were two primary cultural factors influencing the success of managing culturally diverse engineering teams.**

Keywords – **culture, communication, decision-making, engineering management, global teams, international projects, project management**

I. INTRODUCTION

Research undertaken over the last two decades [1,2,3], showed that cultural differences do influence the success of culturally diverse teams in a global work environment. As globalization expands across borders, people become more mobile and proceed to work outside their home countries or with people from other countries in their home country.

The influence of culture can impact on engineering and project management[4,5,6,7]and should be taken into account in engineering and project management. Project management, on the one hand, involves processes, techniques and tools[8], but on the other handinvolves an art form that deals with the people doing the work. In a single country or mono-cultural environment, people tend to understand each other better than in a multi-cultural environment. As a result, project management within a multi-cultural team environment requires of managers to focus on cultural influences [9,10,11,12].

Furthermore, trust formsanimportant part in cross-cultural relationships [13,14]. When trustis undermined or broken, it can resultin damaged team and stakeholder relationships leading to decision-making and communication breakdowns.

A. Defining Cultural Intelligence

A person's culture is learned over the first approximate 10 to 15 years of his or her life [1][2]. This cultural learning process of a young person includes environmental factors, interpersonal relationships with family and friends, beliefs and experiences that result, according to Hofstede [1], in the '*collective programming of the human mind*'. This initial cultural programming in the early childhood years will interact in a similar way as that of a computer's operating system on the decision-making, communication style and interpersonal relationships of a person towards others from different cultures. Culture, therefore,forms the bottom layer of a person's personality. Personality is what makes people unique, but it is influenced by the underlying cultural values that are specific to a group of people from the same nation.

Cultural Intelligence can be seen as the ability to learn, understand and adapt to differences in cultural values of people from other countries.

From observation,it can be noted that thereare, for example, main differences between the cultures of Western countries and Eastern countries. Research literature[2,15,16,17] helped to identifycultural differences between nations. Western countries tend to be more individualistic, competitive, goal and task orientated. While the Eastern countries are more family oriented, collective and hierarchical in their leadership. These main differences between the Eastern and Western countries can lead to mistrust, misunderstanding and miscommunicationif not understood and adapted to.

It is also important to note that Emotional and Social Intelligences are closely related to Cultural Intelligence. Utilizing the multiple intelligences of Cognitive Intelligence (IQ), Emotional (EQ) and Social Intelligences (SQ)together with Cultural Intelligence (CQ), can enhance engineering management effectiveness in culturally diverse work environments. Research by H. Gardner and C.B. Shearer [18,19] reflects on the use of multiple intelligences. With Cultural Intelligence the dimension of the larger social group of people (on national level) is added to the abilities of Emotional Intelligence (self and person to person level) and Social Intelligence (group or team level).

B. Research Question and Objectives

The research question for the study presented in this paper was:

- Does culture influence the effectiveness of project and engineering management in a culturally diverse work environment?

From the main research question, the following objectives were formulated:

- Determine if there are differences in Cultural Intelligence between surveyed groups.
- Evaluate if project and engineering managers can use Cultural Intelligence to improve the efficiency of culturally diverse teams.
- Determine which elements of Cultural Intelligence need to be focused on by project and engineering managers.

II. RESEARCH SURVEY

An Online Questionnaire was sent to a target group of 300 people from 27 countries (Table 1). After checking the online survey data for errors, a final sample size of n = 112 was obtained (Response Rate of 37.3%).

A total of 17 online asynchronous interviews [20]were also completed in addition to the survey by engineers and project managers from different cultural backgrounds. These asynchronous interviews were conducted online. An additional five face-to-face interviews were completed with a team with various cultural backgrounds based in Qatar, Middle East.

III. METHODOLOGY

The research methodology was based on the Applied Research Methodology, which followed a systematic inquiry process.

The work of Soon Ang and Linn van Dyne [16,21] contributed the most to setting up a questionnaire that provided results for comparison and evaluation. The peer-reviewed20-question, Four Factor Cultural Scale (CQ Scale) developed by Soon Ang and Linn van Dyne was embedded in the questionnaire to provide the results on the 4 Cultural Factors or capabilities (CQ-Drive, CQ-Knowledge, CQ-Strategy, and CQ-Action) to calculate Cultural Intelligence. The work of David Livermore [22,23]was also utilized to identify from the 4 Cultural Factors three additional measures of Cultural Intelligence: Cultural Judgement and Decision Making, Task Performance and Cultural Adaption.

Part of the questionnaire also included questions to determine the cultural awareness of people in project management. This was used to cross reference with the outcome of the Cultural Intelligence calculations of the countries surveyed.

IV. RESULTS

A. Overview of the Survey

The primary locations from where the survey data for the research study were collected from: Australia, Germany, India, Malaysia, South Africa, Northern Ireland, USA, Europe, UK and the Middle East. Table 1 indicates in which countries the people that participated in the survey were born in. This formed the final sample size of n=112 people from a total of 27 countries represented.

Table 1:Summary of Survey Data (Countries born)

#	Country	Frequency	Percent%
1	**S. Africa**	**30**	**26.8**
2	**UK/N. Ireland**	**18**	**16.1**
3	**USA**	**12**	**10.7**
4	**Germany**	**9**	**8.0**
5	**Australia**	**8**	**7.1**
6	**Malaysia**	**6**	**5.4**
7	**India**	**5**	**4.5**
8	Ireland	3	2.7
9	N. Zealand	3	2.7
10	Austria	1	0.9
11	Canada	1	0.9
12	Egypt	1	0.9
13	Fiji	1	0.9
14	Greece	1	0.9
15	Iraq	1	0.9
16	Jordan	1	0.9
17	Kuwait	1	0.9
18	Lebanon	1	0.9
19	Netherlands	1	0.9
20	Poland	1	0.9
21	Russia	1	0.9
22	Singapore	1	0.9
23	Sri Lanka	1	0.9
24	Sudan	1	0.9
25	UK/Scotland	1	0.9
26	Yugoslavia	1	0.9
27	Zimbabwe	1	0.9
	Total	112	100.0

B. Discussion of Findings

Figure 2 shows the summary of the Cultural Awareness people have in project management between the countries surveyed. The Cultural Awareness in project management was calculated by asking specific questions on peoples experience and observations. South Africa had an average (68.8%) above the Global Group average (62.6%). Germany (44.1%) had the lowest Cultural Awareness in project management and Australia (78.1%) had the highest average.

Figure 3shows the summary of the overall Cultural Intelligence level between the countries surveyed. South Africa had an average (69.9%) below the Global Group average (73.0%). Germany again had the lowest average

(61.3%) with Australia (85.9%) and the Middle East (80.9%) having the highest averages.

From the work of David Livermore [22,23] three additional Cultural Intelligent measures were calculated from the 20-question, Four Factor CQ Scale. The calculations are as follow:

- Cultural Judgment and Decision Making = CQ-Knowledge + CQ-Strategy
- Task Performance = CQ-Strategy + CQ-Action (Behaviour)
- Cultural Adaptability = CQ-Drive (Motivation) + CQ-Action (Behaviour)

Figure4shows the Cultural Judgement and Decision Making [22] ability of the countries surveyed. Similar to Figure 2 that showed the overall Cultural Intelligence level, South Africa (68.2%) is below the Global Average (71.5%) with Germany (61.8%) the lowest and Australia (83.3%) and the Middle East (79.2%) the highest.

Figure 5 shows Task Performance and Figure 6show the Cultural Adaptability of the countries surveyed. Again South Africa (70.8% & 71.7%) is below Global Average (73.6% & 74.4%) with Germany the lowest (61.8% & 60.8%). Australia (87.7% & 88.6%) and the Middle East (80.5% & 82.6%) are again the highest.

It was noticed that Germany rated the lowest for this particular survey. By looking at Hofstede's Cultural Dimensions[1] for Germany, it is evident that their Individualism and Uncertainty Avoidance Cultural Dimensions rank high compared to other countries and also specifically to Australia in comparison. This indicates that Germany is a highly individualistic societyand with a focus on detail and planning to avoid uncertainty and risk.

Comparing the survey data to the Cultural Dimension Values of Hofstede may help to explain in part the reason for Germany's lowest ranking in cultural awareness in Project Management and Cultural Intelligence. German people surveyed in for this study mostly function in their work environment within Germany as a mono-culture with fewer influences from other cultures. It is also in part related to the fact that the Germans surveyed may have not all worked outside of Germany to the same extent as other respondents surveyed from other countries

Furthermore, the fact that Australia rated highest could be attributed to the particular group surveyed that only made up 7% of the overall survey data. It was noticed in the questionnaire survey data filtering for Australia that people generally rated themselves higher compared to other countries. Again Hofstede's Cultural Dimensions of Individuality, Uncertainty Avoidance and Masculinity (competitiveness) may contributing to the results being different for Australians than the other nationalities.

Figure 1 shows any example comparison of Hofstede's Dimensions between Australia and Germany. It can be noted that Individuality (IDV) differ the most between Australia and Germany. Australia has a much higher Individualistic approach than Germans. Australians working together with Germans may have conflict with their German team members because they will then to their own work and personal requirements first. Australians will look after themselves more than their German counterparts that may be more inclined to teamwork. Engineering Managers therefore need to determine if Australian and German team member tend to isolate themselves from each other. For example when Australians potentially start following their own decisions while communicating only between themselves, team meetings and tasks should be arranged to bring both the German and Australian team members' ideas together. It should also be noted that Germans has a slightly higher Uncertainty Avoidance (UAI) than Australians. This can contribute to differences in decision making. Germans will tend to avoid problems in design by focusing on detailed planning and risk assessments. Australians may seem to their German team members to be somewhat more relaxed with certain risks in a project. The Engineering Manager should encourage the German team members to share their ideas on design improvements and how to manage risks. By utilising the Cultural Dimensions of Hofstede, it makes it possible to build on the strength of cultural diverse teams.

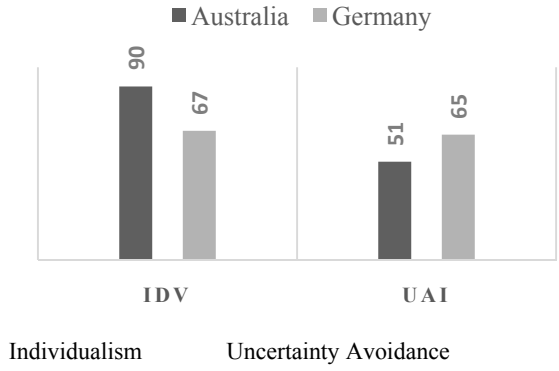

Figure 1: Comparison of Hofstede's Cultural Dimensions for Australia and Germany

Note: For Figures 2 to 5 below, the data for Europe (Austria, Greece, Netherlands, Poland, Yugoslavia), exclude Germany and the UK which were measured separately.

The test for Reliability for the data in Figures 2 to 5 indicated Cronbach's Alpha as $\alpha = 0.962$ (for $n = 112$).

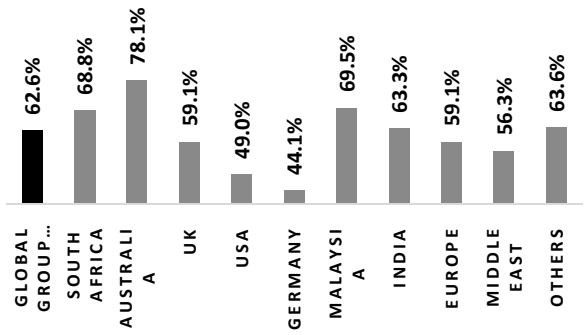

Figure 2: Cultural Awareness in Project Management

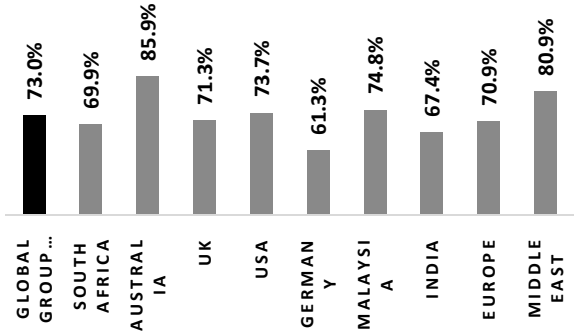

Figure 3: Overall Cultural intelligence (CQ)

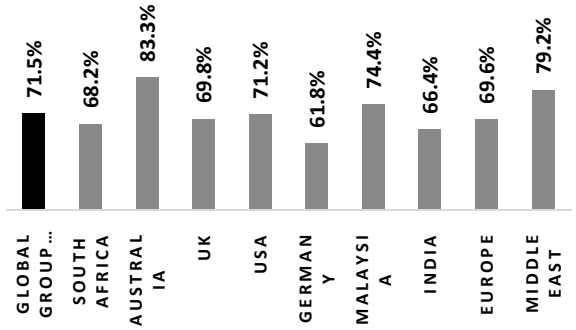

Figure 4: Cultural Judgement and Decision Making

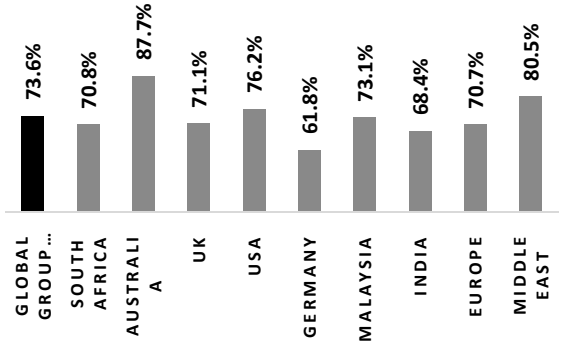

Figure 5: Task Performance

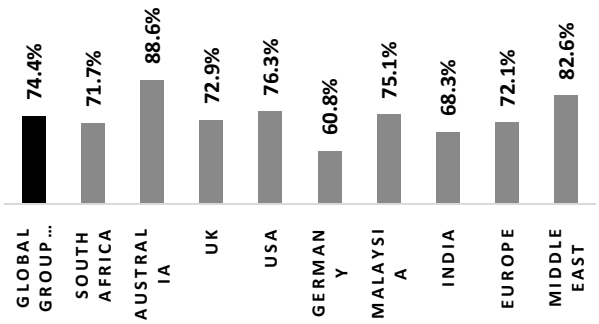

Figure 6: Cultural Adaptability

V. CONCLUSIONS

A. Summary of Findings

A cross comparison (triangulation) between the quantitative (online surveys questionnaire) and qualitative data (interviews and case studies) was made. From this the following primary issues a scribed to cultural differences, were identified:

1. Issues with communication
2. Issues with decision-making
3. Issues with task performance
4. Issues with trust among people
5. Issues with adapting to new cultural environments
6. Issues with lack of Cultural Intelligence training
7. Issues with lack of Project Management training

By comparing the results of the online survey findings (S. Ang and L. v Dyne's Cultural Intelligence Scale and D. Livermore's measurements of Cultural Judgement, Decision Making and Cultural Adaption) with the interview responses and the case studies, it became clear that the seven issues listed above should be focused on by engineering and project managers.

It should be noted that much of these general engineering and project management issues do have underlying cultural differences as the basis of why certain aspects of a project may not become fully successful at the end. Many times these general issues stem from core cultural differences which go unnoticed or not fully understood. If engineering and project management can learn to actually focus on understanding the underlying cultural differences for these general issues, then much reward can result in project performance.

The following findings are noted:

- Cultural differences are part of multi-cultural teams. These differences have an influence on project management processes (communication management, decision-making, task performance

and time management).This influences the efficiency of the people that need to work together.

- Cross-cultural communication and decision-making are key cultural elements to consider in a multi-cultural work environment.
- An early understanding of the various cultural differences should be considered at the start of each new project.

B. Recommendations

1. Engineering and project managers should take into account the influences of culture on projects within culturally diverse work environments. It is essential especially for large-scale projects that will be completed by people with different cultural backgrounds.
2. Neglecting the underlying cultural differences that can cause issues in communication, decision-making (acceptance of responsibility), task performance (which includes the perception of time that relates to the project schedule), and trust can all undermine the success of a project.
3. Companies that send people to foreign countries should understand the importance of formal training in Cultural Intelligence. However, the people that are sent on the overseas assignments will need to be motivated to undertake the assignment. This can be pre-assessed using the 20-question Four Factor CQ–Scale (S. Ang, L v Dyne) [21]. People with high CQ-Drive (Motivation), CQ-Knowledge and Cultural Adaptability scores have a better chance of succeeding in their overseas assignments.

C. Conclusions

The following conclusions were made on understanding the influence of culture on project management:

1. Lack of formal Cultural Intelligence and Project Management training limit engineering and project managers' abilities to only observation and not a proper understanding of the underlying issues related to cultural differences.
2. Engineering and project managers should be well aware of their project team's unique cultural differences and how their own leadership styles impact on these differences. By understanding one's own leadership and cultural values, it becomes easier to adjust to better align with culturally diverse team members.
3. Engineering and project managers of culturally diverse project teams should also learn to properly understand how different communication styles (direct or indirect, high-low context) play a key role in multi-cultural work environments. Communication styles differ from country to country, specifically between Western (Direct and Low Context) and Eastern countries (Indirect and High Context). Without understanding these underlying differences, people can easily miscommunicate relevant information between each other which can result in loss of productivity when work gets completed incorrectly and even create distrust among team members.
4. Developing Emotional and Social Intelligences will also help to improve multi-intelligence skills. Together with improving Cultural Intelligence, it enables engineering and project managers to interact and manage efficiently on a "person to person", "person to team" and "team to team" basis.
5. Engineering and project managers should prioritize building strong trust relationships between team members and foreign clients. When people trust each other, there will be a higher tolerance for each other's cultural differences.
6. Work environments should be created where a culturally diverse team learns how to collaborate effectively with each other. By creating collaborative project tasks where team members need to rely on each other to complete the project, helps to build trust relationships.
7. The focus should be placed on understanding the main Cultural Value differences between countries. Specifically the Cultural Values identified by Hofstede[1]. The Cultural Values (or Dimensions) that are of importance to take into account in Engineering Management are the Power Distance, Collectivism/Individualism, and Uncertainty Avoidance indicators.

ACKNOWLEDGEMENT

The support of Professor Jan-Harm Pretorius and Professor Leon Pretorius from South Africa in this research is acknowledged by the first author. The people who helped to complete the online surveys and interviews are also acknowledged for their support and time spent.

REFERENCES

[1] G. Hofstede, *Cultures and Organisations: Software of the Mind*. 3rd ed., New York,NY: McGraw-Hill, 2013.

[2] G. Hofstede, *Cultural Consequences*, 2nd ed., London: Sage Publications, 2001.

[3] P. C. Early, S. Ang &J.-S. Tan, GQ - *Developing cultural intelligence at work*, Stanford: Stanford University Press, 2006.

[4] U. Ojiako et al., Cultural Imperatives in Perceptions of Project Success and Failure, Pennsylvania, USA: Project Management Institute (PMI), 2012.

[5] D. Kuchta &J. Sukpen, "Culture and Project

Management," *Journal of Intercultural Management*, vol. 5, no 3, Sept, pp. 23–38, 2013.

[6] R. D. Elena, "Cultural differences in Project Management," *Annales Universitatis Apulensis Series Oeconomica*, vol. 2, no. 2/12, pp. 657–662, 2010.

[7] S. Cerimagic &J. Smith, "Project Managers: The importance of Cross-Cultural preparation," in 27th Annual ARCOM Conference, Bristol, UK, 2011.

[8] PMI, A Guide to the Project Management Body of Knowledge: PMBOK Guide. 5th ed., Newtown Square,PA: Project Management Institute (PMI), 2013.

[9] O. Obikunle, "Dealing With Cultural Diversity In Project Management," 2002. [Online]. Available: http://www.pmi.org/learning/dealing-cultural-diversity-project-management-129. [Accessed Jun 2014].

[10] G. Durochik, "Key Success Factors For Multicultural Project Management," 1999. [Online]. Available: http://www.pmi.org/learning/key-success-factors-multicultural-project-management-1150. [Accessed Jun 2014].

[11] D. A. Suberroc, "Multicultural Project Management," 1996. [Online]. Available: http://www.pmi.org/learning/multicultural-project-management-human-resource-794. [Accessed Jun 2014].

[12] I. v. d. Merwe, "Aspects of Diversity that Influence International Construction Projects in Mozambique," University of Johannesburg (UJ) - Faculty of Engineering and the Built Environment, 2009.

[13] M. M. Ajmal, M. Hussein &H. Saber, "Relationship of Culture and Trust in International Project Environments: A Theoretical Study," International Journal of Information Technology & Computer Science, vol. 5, no. Sept/Oct, pp. 13–32, 2012.

[14] M. Sennara, "Managing Cultural Risks on International Projects," in Proceedings of the Project Management Institute Annual Seminars & Symposium, San Antonio,Texas, USA, Oct 3–10, 2002.

[15] N. M. S. U. (NMSU), "GLOBE Project - Global Leadership & Organizational Behavior Effectiveness," NMSU College of Business, [Online]. Available: http://business.nmsu.edu/research/programs/globe/. [Accessed Jun 2014].

[16] P. C. Early &S. Ang, *Cultural Intelligence - Individual Interactions Across Cultures*, Stanford: Stanford University Press, 2003.

[17] R. D. Lewis, *When Cultures Collide: Leading across Cultures: A Major New Edition of the Global Guide*, Boston: Nicholas Brealey International, 2012.

[18] H. E. Gardner, *Multiple Intelligences: New Horizons in Theory and Practice*, New York: Basic Books,Perseus Book Group, 2008.

[19] C. B. Shearer, "Multiple Intelligences Research and Consulting, Inc.," MIDAS, [Online]. Available: http://www.miresearch.org/multiple-intelligences/mi-theory/. [Accessed June 2014].

[20] UWE, "Research Observatory - Research Methods, Online Interviewing," University of the West of England, [Online]. Available: http://ro.uwe.ac.uk/RenderPages/RenderLearningObject.aspx?Context=7&Area=1&Room=3&Constellation=25&LearningObject=119. [Accessed Oct 2014].

[21] S. Ang and L. V. Dyne, *Handbook of Cultural Intelligence - Theory, Measurement and Applications*, New York: M.E. Sharpe Inc, 2008, pp. 91–144,177–240, 289–304.

[22] D. A. Livermore, *Leading with Cultural Intelligence: The New Secret to Success*, New York: AMACOM, American Management Association, 1st ed., 2010, 2nd ed.2015.

[23] D. A. Livermore, *The Cultural Intelligence Difference: Master the One Skill You Can't Do without in Today's Global Economy*, New York: AMACOM, American Management Association, 2011.