

Cultural and National Factors in Nuclear Safety

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This workshop is based on a very important, perhaps life saving, curiosity. How do larger cultural and national factors influence nuclear power plant safety? As the organizers highlight the importance: “In the light of the Fukushima Daiichi nuclear accident some observers have pointed out that certain unique national factors impacted, both positively and negatively, on the safety culture that prevails in Japan’s nuclear industry. This is, of course, not only true of Japan; all nations have their strengths and weaknesses. The commonly used approach when assessing and working with safety culture improvements, however, does not encompass national factors. A global vision and approach towards strengthening safety culture are needed.” “... every Member State needs to ask itself what factors in its national culture context can facilitate or hinder the development of a strong safety culture.”

As suggested in this description much of this discussion has focused on the characteristics of “national cultures” and the relation of national cultures to plant/organizational cultures and subsequently to safety culture. This discussion has been heightened after the Fukushima-Daiichi accident and the release of the Diet report. Certainly safety culture must be considered within the national context.

IAEA defines safety culture as: “*Safety culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance.*” Many have long asked how many of these values, beliefs and assumptions are derived from the larger external culture? How external cultural factors interact with more specific organizational cultures? Where and when might the external cultural values add to and subtract from safe work practices? What happens when external social values clash with safety principles?

Here I wish to review the basic concepts of “national culture,” discuss the value and limits of such conceptions, identify what the research suggests are the most likely effect of general cultural characteristics of the nation state in which they are located, and link externally derived cultural characteristics to high performance organizations.

The Concept of National Culture

National culture has been defined as “the collective programming of the mind acquired by growing up in a particular country” (Hofstede, 1991, p. 262). In this sense it denotes a particular shared propensity to favor certain values or state of affairs over others. But such a simple conception hides many difficulties. First, nations are complex, some very complex. Many are filled with fairly distinct regional cultures; immigration and migration has led to hybridization and pluralistic values systems; even the more homogeneous nations may still be filled with competitive values, tribalization,

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fragmentation, and class specific cultural characteristics; and finally globalized cultural products and messages and international business and management systems may lead to new global systems being more powerful than nationally based ones. And, further, even if national cultural characteristics can be consistently identified, little is known about how general, versus domain-specific, their expression. For example, do they more heavily impact on family and community life than in the workplace?

Despite the complexity, considerable work has been done developing systems to compare and contrast national cultures. The best known is a framework developed by Geert Hofstede (1980, 1991) through surveys of IBM employees throughout the world. Hofstede's original analysis suggested four cultural value dimensions: *individualism-collectivism*; *uncertainty avoidance*; *power distance (strength of social hierarchy)* and *masculinity-femininity (task orientation versus person-orientation)*. Later work added *long-term orientation* and *indulgence versus self-restraint*.

A massive literature exists supporting and criticizing the dimensions, their descriptive value and use. But while relatively few empirical studies focus on the impact of national culture on safety attitudes, behavior and performance, some general conclusions can be reached:

Countries with a high individualism score will tend to hire based on skills while more collectivist countries will focus more on on-the-job training. Each of these can have benefits and costs. Similarly individualist countries will give considerable freedom but expect initiation and preference for challenging jobs while collectivist would expect more compliance and motivation from collective goals.

Collectivist cultures tend to also score high on uncertainty avoidance and long-term orientation. With this combination there tends to be proliferation of rules and regulations, even a psychological need for them. This can lead to efficiencies in routine situations but greater difficulties in ambiguous, fast changing circumstances.

Cultures with high power distance indexes may be unwilling to express disagreement with superiors and prefer autocratic or paternalist management rather than that based in participation and collaboration. Power distance scores also correlates with social class with those of lower social class tending to have high power distance scores independent of the larger national context. Such characteristic may limit a questioning attitude and made shared spaces more difficult in embed in organizational life.

Supporting this, airline pilot data indicated that behavior might be co-determined by the relationship between individualism, power distance and uncertainty avoidance. High power distance pilots from high power distance may follow orders and adhere to the standard operating procedures more. High individualism pilots may be more independent, more flexible and use company procedures with more discretion. The same relations might be expected in NPP operations.

As Kathryn Mearns and Steven Yule (2009) conclude after an extensive review of studies in aviation, construction, and the oil and gas industry, the issues around safety and

Hofstede's national characteristics may be better seen in terms of balance rather than preference for particular cultural qualities: "Extremes of either Collectivism or Individualism may be detrimental to the safety of an organisation. If Collectivism becomes too strong, known in psychological terms as 'groupthink.' Individuals may refrain from offering a divergent point of view vital in critical safety decision-making situations. On the other hand ... Individualism is related to more direct communication and speaking up about issues, an attribute that appears to be particularly important in developing a positive safety culture. Extremes of the Masculinity/Femininity dimension indicate differences in the need for challenge, progress and distinction, which could ultimately result in the loss of interpersonal relations and good communication. While it is likely that no culture possesses all the optimum components necessary for safety, it is possible that certain combinations of national dimensions (especially Power Distance, Individualism, and Masculinity – based on the arguments above) have the potential to create cultural norms that will determine the propensity to engage in risk-taking behaviours at work. The support and commitment of management may be an important mediating influence if this is the case by encouraging employees to behave safely even if they may be more naturally disposed to take more risk than is deemed acceptable."

But ultimately in looking carefully at the Means and Yule (2009) conclude: "The results suggest that more proximal influences such as perceived management commitment to safety and the efficacy of safety measures exert more impact on workforce behaviour and subsequent accident rates than fundamental national values."

But this conclusion has to be qualified some. National culture may have greater impact in some societies than others. Taras, Steel and Kirkman (2011) suggest that great "cultural tightness will lead to greater effects from national culture. "Cultural tightness-looseness is the strength of social norms and the degree of sanctioning within societies. In tighter societies, societal institutions promote narrower socialization with higher levels of constraint and highly developed systems of monitoring and sanctioning behavior, whereas looser societies promote broader socialization with lower levels of constraint and weaker systems of monitoring and sanctioning behavior." "As a result, the relationship between cultural values and workplace outcomes is stronger in culturally tight societies, such as Japan, South Korea or Pakistan, and is weaker in such culturally loose societies as the U.S. or Brazil." (p. 193)

Following Hofstede, GLOBE (Global Leadership and Organizational Behavior Effectiveness Research) has gone much further in exploring cultural differences and connecting them to forms of leadership and organizational effectiveness. The GLOBE Project, collecting data across nearly 1000 organizations in 62 countries identified nine cultural characteristics or competencies and grouped the 62 countries into ten societal clusters (Javidan & Dastmalchian, 2009).

The GLOBE cultural competencies are: 1. *Performance orientation*, an organization or society's tendency to encourage and reward group members for performance improvement and excellence. 2. *Assertiveness orientation*, an organization or society's tendency to be assertive, confrontational, and aggressive in social relationships. 3. *Future orientation*, the degree to which individuals in organizations or societies engage in

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future-oriented behaviors such as planning, investing in the future, and delaying gratification. 4. *Human orientation*, the degree to which individuals in organizations or societies encourage and reward individuals for being fair, altruistic, friendly, generous, caring, and kind to others. 5. *Collectivism I: Institutional collectivism*, the degree to which organizational and societal institutional practices encourage and reward collective distribution of resources and collective action. 6. *Collectivism II: In-group collectivism*, the degree to which individuals express pride, loyalty and cohesiveness in their organizations or families. 7. *Gender egalitarianism*, the extent to which an organization or a society minimizes gender role differences and gender discrimination. 8. *Power distance*, the degree to which members of an organization or society expect and agree that power should be unequally shared. 9. *Uncertainty avoidance*, the extent to which members of an organization or society strive to avoid uncertainty by reliance on social norms, rituals, and bureaucratic practices to alleviate the unpredictability of future events.

GLOBE researchers grouped these dimensions and identified how organizational activities might differ in different national contexts. They also moved away from country by country analysis to grouping based upon cultural similarities owing to shared geography and climate conditions.

Anglo Cultures: England, Australia, South Africa (European ethnic background) Canada, New Zealand, Ireland, United States.

Arab Cultures: Algeria, Qatar, Morocco, Egypt, Kuwait, Libya, Tunisia, Lebanon, Syria, Yemen, Jordan, Iraq, UAE, Bahrain, Saudi Arabia, Oman.

Confucian Asia: Taiwan, Singapore, Hong Kong, South Korea, China, Japan, Vietnam.

Eastern Europe: Hungary, Bulgaria, Romania, Czech Republic, Slovakia, Poland, Lithuania, Latvia, Estonia, Serbia, Greece, Slovenia, Albania, Russia

Germanic Europe: Dutch-speaking (Netherlands, Belgium and Dutch-speaking France) German-speaking (Austria, German-speaking Switzerland, Germany, South Tyrol, Liechtenstein)

Latin America: Costa Rica, Venezuela, Ecuador, Mexico, El Salvador, Colombia, Guatemala, Bolivia, Brazil, Argentina

Latin Europe: Italy, Portugal, Spain, France, Switzerland (French and Italian speaking).

Nordic Europe: Finland, Sweden, Denmark, Norway

Southern Asia: India, Bangladesh, Indonesia, Malaysia, Thailand, Iran, Philippines, Turkey

Sub-Saharan Africa: Namibia, Zambia, Zimbabwe, South Africa (African ethnic background), Nigeria

Certainly this work like Hofstede's is descriptively useful. But little has been done to link these characteristics clearly to organizational performance and especially safety culture. Part of the difficulty arises from the multiple intersecting factors that influence the culture of an organization and its performance. National cultures can usefully be expanded to looking a number of nation state activities partly formed out of shared cultural values that nonetheless heighten and attenuate the various expressions of cultural values.

The Multiple Factors Influencing Organizational Culture

Arie Lewin and Jisung Kim (2004) have greatly enriched the understanding of the various intersecting factors that influence the specific ways organizations perform, adapt, change and innovate. These include both institutional forces, national cultural values being one, and managerial practices. The geography, history and development of the nation state may impact both institutional forces and managerial practices. Cultural values can both impact and be impacted by the geography, history and development of the nation state.

Institutional factors: 1. *Founding Conditions:* The founding conditions include predispositions of founding members and preferences for certain structures as well as competition and market conditions and availability of capital and labor markets. 2. *Role of Government:* Governments are involved at different levels from ownership and control to regulator structures, protection and relation to market conditions. 3. *Legal System:* The legal system impacts the nature of contracts and intellectual property and can greatly influence transparency and adoptions of changes. 4. *Capital Markets:* In many countries the stock and bond markets impact the relative long-term orientation and performance criteria. 5. *Educational System:* Educational systems reproduce, create and transform social values impacting the force of traditional cultural systems and often have great impact on decision-making practices and preferences. Managers are often trained in countries with different cultures and managements systems. 6. *National Culture:* Wider cultural values not without impact in this view, but they intersect in complex ways with other factors.

Managerial Practices: 1. *Governance Structures:* While basic governance models are similar in even very different countries, ownership and labor inclusion may differ markedly. 2. *Authority and Control:* How power and authority are exercised in different companies in different countries is subject to great variation. This can impact directly on things like a questioning attitude. 3. *Employment Relationship:* The embedded relationship often has direct impact on employee motivation, commitment and voluntary compliance and indirectly can impact reporting and innovation. 4. *Strategic Paradigm:* Managers differ greatly in the ordering and timing of strategic goals and methods of accomplishment.

These characteristics are somewhat easier to link to organizational performance than cultural values and dispositions alone. In many was as indicted in Lewin and Kim's (2014) Table 11.1, they can be used to give a somewhat more nuanced account of factors influencing how an organization in a particular country might perform. With the increased globalization of managerial training and capital markets, these factors may suggest a lessening of the impact of traditional cultural values.

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Table 11.1 Dimensions of country differences: United States, Japan, Germany

	<i>United States</i>	<i>Japan</i>	<i>Germany</i>
Institutional Factors			
Founding conditions	<ul style="list-style-type: none"> • diversity • abundant resource • huge domestic market • puritanism • market competition 	<ul style="list-style-type: none"> • homogeneity • Tokugawa era (1603–1868) • Confucianism • strong government 	<ul style="list-style-type: none"> • early industrialization • financing through banks • cartelization • worker participation
Role of government	<ul style="list-style-type: none"> • encourage market competition • low industrial policy 	<ul style="list-style-type: none"> • encourage agreement • high industrial policy 	<ul style="list-style-type: none"> • encourage stability • direct intervention
Legal system	<ul style="list-style-type: none"> • common law • transparent • flexible • adversarial litigation • facilitates impersonal transactions 	<ul style="list-style-type: none"> • civil law • guiding • flexible • conciliatory litigation • facilitates relationship-based transactions 	<ul style="list-style-type: none"> • civil law • transparent • inflexible • facilitates both types of transactions
Capital market	<ul style="list-style-type: none"> • market for control of ownership • highly developed 	<ul style="list-style-type: none"> • market for stability of ownership • moderately developed 	<ul style="list-style-type: none"> • market for stability of ownership • moderately developed
Education system	<ul style="list-style-type: none"> • decentralized • diverse 	<ul style="list-style-type: none"> • centralized • homogeneous • strong meritocracy 	<ul style="list-style-type: none"> • centralized • vocational system
Culture	<ul style="list-style-type: none"> • individualism • heterogeneous 	<ul style="list-style-type: none"> • collectivism • homogeneous 	<ul style="list-style-type: none"> • moderate collectivism • homogeneous
Managerial practices			
Governance system	<ul style="list-style-type: none"> • separation of ownership from management • strong institutional holdings • shareholder oriented • one-board system 	<ul style="list-style-type: none"> • cross-holdings among firms • stakeholder-oriented • one-board system • formation of group 	<ul style="list-style-type: none"> • bank holdings • stakeholder-oriented • dual-board system
Authority and control	<ul style="list-style-type: none"> • emphasis on roles and tasks • top-down 	<ul style="list-style-type: none"> • emphasis on both authority and roles • top-down and bottom-up 	<ul style="list-style-type: none"> • emphasis on power and authority • top-down
Employment relationship	<ul style="list-style-type: none"> • employment-at-will • external labor market • nonparticipative • performance- and market-based • largest gap between top and bottom 	<ul style="list-style-type: none"> • lifetime employment • internal labor market • participative • seniority-based • smallest gap between top and bottom 	<ul style="list-style-type: none"> • long-term employment • participative • performance- and seniority-based • moderate gap between top and bottom
Strategic paradigm	<ul style="list-style-type: none"> • short-term oriented • external growth • high managerial autonomy 	<ul style="list-style-type: none"> • long-term oriented • internal growth • incremental growth • low managerial autonomy 	<ul style="list-style-type: none"> • long-term oriented • internal growth • moderate managerial autonomy

Likely Consequences of Cultural Value Differences

Numerous attempts have been made to identify links between largely shared cultural values and specific organizational and individual behavior (see, Triandis, 1994, for example). Most agree that correlations can be found but causality is much more difficult to show. Certainly static snapshot correlations do not help much. A much more dynamic

look at mediating variables and processes is necessary to show how the impact might occur in a particular organization during a particular set of events.

Neville Moray (2001) has helped in detailing the relations of cultural and national characteristics and safety. He has shown that at each level “ergonomics, control room organization and national characteristic of the workforce there seem to be substantial differences that have potential impacts on nuclear safety and productivity.” (p. 37) And, further, these may have impacts as technologies and designs are exported to different cultural contexts.

At the level of ergonomics, national groups have long-term preferences for the color and orders of displays and direction of throwing a switch. It would be a mistake to assume that these are isolated preferences. Rather than are often linked to larger world-views and sense of natural order. Similarly differences are evident with the control room organization. Much variation exists across countries and these often arise out of specific national histories, for example the hiring from the Navy in the US, rather than reactor design. Differences across countries also arise from the relation to sub-contractors, various forms of gender and class politics, communication issues between majority and minority workers, and so forth.

Despite clear influences the evidence of simply or strong national culture effects is not very strong. Variations within a country can be as strong as difference across countries. And globalization including the gradual universalization of certain management practices leads to uniformity across cultures that may be stronger than traditional cultural values in determining behavior within specific contexts.

Management and leadership have emerged as significant determinants of safety performance in most sectors.

Aspects of National Culture in Relation to Safety Culture

Many forces contribute to any organization’s success as well as safety record. National culture is one of them but not consistently important, unlike managerial practices that seem consistently critical. But, Vas Taras, Piers Steel, Bradley L. Kirkman (2011) have argued that national culture is related to several relationships that are persistent and significant. These are summed below. Some of these have implications for safety culture.

“Preferences for leadership styles: People in individualist, low power distance cultures consistently display preferences for participative leadership. In contrast, collectivist and high power distance values are associated with a preference for more direct and charismatic leaders.”

“Group dynamics: Not surprisingly, due to its close ties to beliefs about groups, individualism—collectivism has a strong effect on group dynamics. First, collectivist values are associated with the need for being with others and the need for social support. Further, collectivists are much more likely to prefer to work in a

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team and are much more committed to their team than are individualists. On the other hand, individualists are less likely to conform to group pressures. Consequently, collectivists show strong favoritism to the groups to which they belong, while individualists tend not to have such strong group affiliations.”

“Communication style: Masculine and individualist values have been consistently shown to relate to more direct communication styles, self-promotion, and openness in communication. In contrast, collectivism, femininity, and high power distance orientation tends to relate to indirectness and modesty. Communication in individualist cultures is also low context, meaning that the verbal, rather than the non-verbal (e.g., facial expressions, body language), aspects of messages are ascribed the most importance. In contrast, communication in collectivist cultures tends to be high context, with non-verbal cues carrying the most meaning. Depending on the context and how it is conveyed, “Perhaps” can become “Definitely Yes” or “Definitely No.””

“Fairness perceptions and compensation: Individualist cultures display a preference for equity rules in distribution of rewards and punishments; that is, those who contribute more are believed to deserve a greater reward. Collectivist cultures tend to favor equality rules and are much more comfortable with each member of the group receiving equal compensation regardless of individual effort or input. Cultures characterized by high power distance are known for a strong preference for seniority rule that allocates the greatest reward or responsibility to the eldest or otherwise most senior group member. Regarding the perceived fairness of decision-making criteria, individualist cultures, in particular when individualism is coupled with more femininity (as in Northern European countries), show a strong preference for a cooperative style in decision-making, whereas masculine, collectivist and high power distance cultures tend to favor a top-down decision-making process and show a greater respect for authority.”

“Conflict handling preferences: In the related area of conflict resolution, collectivist cultures show a much stronger concern for interests of the other party and strongly favor involvement of a third party or a mediator. Individualists and people with masculine values tend to be much more vocal when faced with perceived unfairness and often display their disagreement by exiting the group or quitting. In contrast, collectivists and people with feminine values tend to react to perceived unfairness by diminishing their effort or simply ignoring the unfavorable outcome in an effort to restore group harmony and cooperative spirit.”

“Work design: Individualists and people with low power distance orientation have been consistently shown to favor work design that allows for personal autonomy, flexibility, involvement in the decision-making process, opportunities to make personal contributions beyond job descriptions, and quality of personal and family time. In contrast, people from collectivist, high power distance cultures tend to prefer more structured roles, clearer directions, and often feel uncomfortable with empowerment or the need to show initiative beyond traditional situations. They also show a strong preference for closeness with their immediate supervisors, feed-back

seeking, and expect and provide more paternalistic, caring, and trusting subordinate-supervisor relationships. While understanding which types of workplace outcomes are likely to be affected by national cultural values, managers would also benefit from understanding when culture is likely to matter most, a discussion to which we turn next.”

National Culture and the Link to High Performance Organizations

The identified organizational characteristics linked to national culture can be compared with research-identified characteristics of “high performance organizations.” In these comparisons not all organizations are equal and to the extent that they derive certain values and practices from national cultures the value of the growth of global management systems over traditional value systems become clearer. Beginning from LaPorte (1996) work the following are standard high performance organization characteristics:

- They have a strong sense of mission and use operational goals to provide service and reliability using mission and goals over direct supervision.
- They have a tight coupling of technical and social relationships thinking of the organization in complex systems’ terms.
- High reliability and optimal performance is achieved through ready access of personnel to senior management to report problems and offer improvements. The reporting of errors is ready and visibly rewarded.
- Continuous improvement through capacity building, goal setting, assessment, system understanding and dialogue is central to the organization. This is enhanced by the presence of groups who look for weaknesses and areas for improvement.
- People are trained to perform multiple functions and tasks enabling structural flexibility and redundancy.
- New and/or unanticipated events are met with re- and self-organizing to meet the new demands. Multiple forms of authority and expertise are recognized. Hierarchies are flexible and transform to meet new demands.
- Decision-making is dispersed. And, decisions quickly move to actions without long approvals and rethinking.
- The combination of high technical and transparency enables an easy overview of the functioning of the system as a whole and the nature of the various interfaces.

In Sum

National cultures have consequences and certainly must be taken into account at all levels of design and operation, but the stability, uniformity, and impact of national culture can

easily be overstated. In some cases it can be used as a cover for what are more clearly failures of management. Successful management must understand and work with larger social values. Cultural values can be put to use for good or can have negative consequences in particular circumstances. But national cultural consequences are not inevitable. Management practices can significantly outweigh potential negative effects of cultural tendencies. Specific management practices introduce a complex set of values that may replace or reduce the impact of the tendencies based in national cultural values.

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