

# The impact of cultural diversity on the technological innovation process in the nuclear energy corporations

Mohamed Aljaberi<sup>1</sup> and Khalid Almarri<sup>2</sup>

<sup>1</sup>Nawah Energy Company, Barakah Nuclear Power Plant, Barakah, Abu Dhabi, United Arab Emirates. [mohamed.aljaberi@nawah.ae](mailto:mohamed.aljaberi@nawah.ae)

<sup>2</sup>Faculty of Engineering and IT, the British University in Dubai, P.O. Box 345015, Dubai International Academic City, Dubai, United Arab Emirates

Corresponding author: [khalid.almarri@buid.ac.ae](mailto:khalid.almarri@buid.ac.ae)

**Abstract:** The research paper intended to show the impact of cultural diversity on the technological innovation process in the nuclear sector in the UAE. The study is based on both of the secondary and primary resources of information. The focal emphasis areas on the paper is to show the benefits of cultural diversity in respect of innovation process, the pouring forces for nuclear technology innovation, the nuclear innovation program, the challenges of cultural diversity in respect of innovation process and the current strategies of handling cultural diversity for executing innovation process.

For the primary data, it has been gathered from a sample of the staff working in the Nawah Energy Company, which has been chosen for conducting the primary research. In the present context 75 employees of the Nawah Energy Company have been chosen for collecting the quantitative data, while 3 managers of the same organization have been selected for gathering the qualitative data.

The paper recommends several strategies for improving the positive impact of the cultural diversity practices in the nuclear sector to improve the innovation process in this critical sector. These included the communication cost, access of market, creative ideas, as well as, resource allocations are the highly crucial aspects of the innovation process in the nuclear sector.

## 1. Introduction

In the world of today, innovation is considered as one of the most effective tools that ensure the success of businesses and organizations, so the research area focused on innovation and the factors impacting it has become a real rich area. As knowledge, skills and experience are all considered as critical elements of innovation and success, the mobility of people is considered as the most crucial mechanism for transferring as well as diffusing these three elements from one country to another. That can be attributed to the fact that a huge amount of the embodied knowledge as well as personal experiences that can be relocated with an effective geographic mobility of the highly skilled workers from one geographic region to another. There are different phenomena that have emerged in the new world, eased the mobility of skills, knowledge and experience, and enabled the highly skilled employees from all over the world to move from one country to another. This movement helps in the cultural movement, as cross-cultured employees are found together in just one work place, so they benefit and are benefited at the same time. The benefit which these employees get is represented in enhancing their income and living conditions, and additionally to develop their knowledge, experience and skills. While their employers are benefited from this cultural diversity to enhance the productivity and performance in their organizations, and additionally to enhance and brighten the image and reputation if the organization.

There are some sectors that need innovative ideas and outstanding efforts to develop and to be more productive, and one of these sectors or industries is the nuclear industry. One of these industries is the nuclear industry that experiences a great amount of cultural diversity due to the talent circulation across the multinational firms working in this area.

However, there is a strong argument, whether the enhancement of diversity can be considered as one of the external factors affecting the growing production and innovation in the nuclear sector. In support of this argument Rayner [1] presented a crucial information that economic growth as the means of innovation can be considered as a positive externality or external factor of the diverse, as well as skilled populated domain. In addition to that, the long-term, as well as irregular distribution of knowledge by the migrated and skilled employees in the globally connected cities strongly contradicts the neoclassical theory of complete knowledge Spill over. It has been observed by Berger and Huntington [2] that the failure of the generation and absorption of the innovative ideas present the ultimate reason of falling out from the development. On the other hand, the current studies have revealed that the ability to circulate the tacit knowledge by the diversified workforce is the prime factor for obtaining the most generous growth.

The United Arab Emirates has an ambitious nuclear power program, and it works in association with the International Atomic Energy Agency, and gets a considerable public support. The country has received a bid amounting \$20 billion from a South Korean group to be used for building 4 of the commercial nuclear power reactors, by the year of 2020, and the UAE works hard so as to use the peaceful, citizen nuclear energy program that keeps the uppermost approved safety and security standards, as well as the reduction and control for the working clarity. The UAE government has made good efforts for using the nuclear energy to meet the different and diversified energy needs of the country, like the country need for the electrical energy. Concerning the usage of the nuclear energy in order to generate electrical energy, a local nuclear energy program has been launched according to a deep and detailed estimation for the future needs of the country. A pilot study has shown that the local yearly maximum demand for the electrical energy in the UAE is estimated to reach 40,000 megawatts in the year of 2020, showing a rapid increase in the annual growth rate. To meet these extended needs for electricity, the UAE has examined the different available options for meeting this demand for electrical energy.

In the 21st century, the companies and organizations are desperately trying for attaining innovation and diversity within the business environment. In spite of the possession of adequate skills by the employees, the managers are in a dilapidated situation regarding the development of integrated structures for fulfilling the identified and the specified objectives. This research would be an attempt to fill some of the gaps and bring in diversity through the means of facilitating innovation in the UAE nuclear industry.

The aim of this research is to assess the impact of cultural diversity on the innovation process of nuclear sector in United Arab Emirates. Based on this identified aim, the following objectives would be helpful for carrying the research forward:

- To achieve an understanding about the concepts related to cultural diversity and innovation
- To identify the driving forces, which leads to innovation in the nuclear sector of UAE
- To assess the impact of cultural diversity on the innovation process in the nuclear sector of UAE
- To suggest recommendations for bringing improvements in the innovation in the nuclear sector of UAE

In spite of limited sources, the research attempts to provide an insight into the impact of cultural diversity on the innovations in the nuclear sector of UAE. The major drive behind this is the conjunction of the two variables: cultural diversity and technology bringing innovation in the nuclear sector of UAE [3]. The aspect of diversity broadens the scope and arena of the research through the effective and critical utilization of the related literary sources. In addition to this, the research, through the means of an integrated framework enhances the clarity of the personnel in terms of talent management.

## **2. Literature Review**

### **2.1 Concept of Cultural diversity:**

There are many definitions of cultural diversity that include cultural difference between the target markets. It can also be divided upon the language, ethnicity, identity and others. There are two implications of the diversified culture-one is positive, and one is negative. These depend on the globalization and geographical diversities of world culture [4].

Evidences show that there are multiple emerging cultures all over the world. The defining characteristics in context of cultural diversity are dress, language and traditions. The different organizing styles of society and the environment of the society can also be considered as the major components of cultural diversity [4]. The second component poses a negative effect on the society.

According to Forbes Insights [5] diversity is a primary factor of development and it is a basic constituent of being viable on a worldwide scale. Senior officials distinguish that divergent individuals cooperating can bring new thoughts and arrangements, as indicated by their distinctive encounters. The new thoughts and arrangements won't be made just when individuals from various locales cooperate, however utilizing that diverse workforce to improve items and administrations that regard their wide-achieving clients and offer one of a kind keys.

Nevertheless, Communication is an important factor that influences innovation, especially the effective communication that people can benefit from it and have the support to innovate. There are rules to communicate with people effectively, for example to listen more than you talk. Mark Twain famously remarked, "If we were supposed to talk more than we listen, we would have two tongues and one ear. A key way leaders can inspire people to produce ideas is to take time to actively listen to them. It sounds obvious, but giving someone space to develop their ideas creates a respectful environment, where people feel comfortable expressing themselves.

In Addition, concurring to William Issacs, discourse is a state of mind and reflecting together. It isn't something you do to someone else. It is something you do with individuals.

Leaders can sometimes get carried away by their own status and positional power and feel compelled by a sense of honour to challenge ideas, and continue everything on track. This shuts down development. Thoughts can't stream when everybody is arm wrestling; ideas stream when individuals are interested, asking and transparently communicating their thoughts.

In addition, leaders ought to perceive that dialogue is key to innovation, and they ought to empower, developing and part demonstrating shared thinking.

In his book, *Capitalism, Socialism and Democracy*, financial analyst Joseph Schumpeter [6] presented the idea of an advancement economy. He contended that developing establishments, business visionaries, and innovative changes were at the core of financial development. Be that as it may, it is just as of late that "development economy," grounded in Schumpeter's thoughts, has turned into a standard idea.

Since 2009, Aspen Institute's Economic Innovation roundtables approve that development, to be compelling, requires a genuine administration affect that stems from joint effort, vision, or more all the will to coordinate advance for long haul development. It is about how to tackle any association's maximum capacity through administration commands and activities for a practical future.

Culture is not the only factor that influences innovation in a state. Other main factors such as education, policies, financial organizations will affect too. But all those, are shaped by their people. Actually, people's values and beliefs accelerate education, create policies and acquire organizations. Currently, in which innovation is an analytical factor of being successful on a global scale, people have to try to learn and set their habits, values and beliefs in parallel. Just remember there are many opportunities, still to be discovered for those who can do so.

Several factors are important contributors to the diversification of the society and the country at large [4]. These factors have great implications in shaping up the ways the country can progress by using the cultural diversity.

The norms are referring to the public behaviour, and it can be looked at as being one of the most important cultural factors affecting innovation, specifically technological innovation. There are some cultures that enforce severe restrictions on the way that the person behaves, and the result is that people are raised with an internal feeling of being watched and controlled. These people are not prepared to be innovators, so they don't add to the revolution of technological innovation.

## **2.2 Nuclear innovation programmes**

As the energy shortage has become one of the serious problems of this era, an urgent need has appeared for introducing new sources of energy rather than the fossil fuels and the nuclear power plants are among the effective alternatives. For the nuclear innovative programs, they include different on-going projects with innovation factors on numerous subjects like the materials deprivation, high functioning fuel, fuel reliability, instrument and control (I&C) hardware and systems modernization, nuclear asset risk management, safety risk technology and application, etc. [7]. The organizations mainly concerned about the nuclear programmes are the Industry Research Organizations (IROs), while the demands are fundamentally from the services and controlling authorities.

According to Sheeha [7], for the nuclear innovation programmes, they include the typical R&D programmes that aim to develop the Generation III and III+ reactors, with more advanced features like the improved safety measures though the essential characteristics and as well as the passive systems.

## **2.3 Driving forces for nuclear technology innovation**

There are different driving forces for the nuclear technology innovation, and for the importance of these forces there is a considerable amount of studies in this area. Among the important studies in this area, there is the study of Bertel [3].

According to the author, innovation is one of the most effective driving forces that add to the success of the industry of nuclear energy and it is an essential supporting force for the future of this important industry. For the guarantee of the on-going safe and economically effectual

operation and maintenance of current nuclear systems, and for meeting the main aims that the nuclear projects set concerning both of the design and implementation of the future advanced systems, and effective innovation systems required. As a result, the analysis of the different innovation systems is highly important for better understanding for the features of the nuclear industry and for understanding the way of enhancing the performance of those working in this greatly sensitive sector.

In spite of the fact that there are numerous driving forces for the various technologies, in addition to the presence of various priority motivators based on factors like the plans and the policies of the national energy and nuclear sector, and additionally according to the various nuclear sector organizational structures, it is obvious that there are specific major driving forces for the nuclear technology innovation. The different reports and case studies in different countries have revealed that the major driving forces of technologies can be categorized in the following classes:

The market drivers, they include subjects, such as the economic developments, approaches of managing the commercial risk, supply and service arrangements, and positioning requirements including electrical output [7].

The political or public driver's class, they involve the public policy concerns, for instance the environmental and the nuclear safety controlling requirements, physical protection, global collaboration motivations, general policies of the national energy, as well as the electrical supply strategies [7].

The technical drivers, they involve the nuclear power facility operational features , like the productivity and improved operability, conditions for improved materials and extensive service, uranium utilization, improvements in the area of arrangement and control, erection methods, procedures of project and construction management, and improved computer simulation.

#### **2.4 Relationship between diverse workforce and innovation process**

Diversity has a huge effect on the workforce of the firms (Harvey and Allard 2015). Many believe that it can affect the workforce in many ways and motivate them to do better. Diversity in the firms has aggravated the innovation process thus making it easier to grow in the competitive market [8]. Diverse ideas from a range of diverse talents help to get the best business options and it does thrive to the growth of the business. According to many research works, firms where many people from diverse workforce are employed had a great profit because many creative concepts were conceived by them in diverse contexts.

Diverse workforce in the offices must be motivated to enhance their skills and contribute more for the organization [9]. In return, they have to be valued and given more importance and their welfare should be looked after. The two types of diversity i.e. inherited diversity and acquired diversity are very important in the context of the discussion. In matters of diversified environment, many creative ideas can be found and they have to be utilized to the betterment of the organizations in the nuclear energy industry [10]. The teams should be comprised of people from diverse culture and they should possess the decision-making authority.

### **3. Methodology**

In this research both quantitative and qualitative data has been used for better understanding of the outcome. The quantitative data has been collected from survey questionnaire and qualitative information has been collected by interviews. For the quantitative analysis, one-way ANOVA test was used to test whether the respondents concurred on the influence and

cultural diversity on the innovation process. Furthermore, the Tukey test was used to confirm if there is a difference between the respondents' categories in the mean rating at the 0.05 significance. Concerning the interviews, the grounded theory techniques were employed to thematise, code, and establish the propositions based on the top managers responses.

For this research, purposive sampling has been chosen to ensure the nuclear characteristics of the sample, and to ensure the alignment with the objectives of the study. In this research, the researcher randomly selects 75 employees working in nuclear sector of UAE. For the non-probability sampling technique, it has been used for collecting quantitative data in a neutral fashion. In the present context, 75 employees of the Emirates Energy Corporation (ENEC) have been chosen for collecting the quantitative data, while three managers of the same organization have been selected for gathering the qualitative data.

#### 4. Findings and Interpretation

The findings of this study show intensity to which cultural diversity impacts technological innovation process in nuclear sector of UAE. For the demographic data of the interviewed sample of the Emirates Nuclear Energy Corporation, 56% of the sample is males, while 47% are females. Regarding the age of the respondents, 8% are more than 60 years, 16% are between 45- 59 years, 28% between 30-44 years, and 48% are below 30 years. Concerning the tenure of occupation, 20% of the sample have spent more than 7 years with the organization, 28% have spent 3-7 years, while 52% have spent below 3 years with the organization. For the studied factors of innovation process, 25% find the communication cost as the most important factor, 23% find access to market as the most important, while 31% of the sample has chosen the creative ideas, and 21% have chosen the resources allocation as the most important factor of innovation process. (Table 1)

TABLE 1: Demographic details

Criterion	Options	Response Frequency	Responses Percentage (%)	Total Responses
Age	More than 60 years	6	8	75
	45 – 59 years	12	16	75
	30 – 44 years	21	28	75
	Below 30 years	36	48	75
Gender	Male	42	56	75
	Female	35	47	75
Tenure of occupation	More than 7 years	15	20	75
	3 – 7 years	21	28	75
	Below 3 years	39	52	75

When asking the sample about the cultural diversity and its impact on reducing the communication cost, 41% of the sample strongly agrees with that, 31% agree with that, 3% have a neutral opinion. While 16% of the sample disagree with that and 9% strongly disagree

with that. The results for the impact of the cultural diversity on enhancing the access to market, 43% of the sample agrees with this statement, 29% agree, 3% have neutral responses, while 15% disagree and 11% strongly disagree. Regarding the summary of the responses on the statement about the level to which the cultural diversity increases the number of creative ideas, 44% of the sample strongly agree with that cultural diversity increases the number of creative ideas, 39% agree with that, 1% have a neutral response, while 9% disagree and 7% strongly disagree. Regarding the statement that cultural diversity limits the wastage of resources, 39% of the sample strongly agrees with that, 33% agree with that, 3% have a neutral response, while 15% disagree with that, and 11% strongly disagree. For the impact of cultural diversity on raising barriers against the transformation process, 36% of the sample strongly agree with that, 28% agree with this statement, 4% have a neutral response, while 17% disagree with that and 15% disagree with that statement.

Among the different factors of cultural diversity, this study has focused on four of them, which the researcher has founded to be the most important when discussing the impact of cultural diversity on technological innovation in the nuclear industry. These factors discussed include the language, ethnicity, identity and religion.

The vital features of the innovation processes have been moreover exposed from the above data analysis project. Furthermore, to that, the information analysis has clarified the current approaches of managing cultural diversity, which are commonly used for the implementation of innovation process. Lastly, the data analysis has revealed that there is a strong impact of the cultural diversity factors of language, ethnicity, identity and religion on the technological innovation process in the nuclear industry.

## **5. Discussion**

It has been presented from the data findings part that language, ethnicity, religion as well as identity of the individuals are most important factors of the cultural diversity. The data findings revealed that communication cost, access of market, creative ideas, as well as resource allocations are the highly crucial aspects of the innovation process in the nuclear sector. In addition to that, the data findings have been quite impressively able to identify that the cultural diversity will be able to reduce the cost of communication. At the same time, the data findings pointed out that the cultural diversity has been able to enhance the access of market.

It has been observed from the analysed data that the numbers of creative ideas are highly dependent on the cultural diversity, as the more the employees are diversified, the more the organization is creative. It is obvious that in a relatively newly use of nuclear power to produce energy, the creative ideas are highly required to enhance the quality and quantity of the produced energy and at the same time to reduce the costs and to reduce the negative impacts on the surrounding environment with all of its ingredients. At the same time, the data findings illustrated that the cultural diversity enables the nuclear firm in respect of proper allocation of the resources. In addition to that, the transformation process is additionally highly hindered by the cultural diversity.

The responses provided by the three managers of Emirates Nuclear Energy Corporation (ENEC) can be related with the linkages between the two variables, the main theme of the research. Unity and coordination between the managers is an evidence of slow and gradual progression towards the achievement of innovation with the business processes [11]. The collected data revealed that the main benefits of cultural diversity in respect of innovation process include the reduction of the information flow and cost of the communication, and this encourages the generous innovation process. Additionally, it helps in easy access to the

international markets. This way the organization benefits from both of the economic policies and technologies of the different nations. Finally, cultural diversity helps in combining numerous innovative ideas from the different cultural employees. This way the nuclear firms can cultivate the collaborative creativity in the innovation process.

The collected primary and secondary data have revealed the same driving forces in general, which are the market drivers, such as the economic developments, the political or public drivers involving the environmental issues, and technical drivers, such as the productivity and improved operability. Both Sheeha [7] and Morris [12] have highlighted these points. There are other driving forces for the nuclear technology innovation, including those of demand for nuclear energy that requires researches in this area and that makes technological innovation one of the major requirements. Additionally, the available finance to pay for the different expenses of the research and development programs that inspire and motivate technological innovation, as big budgets might be needed for the theoretical and practical researches and activities. Another driving force is the capable experienced and innovative human resources, as humans' minds are the main source of innovation and when lacking this critical force, not satisfactory outcomes can be achieved. Finally, there should be an easy access to science, technology and business best practices as science and technology are the mostly required tools for innovation, especially technological innovation, this is in line with findings of the studies by Sheeha [7] and Morris [12].

It is obvious that there are some challenges concerning the cultural diversity in respect of innovation process. This is the reason for introducing these challenges from the perspective of the managers in one of the nuclear energy corporations in the UAE. The managers introduced the different challenges of the discriminative practices within the workplace, indecision from a culturally diversified team. Additionally, the difficulty to influence and to manage the employees of different ethnicities, religions, languages and identity.

In general, these results or outcomes of the primary research conducted in the Emirates Nuclear Energy Corporation about the impact of cultural diversity on the technological innovation in nuclear industry match the data collected from the secondary resources forming the literature review for the study. For instance, the primary research has proved that the studied factors of ethnicity, language, religion and identity have a significant impact on the technological innovation in the nuclear industry, and (Mayhew, 2013) has concluded the same result. Additionally, for the driving forces behind the technological innovation in the nuclear industry, both of the primary research and Sheeha [7] have reached to the same conclusion, which is that the driving forces of market drivers, political / public drivers and technical drivers have a significant impact on technological innovation in the nuclear industry. For the relationship between the cultural diversity and technological innovation in the nuclear industry, this study established that there is a positive relationship both between the cultural diversity and the technological innovation in the nuclear energy. These findings are in line with the findings of other current studies [13, 14,15,16].

## **6. Conclusion**

There are many technical aspects of innovation in the nuclear industry. Cultural diversity has a lot of positive effect in the organizational success. The various aspects of cultural diversity have to be looked after and the innovation process has to be enforced by focusing on the different aspects. The innovation process has to be motivated so that the market can be captured, and the proper skilled and experienced employees have to be given the opportunities to enhance the given scenario. The nuclear innovation programs have to be initiated to provide an alternate option for the energy resources. In addition, the communication cost, access of the



market, developing creative ideas, as well as, resources allocation are the most important aspects of the innovation process.

Another conclusion for this study is that, the main benefits of cultural diversity in respect of innovation process include the reduction of the information flow and cost of the communication, motivating the generous innovation process, enabling an easy access to the international markets. It additionally helps in combining numerous innovative ideas from the different cultural employees. Regarding the driving forces for nuclear energy innovation, they include the market drivers, the political or public drivers and technical drivers. There are different challenges of cultural diversity in respect of innovation process including the discriminative practices within the workplace, indecision from a culturally diversified team; additionally, it is not easy to influence and to manage the employees of different ethnicities, religions, languages and identity.

Finally, there are different strategies of managing cultural diversity for executing innovation process including the development of a generous environment of collaboration, creating an active support system, hiring employees of the support system who are highly experienced in the innovation system and managing the diverse team, and lastly motivating the employees to participate in the business activities.

As a result of the conducted research, below are the main recommendations that can help in achieving the best benefit from the cultural diversity in the workplace in motivating the technological innovation in the nuclear industry, as well as the action plan related to every recommended action:

#### 1. Providing executive level support and accountability

- Support from the executive level should be sought by the organizations.
- The sense of cultural competence should be created in the employees so that they can take care of the cultural diversity facts very well. The organizations must welcome the policy in respect of increasing the development of the diverse workforce as well as cultural learning.
- The organization must enhance the level of the policy through a planned budget which will include all of the competence strategies as well as activities.

#### 2. Developing actions plan for increasing incremental and realistic competence

- Diverse workforce should be welcomed by the company.
- All the strategies should be utilized within the fixed budget.
- The organization must be able to form a diverse workgroup as well as select realistic goals.
- An effective action plan must be developed, and the teams must argue their different contribution on agreeing the similar goals base on the nuclear industries.

#### 3. Developing a system for managing the grievance of staffs

- Staff grievance should be handled properly through a proper resolution process.
- The selected diversified group should be able to achieve the organizational goals

There are different implications for this study and they can be categorized into two classes, which are the theoretical implications and the managerial or practical implications. For the

theoretical implications this study is in one of the not greatly examined topics, so researches of this type are highly recommended. This research paper sheds the light on different aspects and related cultural diversity to innovation in one of the critical industries, which is the nuclear energy. As the world today is heading towards the extensive use of the non-renewable energy, such as the nuclear energy, especially with the significant shortage of non-renewable energy resources, researches in this area are required. This research might be limited in scope and there are too many other points are needed to be discussed, additionally the size of the sample might be limited, but it can be a core for more extended similar researches and it can be the base of a great structure.

Secondly, the research has several managerial or practical implications, as there are various organizations in the UAE which can make use of the findings and the recommendations of this project to manage diversity among the employees in a good way to achieve high innovation in the workplace. Especially the organizations working in the area of energy, specifically, nuclear energy can benefit from this research. It has to be taken into consideration that the UAE is a country characterized by a broad presence of employees' diversity, because employees from all over the world head toward the country for enjoying better working conditions and better standard of life.

The main limitation was that the sample sizes for both the quantitative and qualitative analyses were relatively small, as respectively, the samples includes 75 of the employees working in the Emirates Nuclear Energy Corporation (ENEC), and just three managers. The limited sample sizes might not be sufficient to collect highly trusted primary data, as the bigger the sample size, the more trusted and reliable are the field study outcomes. Therefore, the quality of the data might be affected due to these limitations.

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