Chapter 35

The Roles of Cognitive Machines in Customer–Centric Organizations:
Towards Innovations in Computational Organizational Management Networks

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ABSTRACT

This chapter proposes innovative features of future industrial organizations in order to provide them with the capabilities to manage high levels of environmental complexity in the 21st century. For such a purpose the author introduces the concept of Computational Organization Management Networks (COMN), which represents new organizations whose principles of operation are based on the concepts of Hierarchic Cognitive Systems (HCS) along with those of Telecommunications Management Networks (TMN). Structured with functional layers and cognitive roles that range from technical and managerial to institutional levels of analysis, and also equipped with operational, managerial and strategic processes, the concept of Computational Organization Management Networks (COMN) plays an important part in the developments of future organizations where cognitive machines and Cognitive Information Systems (CIS) are prominent actors of governance, automation and control of the whole enterprise. It is in such a context that the new organization COMN will provide customers and the whole environment with innovations such as immersiveness for the production of services and goods that are most customer-centric.

INTRODUCTION

This chapter mainly relies on principles of incompatibility, or non-equilibrium, existing between the continuous growth in the level of environmental complexity and the insufficient cognitive capacity of the organization to deal with higher levels of uncertainty, to operate in complex task environments, to attend new market demands, to manage new approaches to customers' satisfaction and relationship, and to capture effectively information resources from the environment. Such a premise has motivated organizations to pursue higher degrees of cognition, intelligence, autonomy, and learning through principles of organization design (Nobre, Tobias & Walker, 2009a, 2009b, 2009c, 2010; Nobre & Walker, 2011).

Therefore, this chapter focuses on the general picture of organizations pursuing high degrees of cognition in order to improve their capabilities of information processing and uncertainty management. It assumes that improvements in the degree of organizational cognition can lead the organization to achieve higher degrees of flexibility and agility, to operate through higher levels of mass customization (Pine, 1999), and to provide customers with immersiveness. In a broader sense, such improvements extend the capability of the organization to manage higher levels of environmental complexity. In such a context, flexibility means capability to reconfigure and to adapt to new operational and management conditions (Toni & Tonchia, 1998); and agility means the ability to manufacture a variety of products, services and goods, at low cost and in a short period of time (Lee, 1998).

This chapter supports existing works on manufacturing systems (Kusiak, 2000; Monfared & Steiner, 1997; Rao *et al.*, 1993) and industrial organizations (Nobre *et al.*, 2009a, 2009c), and additionally, it extends past and present concepts by proposing new technological, managerial and organizational capabilities which have to be developed in order to satisfy the requirements

and to configure the new face of the industrial organization in the 21st century. First and foremost, this work aims to give insights and answers to the questions in the following whose responses are blended over this full chapter:

a.   What is the nature of this new industrial organization?
b.   What steps are required to design this new enterprise?
c.   What would be the future of these organizations?

Chronologically, this work first introduces concepts of organizations and machines which are fundamental for the understating of this research. Such concepts comprise organizational cognition, intelligence, autonomy, and learning, along with uncertainty, environmental complexity, and cognitive machines.

Second, it proposes the concept and the features of Customer-Centric Systems (CCS) which were most developed through literature review and analyses of past and current industrial organizations as researched in (Nobre & Steiner, 2002; Nobre et al., 2009a, 2009c); whereas, in these works, the authors outlined the development of manufacturing systems and organizations, especially in the 20th century, through complementary perspectives of technology, management and organizational systems theory, respectively. As a result of the analyses, they indicate limitations of past and current manufacturing organizations which motivated them the proposal of the new frontiers, concept, and features of Customer-Centric Systems (CCS). CCS represent new organizing models of production that pursue high degrees of organizational cognition in order to manage high levels of environmental complexity, to operate through intensive mass customization processes, and to provide customers with immersiveness.

Third, from all these interdisciplinary backgrounds, this chapter mainly contributes by presenting the concept, structure and processes

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