Development of Human Factors Ontology for Business Knowledge Management

Monica Philippart, University of Central Florida, USA

Waldemar Karwowski, University of Central Florida, USA

ABSTRACT

Employee knowledge and cognitive skills are key assets to achieving business success, yet are often misman-aged. By promoting the human-centered design approach, the discipline of human factors and ergonomics (HF/E) can significantly contribute to optimizing business processes through effective management of employee knowledge. However, a comprehensive methodology is needed to help organizations integrate the HF/E principles across various business processes. This paper introduces a novel method for integrating HF/E principles into business processes through the application of HF/E ontologies.

Keywords: Business Processes, Human Factors, Human-Systems Integration, Knowledge Management, Ontology

1. INTRODUCTION

It is now widely recognized that the people are the most important component of any technological system or business enterprise (Ordonez de Pablos, 2004). Technology and organizational structure may be imitated, unlike the qualifications and motivation of a workforce. Employees knowledge and cognitive skills in particular are a key organizational asset which is prerequisite to achieving competitive business advantage (Duffy & Salvendy, 1999; Sherehiy, Karwowski, & Layer, 2007). One of the most recent attempts at capitalizing on these valuable assets is through knowledge management (KM).

But, as tacit knowledge only exists in the heads of the workforce, KM tools and techniques are not able to make use of it adequately. The discipline of human factors and ergonomics (HF/E) can help in this quest by facilitating and increasing the likelihood that people use their knowledge to their greatest abilities in the workplace.

Currently, the applications of HF/E knowledge and design principles are mostly found in corporate safety and health departments with important yet limited objectives such as reducing employee injuries and illnesses (Zink, 2005). However, the goals of HF/E discipline are much broader and more ambitious than that (Karwowski, 2006; Karwowski & Ahram, 2009). Through the human-centered design paradigm,

HF/E strives to achieve complete system safety, productivity and user satisfaction. Limiting the use of the HF/E knowledge to the management of safety and health deprives organizations from the productivity and satisfaction benefits that could be obtained throughout the enterprise (Sherehiy & Karwowski, 2006).

People are central to all organizational activities. Because people interactions encompass the domain of HF/E, the HF/E contribution must be integrated throughout the whole business organization rather than added as an afterthought or treated as a separate project. The benefits of considering the human a critical part of a system and integrating HF/E into system design have been strongly documented (Karwowski, 2006). Such benefits have been widely accepted, as great effort has been expended in the generation of programs that aim at the integration of HF/E into many consumer products, production processes, and control systems. Current research is focusing on the development and improvement of KM tools, which seem to be under high industry demand. There are many opportunities for HF/E to enhance KM which are not clearly documented in the current subject literature. Multiple documents, such as MIL-STD1472, detail how to apply HF/E principles to the design of a piece of equipment. Programs like MANPRINT describe the HF/E activities required for the integration of human considerations into system acquisition processes. However, the focus of these is on systems within the system that is the organization, but not the organization itself.

An organization may be defined as "the planned coordination of two or more people who, functioning on a relatively continuous basis and through division of labor and hierarchy of authority, seek to achieve a common goal or set of goals" (Robbins, 1983). If an entire organization is considered a [work] system, then Robbins' definition of an organization would be the definition of that system. Defining the work system as an entire organization, the application of the HSI philosophy would provide the benefit of optimal overall organization performance. However, no comprehensive system exists that organizations can go to for recommendations on which of the myriad of HF/E specialties should be applied to which of the multiple business processes. Currently, there is no robust methodology or structure available to help organizations integrate HF/E knowledge and design principles into corporate business processes.

This paper proposes a novel method that organizations can use to integrate HF/E principles throughout their businesses operations and processes. The main focus is on expanding the HF/E contributions to the management and organization of business processes by integrating human factors knowledge and principles throughout the entire enterprise.

2. HUMAN FACTORS AND ERGONOMICS

Knowledge management is one of the recent attempts at optimizing business processes through effective use of employees' knowledge. By promoting the human-centered design approach, the discipline of human factors and ergonomics (HF/E) can significantly contribute to achieving this goal. HF/E, as a unique discipline that focuses on the nature of human-artifact interactions, which are viewed from a unified perspective science, engineering, design, technology, and management of human-compatibility systems (Karwowski, 2005), promotes a holistic, human-centered approach that considers physical, cognitive, social, organizational, environmental, and other design-relevant factors. As such, HF/E aids designers by raising their awareness of the full scope of knowledge required when designing systems.

Hendrick and Kleiner (2002) indicated that HF/E has at least five identifiable major components, which he called technologies, as follows:

1. Human-machine interface technology or hardware ergonomics, primarily concerning the study of human physical and per-

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