Industry 4.0: The Organizational Culture Perspective

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Abstract. Industry 4.0 has been a hot topic for the researchers in the recent years. However, much of the research up to now has been about the technological aspects of Industry 4.0. This paper focuses on the organizational culture perspective by examining the level of organizational culture in organizations in the Czech Republic using the Organizational Culture Index. Hofstede's model of six dimensions of national cultures is considered in his paper as well in order to get a better understanding of the possible uses of this model for defining for preconditions for implementing industry 4.0 form the point of view of organizational culture. It is safe to assume that the Innovative culture is one of the pre-conditions for implementing Industry 4.0 because it is more flexible and deals with risk better than the other types of the organizational culture, we can then speculate that innovative culture does not depend on the size and/or the type of the organization.

Keywords: Industry 4.0, Organizational Culture, Readiness.

1   Introduction

Industry 4.0 is known to be the essence of the fourth Industrial revolution. By applying and using cyber-physical system (CPS) in order to grasp high levels of automation, Industry 4.0 is currently being used in manufacturing [13]. The Cyber-Physical System is the base for smart factories and this is possible by interconnect sensors, machines and IT systems inside the value chain through enterprise boundaries [6].

The review of literature exposed that the technological features of Industry 4.0 concept have been very well studied and documented. Nevertheless, the other features such as those regarding organizational culture have been understudied. Without a doubt the technological aspect of the Industry 4.0 holds a significant importance for this concept but this does not mean that other aspect are less important.

Generally foreign sources were used for composing the Literature review of this paper to have a rather more international view towards the research.

The objective of the paper is to inspect the organizational culture in organizations in the Czech Republic to find out what kind of organizational culture they have and which kind of culture is more appropriate for the implementation of Industry 4.0 in order to choose appropriate managerial methods and approaches to help prepare firms for the implementation of Industry 4.0 concept.

In order to realize the objective of this work the Wallach's Questionnaire (1983) has been chosen as the utmost fitting method for the research. Furthermore, the Hofstede's model of six dimensions of national cultures is examined in connection to this work to find out if it would be possible to use it for defining the organizational culture preconditions for implementing industry 4.0.

2   Theoretical Background

The 1st industrial revolution occurred once mechanical production facilities were powered by making use of water and steam by the end of 18th century. The 2nd industrial revolution followed in the beginning of the 20th century when electrical energy was introduced to mass production and division of labor was utilized. The 3rd industrial revolution is believed to be when information technologies and electronics were utilized to reach automation of production in beginning of 1970s. The Industry 4.0 concept (Industrie 4.0) is considered to be the description for the 4th industrial revolution and it was originated in Germany. The use of Cyber-Physical Systems (CPS) made this possible [14].

"Industry 4.0 concept can be characterized as a transformation of production as separate automated factories into fully automated and optimized manufacturing environments. Production processes are linked vertically and horizontally within enterprise systems" [6]. Industry 4.0 is currently being used in manufacturing by utilizing cyber-physical systems in order to attain high levels of automation [13]. The Cyber-Physical System (CPS) is considered to be the footing for smart factories because it is able to interconnect sensors, machines and IT systems within the value chain throughout enterprise boundaries [6].

In general the idea of Industry 4.0 could be explained as a transformation of production as single automated factories into entirely automated and optimized manufacturing surroundings, where production processes are linked vertically and horizontally inside enterprise systems [2].

Automation is typically acting, functioning, or self-regulating lacking the human involvement. This basically means that the human intervention is cancelled partially or entirely in the implementation of scientific, administrative, industrial, or household tasks and duties [7].

"The platform Industry 4.0 itself has divided its main areas of focus across five different working groups up: Reference Architecture; Standardization; Research and Innovation; Networked Systems Security; Legal Environment; and Work, Education/Training" [4].

Industry 4.0 necessitates considerable investment from the beginning, and for that reason a larger interest of companies in industry 4.0 would perhaps be originated by government incentives or subsidies [6].

Industry 4.0 describes the organization of production processes that are founded on cooperating technologies and devices that are called 'smart' factory. Physical processes are controlled by computer-driven systems in a smart factory with making decentralized decisions that are dependent on the self-organization mechanisms [4].

Organizational culture is the set of mutual beliefs, principles, values, and assumptions that formulate the behavior by building commitment, giving direction, forming a collective identity, and constructing a community. An organizational culture is considered to be effective when it is in alignment with the organization's resources, environment, values, and objectives [8].

Culture of an organization consists of common beliefs, attitudes, assumptions, and expectations guiding behaviors the law or clear directions are lacking. "Culture could be a powerful resource of common identity purpose and flexible guidelines" [1]. Weak organizational culture avoids people from sharing their knowledge in order to preserve personal power and their efficiency [1].

The path to success in an uncertain environment like Industry 4.0 is to pay attention to training, learning, and innovation capability. Organizational training, learning, and innovations are strongly reliant on the role of employees in the organization and that is why organizations have to formulate their strategies according to what they want and expect from their employees [9].

Organizations have to have more flexibility, responsiveness and efficiency due to the fact that the global business environment has a highly unpredictable nature and also because of the necessity to respond to challenges that are coming from both local and international competition. This means that there is a greater need for continuous innovation of products and services and more importantly internal processes and behaviors [10].

Employee knowledge is necessary for organizations in order to become innovate and to develop a competitive advantage. Hence, it is essential to know how to form an organizational climate that encourages innovation among employees [10].

There are three types of organizational cultures: bureaucratic culture, innovative culture and supportive culture [12]. Bureaucratic, supportive, and innovative cultures have an association with employees work performance with diverse results; and it is important to pay attention to an innovative culture that is empowering for improving employee performance. Innovative culture increases creativity and it is known to be results-oriented, and therefore stimulation and challenges became the driving force of performance. In general, organizational culture is closely associated with behavior in the workplace and mainly in individual performance [11].

The six dimensions of national cultures in the Hofstede's model are as follows:

1. Power Distance: is associated with the various solutions to the simple problem of human inequality; "Power Distance has been defined as the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally" [5]. This awakens cultural features that are fixed in social inequality like prosperity, power and prestige. Those cultures that have high PD have a tendency to care for an elite social class above the wellbeing of the others. We can frequently see such behavior in the corporate culture as well where elite groups of managers are known to have a superior, indisputable social standard. This kind of cultures tend to hierarchical and to have a lot of respect for elders [2].

2. Uncertainty Avoidance: is linked to the level of stress in a society that is dealing with the unknown future and it is not the same thing as "risk avoidance". Uncertainty Avoidance "deals with a society's tolerance for ambiguity" [5]. Uncertainty avoiding

cultures attempt to reduce the likelihood of unstructured situations by firm laws and rules [5]. Controls are created by the support of Rules, technology and religion in order to avoid or decrease uncertain situations in the future. In those countries where there is high Uncertainty Avoidance culture, bureaucratic system are commonly developed to be able to deal with unexpected circumstances with a precisely and clear set of rules [2].

3. Individualism vs. Collectivism: "is the degree to which people in a society are integrated into groups" [5]. The possibility that everybody is watching out for themselves and their immediate family is more on the individualist end, but it is evident that people tend to care more about the group on the collectivist end. "This dimension is bi-polar as it expresses individualism vs. collectivism. The more "collectivist" a country is the less individualism it enjoys" [2].

4. Masculinity vs. Femininity: is about the division of emotional roles among women and men and the spreading of morals among the genders [5]. The emphases of the Feminine culture is on relationship, helping people, and the physical surroundings. The focus of the masculine culture conversely is chasing money, success, progression and profession [2].

5. Long Term vs. Short Term Orientation: this refers to "the choice of focus for people's efforts: the future or the present and past" [5].

6. Indulgence vs. Restraint: connected to the satisfaction versus control of elementary human needs associated with enjoying life.

3   Objectives and Methodology

The objective of the paper is to inspect the organizational culture in organizations in the Czech Republic to find out what kind of organizational culture they have and which kind of culture is more appropriate for the implementation of Industry 4.0 in order to choose appropriate managerial methods and approaches to help prepare firms for the implementation of Industry 4.0 concept.

The following research questions have been formulated in connection with the objective of the paper, which examines organizational culture in the context of the 4th Industrial Revolution in the Czech Republic:

RQ1: Do organizations in the Czech Republic have the type of organizational culture that supports the implementation of the Industry 4.0 concept?

RQ2: Is innovative culture dependent on the size and/or the type of the organization?

For the purpose of this paper literature review, methods of description, and induction and deduction reasoning were used. Wallach's Questionnaire (1983) - Organizational Culture Index (OCI) in Czech language was selected as the most suitable method for the purpose of this research.

4   Results and Discussion

The organizational culture has been categorized into three dimensions: bureaucratic, supportive, and innovative [12] Bureaucratic culture is referred to the type of culture

that is a prominent hierarchical organization and is very organized with a clear definition for authority. The supportive culture is based on mutual trust, encouragement and co-operation and its focus is mostly on interpersonal relationships and it. Innovative culture is believed to be dynamic, it helps and promotes creative work, carries new challenges and encourages risky behavior; And this is the type of organizational culture that seem to be the most convenient culture for the implementation of Industry 4.0.

Therefore if organizations in the Czech Republic have such features like innovative organizational culture in accordance with the organizational culture index, then it is safe to say that the organizational culture of is supportive or Czech organizations are ready for implementing Industry 4.0.

The Hofstede's dimensions of culture could be considered with or as a support to the Organizational Culture Index to explain the readiness of the organizations. For instance, in those countries which there is high uncertainty avoidance, they try to deal with the unexpected situations with accurately defined set of rules and consequently they develop systems that are bureaucratic.

5   Conclusions

It is safe to assume that the Innovative culture is one of the pre-conditions for implementing Industry 4.0 because it is more flexible and deals with risk better than the other types of the organizational culture, we can then speculate that innovative culture does not depend on the size and/or the type of the organization.

By the correct use Wallach's' model and/or Hofstede's Model it is possible to find out about the type of culture in organizations that are we dealing with when preparing them for implementing 4.0, and as a result more appropriate approaches and strategies could be chosen in accordance with the type of culture and therefore the company's transition towards Industry 4.0 would go smoother and easier and potentially the costs of such transition would be reduced.

The results of this research could be beneficial in the defining and adjustment of strategy and methodology for preparing firms in order to implement Industry 4.0 in terms of increasing the efficiency of human resource utilization and subsequently cost reduction and better overall economic outcomes of the firms.

Hofstede's model together with Wallach's model could provide us a decent awareness of the existing organizational climate of the firms and the appropriate approaches and strategies could be selected based on this knowledge in order to make some adjustments and to prepare firms in such ways that they meet the proper preconditions for implementing Industry 4.0 for better and more efficient transition.

For successful implementation of Industry 4.0, it is significantly important to pay attention to its social aspects and particularly the organizational culture and take them into consideration as well as the technological aspects.

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