

Understanding Cultural Characteristics Shared by MCR Operators in Korean NPPs

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1. Introduction

There are various factors that affect the performance of human operators and they are called performance shaping factors (PSFs) or performance influencing factors. Many studies on diverse PSFs have been carried out, and the cultural characteristics of an operating team has been proposed as one of important factors determining team performance [1, 2].

Hofstede [3,4] defined culture as “the collective programming of the mind distinguishing the members of one group or category of people from others”. That is, people engaged in a certain domain tend to share a similar culture according to the domain-specific traits such as internal operating rules, management style, expertise, training, etc. Shin et al. [5] proposed how to identify a domain-specific cultural characteristics and confirmed its presence in the nuclear industry using Hofstede’s five cultural indices, which provided a starting point to study the effects of team culture on team performance. In addition, before scrutinizing the relationship between team culture and performance in nuclear industry, it is crucial to understand the specific cultural profile itself shared by operator groups in depth. In this regard, this study explains the cultural profile shared by operator groups in Korean nuclear power plants (NPPs), and discusses the implications of the identified cultural characteristics by each Hofstede’s index.

2. Hofstede’s Cultural Indices

This section briefly introduces Hofstede’s indices employed to identify cultural characteristics in this study. Hofstede developed five indices to represent differences among national cultures [3,4] and questionnaire analysis is used to quantify each cultural index. The five cultural indices are power distance, individualism, masculinity, uncertainty avoidance, and long-term orientation. The definition of each index is described below.

- Power distance index (PDI) is the extent to which the less powerful members of organizations and institutions accept and expect that power is distributed unequally.
- Individualism index (IDV) is the degree to which individuals are supposed to look after themselves or remain integrated into groups, usually around the family.

- Masculinity index (MAS) refers to the distribution of emotional roles between the genders, which is another fundamental problem for any society to which a range of solutions are found.
- Uncertainty avoidance index (UAI) is the extent to which a culture programs its members to feel either uncomfortable or comfortable in unstructured situations.
- Long-term orientation index (LTO) refers to the extent to which a culture programs its members to accept delayed gratification of their material, social, and emotional needs.

3. Cultural Profile of MCR Operators in Korean NPPs

A questionnaire survey was carried out to derive Hofstede’s cultural indices of the operator groups from four Korean NPP units (called KR1, KR2, KR3, and KR4 in this study) [5]. The operators from KR1 and KR2 were working in conventional analog main control rooms (MCRs), while those from KR3 and KR4 were working in fully digitalized MCRs at the time of data collection.

Figure 1 shows the cultural profiles of the four MCR operator groups together with the profile of ordinary Korean people reported by Hofstede [6]. From Fig. 1, first, it can be found that all the operator groups have very similar profiles in terms of the five Hofstede’s indices. In this regard, the numerical verification for the similarity among the operator groups were conducted by Shin et al. [5]. In addition, from Fig. 1, it seems that the cultural profiles of the operator groups are very different from that of ordinary Korean people.

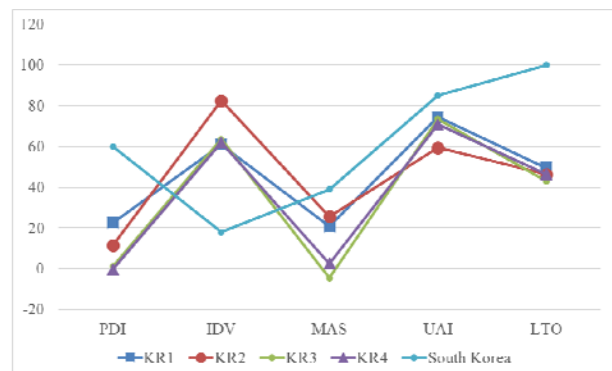


Fig. 1. Cultural profiles of MCR operators from Korean NPP units along with ordinary Korean people.

Table I: Cultural Characteristics of MCR Operators

	MCR Operators	Ordinary Korean
PDI	Independent (equal rights)	Slightly Hierarchical
IDV	Individualistic	Collectivistic
MAS	Feminine	Slightly Feminine
UAI	Threatened by ambiguity	Threatened by ambiguity
LTO	Unbiased	Strongly long- term oriented

Table I summarized the cultural characteristics of the MCR operators by comparing with ordinary Korean people. The following sections scrutinize the cultural characteristics by each Hofstede's index.

3.1 Power Distance

The MCR operator groups have very low values of PDI, which means that the organization can be characterized as follows: Being independent, hierarchy for convenience only, equal rights, superiors accessible, coaching leader. These are very opposite of the characteristics of ordinary Korean that accepts a hierarchical order in which everybody has a place and which needs no further justification. The low PDI of the MCR operator groups might be related to the composition of an operating team and role of each operator. An MCR operating team typically consists of five operators (a shift supervisor, reactor operator, turbine operator, electrical operator, and shift technical advisor), and their respective roles are very important to operate a reactor safely. The relationship among the operators seems to be horizontal, which is in line with the characteristics of low power distance.

3.2 Individualism

The MCR operator groups are characterized as individualism, while Korea is considered a collectivistic society. In the individualistic organization, hiring and promotion decisions tend to be based on skills and rules only, and employer-employee relationship is considered as a business deal in a "labor market". Also, in business, task and company prevail over personal relationships [4]. Like the low PDI, the high IDV of the MCR operator groups might be related to a clear distinction between the roles of the operators. In addition, it should be noted that IDV is significantly correlated to PDI; the society with low PDI is more individualistic in nature [4].

3.3 Masculinity

The MCR operator groups have very low value of MAS and more feminine characteristics compared to ordinary Korean people. In the feminine organization,

the softer aspects of culture are valued and encouraged such as leveling with others, consensus, independent cooperation, and sympathy for the underdog. Incentives such as free time and flexibility are favored. In contrast, a high masculine society considers the cooperation as a sign of weakness and has a lower appreciation of cooperative strategies [7]. In general, the MCR operators value the cooperation among team members for reactor operation, and recognize the ability of other members in their areas. This characteristics of the MCR operator groups seems to result in the low scores of MAS.

3.4 Uncertainty Avoidance

Even though the MCR operator groups have slightly lower values of UAI compared to the ordinary Korean people, their scores are high enough to be considered as an organization with high UAI. Members with high UAI are uncomfortable in the face of potentially unforeseen outcomes in the future and take efforts to minimize the likelihood of the same. Thus, they encourage creation of rules and regulations so as to minimize ambiguity [8,9]. These characteristics are quite similar to those required in nuclear industry. As safety is the first priority in NPPs, very strict regulations and procedures are applied to plant operation. Accordingly, the MCR operator groups supposedly share the tendency to avoid uncertainty.

3.5 Long-Term Orientation

With an intermediate score of LTO, the MCR operator groups are seen to not represent a clear preference on this index, while the Korea scores as one of the most long-term oriented societies. It is known that the high LTO is oriented towards the future and low LTO is oriented more towards the past and the present. In addition, the LTO corresponds to work values like self-discipline, accountability, and learning. Cultures with relatively short-term orientation may feature potential conflicts between managers' and workers' aspirations and goals [9]. The MCR operators seems to have an intermediate trait for long-term and short-term orientation.

4. Summary and Conclusions

As human operators play an important role in operating socio-technical systems, the culture of operators should be stressed because it entirely governs the behavior of the operators. There have been sustained efforts to evaluate the relationship between cultural characteristics and safety performance in diverse industries [7-10]. In this respect, a domain-specific group culture formed in NPPs was identified by investigating operator groups in diverse contexts [5]. Before scrutinizing the effect of team culture on the

associated team performance in NPPs, this study focused on the implied meaning of the cultural profile shared by MCR operators working in Korean NPPs.

It was revealed the MCR operators have low PDI and MAS, high IDV and UAI, and intermediate LTO scores. The cultural characteristics of the MCR operators associated with each index was explained and it was discussed how the domain-specific culture has been established differently from Korean ordinary people. Understanding the cultural characteristics will give a basis for analyzing the relationship between team culture and team performance, and accordingly, planning a domain-specific training strategy to improve the performance.

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