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WHAT DOES IT MEAN TO BE AN ENGINEER?

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Abstract *The present paper outlines the scope and significance of studying engineering culture with a view to gain insight into the nuances of one of the most preferred professions of the day. In doing so it highlights the need for an occupational, and not an organizational lens to make sense of human behavior at workplaces. Resting on the theoretical premises of Durkheim, Comte and Tonflies, the paper argues that occupation, or occupational culture, unlike organizational culture, is not restricted to a single organization. It spans across organizations. The paper cites studies that portray engineers as technophiles, experts, result oriented, aggressive and independent. It also cites studies that show engineers as poor communicators with inadequate team skills. While contending that culture, including occupational culture, differs across nations, the present paper points at a serious dearth of studies examining engineering culture from an Asian or Indian perspective. It further states the utility of such studies and outlines areas of future research.*

Keywords: *Culture and Communication, Occupational Culture, Engineering Culture, Cultural Studies*

INTRODUCTION

Engineering, as a profession, is directed towards application and advancement of skills based upon a body of distinctive knowledge in mathematics, science and technology, coupled with business and management. Engineers are involved in implementation, application, operation, design, development and management of projects and processes (Nguyen, 1998). As a profession, engineering is quite popular in India and abroad. India alone, for instance, trains around 1.5 million engineers, which is more than the US and China combined (Chaturvedi and Sachitanand, 2013). All India Council for Technical Education (AICTE), the regulator of technical education in India, put the number of engineering colleges as on 2006-07 at 1,511. The number rose to 3393 in 2012 (Rao, 2012). The addition of new Indian Institutes of Technology (IIT) and National Institutes of Technology (NIT) to the existing list and the birth of more private institutes point at an ever growing demand for engineering as a career option among Indian youth. Engineering is the most preferred career option in U.S. (Wright, 2014). In recent past, in U.S., jobs have significantly grown in most engineering professions. The output of engineering graduates, in U.S., has also shot up by 33 percent since 2007, thus hinting at a clear demand for engineering education (Wright, 2014). Despite questions being raised (in India at least) about the quality of engineering education or the employability of graduating engineers, the profession continues to attract the best of talents across the globe.

Looking at the all pervasiveness of engineering as a profession, scholars in the west have made attempts to study engineers as an occupational community (Brooks, 1982; Florman, 1987; Kunda, 1992). Insights into occupational culture, or to be more precise, engineering culture, has been gained using ethnographic studies of life and work in large and profitable technology firms (Kunda, 2002). Such studies have rendered closely detailed narratives of everyday work activities as well as first-hand accounts of observed events in technology firms.

Studies in occupational cultures are rare, though not absent. Studies on human behavior in organizations have conspicuously ignored the occupational, while over-emphasizing the organizational perspective. In their seminal work Van Maanen and Barley (1984) try to develop the concept of an occupational community to make sense of the way people behave as they do at workplaces. The perspective they adopt is in stark contrast to the more commonly accepted ways of employing an 'organisational frame of reference' to explain human behaviour in organizations (Maanen and Barley, 1982). So while the automobile repairman, through the occupational perspective, could be seen as 'mechanic', the same person appears to be an employee (working for an employer) through the organizational lens (Maanen and Barley, 1982). Organization behaviour literature, for a long time now, has turned a blind eye to the specifics of work and career of those employed as engineers, doctors, or lawyers, thereby taking a reductionist stance of viewing

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them all as employees. The same, in a way, has constrained our understanding of the phenomenological boundaries recognized by members of particular work worlds. This paper, while presenting a theoretical framework for occupational cultures, also reviews the existing literature on engineering culture to discuss some prominent features of engineers as an occupational community.

Scholars of such occupational communities have come to acknowledge the formation of social worlds around occupations. Members of occupational communities, for instance, are favorably oriented towards their jobs and careers. To them work is more of a source of meaning and value and is not just about livelihood (Maanen and Barley, 1982). Such studies, even as they continue to evolve, are mostly restricted to western societies. Survey of literature reveals no significant study of occupational communities in Asian societies.

A SHIFT IN APPROACH: FROM SYSTEMS TO CULTURE

While attempting to understand corporate culture, if not occupational culture directly, scholars have also tried to define, refine and apply a cultural perspective to the description and analysis of the organizational phenomena (Pacanowsky and Trujillo, 1983). In doing so they have made a deliberate shift from the systems view towards organizations (and the people employed therein) made popular during the late sixties and early seventies. Though the systems approach, with its emphasis on input, output, and feedback, provided valuable insights into the complicated nature of organizations, scholars grew wary of looking at organizations as mere computer-like machines. Increasingly, organizations started being viewed as tribes with their distinct language, rituals and myths. Inspired by the works of Weick (1979), who proposed that organizations were not static, Pettigrew (1979), suggested that organizational cultures were created symbolically through the use of language and myths. He hinted at the study of the symbolic acts performed by organizational members as a mechanism for understanding organization's culture, which in turn was being continuously created. Barley (1983, p. 393) saw organizations as "speech communities sharing socially constructed systems of meaning". Maanen and Barley (1982) too pointed at observable differences in the naturally occurring conversations of one occupational community from others. The idea of a shared culture among the members of a particular occupational community thus got strengthened.

THEORETICAL PERSPECTIVE

The notion of an occupational community (and thus occupational culture, or for that matter engineering culture) derived from two classical sociological premises. First is the assumption that people bound together by common values, interests and a sense of tradition share a sense of mutual regard and partake of a communal way of life that contrasts with the competition, individualism and rational calculation of persons organized on utilitarian principles. Social theorists like Comte, Weber, Durkheim, Tonflies and Marx were concerned with the distinction between communal and utilitarian principles of human association. Durkheim (1933) was of the opinion that modern society is not just structured vertically by the rationality of industrial and state organizations; it is also structured horizontally by occupational groupings.

The second premise on which the notion of occupational community rests is on the idea that the work we do shapes the totality of our lives, and to a great extent, determines who we think we are (Durkheim, 1933). Later theorist contended that the work roles provide incumbents with a social identity and a code of conduct, both within and without the workplace (Becker, 1963; Hughes, 1958, 1971).

Studying culture or 'webs of significance' (Geertz, 1973), requires interpreting the codes of meaning in the everyday actions of individuals, which in turn are contexts (not causes). Scholars have, thus, advocated interpretation as a suitable tool for gaining insights into occupational cultures (Bantz, 1993; Kaarst-Brown and Robey, 1999; Nord et al., 2007; Ramachandran and Rao, 2006).

Scholars have, almost unanimously, pointed at engineers being distinctly aware of them as belonging to a specific culture. The same, in turn, presents them with clear guidelines of what it means to be an engineer. Kunda (1992), for instance, points at the presence of strong cultures, often perpetuated by management, in reputed technology firms. Such cultures often refer to a body of tradition that governs what one needs to know, think and feel in order to meet the standards of membership of a given occupation. Strong corporate cultures may serve the organizational needs by acting as a normative control over the employees (Broek, 2004; Kunda, 1992; Owoyemi and Ekwoaba, 2014).

Other studies have also observed that engineering is much more than simply a set of skills. They have viewed engineering as 'embedded in a social system consisting of shared values of norms, a special vocabulary' and 'differentiation of members from non-members' (Kiesler *et. al.,* 1985, p.453; Leonardi *et. al.,* 2009).

Studies have also been suggestive of engineering culture being extremely coherent, pervasive and persistent. It is as if engineers, everywhere, know what it means to be an engineer. So much so that some researchers have also called into question the mechanism through which engineering culture maintains its aura of coherency. Some facets of engineering culture are detailed below.

ENGINEERS AS TECHNOPHILES AND EXPERTS

Engineers are found to be diehard technophiles (Henderson, 1998). Developing new products is seen by them as a glamorous work. It is seen as an essence of creative engineering. Technology, or its creation, often determines the status of engineers in an organization. Engineers, for instance, dealing with field service, performance evaluation, maintenance, quality and other support activities are considered lower in status compared to their counterparts who deal with the state-of-the-art technologies and product innovation (Kunda, 2006). Technology and its aesthetics are said to be the main concerns of an engineer. Also, technical sophistication is, practically speaking, a prerequisite for managers of technology firms. In fact, Kunda (2006) suggests that tech managers have a reputation of choosing technology over people skills, the latter being a must-have for managers in other sectors. Studies have confirmed the primacy of technology in most engineering workplaces.

Engineers are often required to operate simultaneously as craft and knowledge workers (Whalley and Barley, 1997). A mechanical engineer, for instance, is expected to be a mechanic and a scientist i.e. one who understands the theory of machines. The inherent tension experienced due to enactment of these dual roles is a hallmark of engineering culture.

Due to the scientific nature of their work, engineers have often positioned themselves as experts. The close relationship between scientific knowledge and the tendency to claim expertise has been well documented (Knorr Cetina, 1999). Engineers invoke the discourse of science when interacting with one another in order to pronounce their expertise and make claims about the essence of design (Bucciarelli, 1994). Notwithstanding the fact that expertise may often lead to problems while communicating with other groups, an engineer's penchant to be referred as an expert is well established.

ENGINEERS AS AUTONOMOUS

Within engineering, importance of individuals and their autonomy is upheld. Engineering work centers heavily around the lone engineer working with technology. Ethnographic studies attempting to explore work culture in technology firms (Kunda, 2006) have noticed that organizational action (in such firms) is often based on principles of individualism, autonomy of action, freedom and self-generated initiative. While the desired behaviors (from an engineer) are hardly articulated, a sense of accountability and responsibility are enforced by one's peers and superiors. Rewards for engineers are often based on individual rather than teamwork (Ross, 2000).

ENGINEERS AS MACHO

Studies have also liked engineering with masculine ideals of possessiveness, aggressiveness, gender role rigidity and a constant need for respect. It has been suggested that engineering can be distinguished from other technical professions by the machismo myth that surrounds it and the aura of masculinity with which it is associated (Carter and Kirkup, 1990). Aggressive displays of technical self confidence and hands on ability are criteria for success in engineering culture (Ingram and Parker, 2002; Kunda, 1992). The desire to excel by carrying the right answer to every problem faced is mostly associated with engineers (Brooks, 1982).

ENGINEERS AS OUTCOME-FOCUSED

The nature of engineering culture is highly competitive and is mostly concerned with technical results. Successful engineers have an impressive technical track. The not-so-successful are often transferred to non-technical positions. Job stress in tech firms, often resulting in burnout, has been documented in several studies (Kunda, 1992). This aggressive outcome-focused orientation also has effects on how engineers work with others. Engineers, for instance, find it difficult to adequately function as team members (Lovgren and Racer, 2000).

The culture of engineering also stresses the importance of technology over personal relationships (Robinson and Mcllwee, 1991) and as a result promotes isolationism as an important precondition to the smooth working of an engineer (Feldman, 1989; Hacker, 1981). Also, firms appoint engineers for special projects based on their technical competence. Needless to say, the reward system for engineers is normally based on individual output rather than group work (Ross, 2000). While studies have highlighted weak group work and weak collaboration as important characteristics of engineering occupation, a growing body of research also hints at increasing workplace diversity which in turn may require engineers to be effective group workers, with enhanced communication skills. Mergers, acquisitions and joint ventures have immensely contributed to the workplace diversity mentioned above (Knippenberg & Schippers, 2007).

ENGINEERS AS NON-COMMUNICATORS

Though there is considerable literature throwing light on the patterns of communication among engineers (Chitrita et. al., 2015; Hailey, 2000; Tenopir and King, 2004), studies have also hinted that engineering culture encourages engineers to be non-communicators (Darling and Dannels, 2003; Ingram

and Parker, 2002). Many scholars have argued that this lack of communication characteristic of engineering culture is due to the fact that engineers work very closely with technology, and social interaction - as it distracts them from time spent with technology - is often discouraged (Henderson, 1998; Robinson and Mcllwee, 1991). Because of this problem engineers also have a difficult time understanding people. Engineering scholars have often recognized this problem and have tried to devise strategies with which engineers can improve interpersonal relations. Training in language and communication skills form a compulsory part of the curriculum in most engineering syllabi in most parts of the world.

The above paragraphs detail how the coherency of engineering culture has produced various characterizations of the mythical engineer. It sheds light on how the myth of engineering culture has a tremendous impact on engineers' understanding of what it means to be an engineer.

A better understanding of culture can control employees, without them knowing it, for the betterment of places where they work. Thus understanding of engineering culture is potentially productive. This skilful use of culture combines organizational mission, the creation of a unique blend of business and technological principles and an emphasis on progress and individualism. Culture can be used as an alternative organizing principle to bureaucratic authority.

Culture differs across nations. Cross-national cultural differences affect professional behavior in general. It has been pointed out that Indian engineers, when compared with their western colleagues, differ in their approach to work. Indian and other Asian engineers, in comparison with their western peers also differ in their reasoning and problem solving styles (Radjou, 2008). In light of the above it is imminent that studies on engineering culture in Indian and other Asian societies be conducted.

CONCLUSION

There have been studies, though scant, on engineering as an occupation. Such studies have shown engineers to be autonomous in their functioning and poor at teamwork. The result of engineering work is seen as outcome-focused, with ends justifying means. Engineers are portrayed as technophiles with an appetite for product innovation. Technical expertise acquires an upper hand, with people skills taking a backseat. Engineering work promotes isolationism, leading to engineers being labeled as poor communicators. Studies also hint at the changing nature of present day workplaces presenting unprecedented challenges before engineers. Strong interpersonal skills might seize the spotlight in our future multicultural work environments. Isolationism may give way to interaction. Amidst all this, there has hardly been a systematic attempt to study engineering culture from an Asian perspective. The same needs to be explored by future researchers.

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