

HR perceptions and the provision of workforce training in an AMT environment: An empirical study

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Received 26 May 2004; accepted 11 May 2005

Available online 14 July 2005

Abstract

Research literature indicates the importance of workforce development in the successful implementation of advanced manufacturing technologies (AMTs). However, the relationship between advanced technologies and workforce training is assumed to be a direct one with limited consideration provided to factors that may influence it. This study examines the impacts of environment and human resource (HR) manager perceptions on the provision of workforce development activities. A human-centered technology philosophy is proposed as a conceptual framework for examining the role of HR manager perceptions to mediate the relationship between AMTs and workforce development. Results from hierarchical regressions indicate that the perceptions of HR managers regarding technology-driven workforce need to explain a large portion of the variance for both individual and process development activities. Findings support that the managerial role of assessing workforce developmental needs from basic AMTs places HR managerial perceptions at the focal point of social–technical systems. The role of environmental uncertainty is also examined as a moderator of managerial perceptions of technology-driven needs in an AMT environment. The results suggest that environmental uncertainty did not moderate the relationship between HR perceptions as a predictor of workforce development activities. This could imply that HR managers may not consider critical external environment issues when making decisions of workforce development activities. The implications of these findings for HR perceptions in an AMT environment are discussed, and suggestions for future research are provided. © 2005 Elsevier Ltd. All rights reserved.

Keywords: AMT; Workforce development; Human resource (HR) management; Managerial perceptions

1. Introduction

Expanding domestic and international product markets have increased the competitiveness among global manufacturing organizations. As a result many organizations have chosen to implement advanced manufacturing technology (AMT) that promote increased product and volume

flexibility, superior quality and lower manufacturing costs with greater process control. AMT includes a wide variety of integrated hardware-based (CNC machines and robotics) and software-based technologies, including computer aided design, computer aided manufacturing and automated material handling, that automate both information and production processes [1]. Researchers suggest that the provision of workforce training is essential to the effective usage of new manufacturing technology due to additional demands on workers in terms of new skill and relational requirements [2–4]. However, the relationship between AMT and workforce training has been assumed to be a direct one, with limited consideration provided by researchers as to the

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variables beyond the technology that may impact it. Specifically, the literature makes a technology–training link without consideration of individuals that are involved in the process of selection and provision of worker development.

The socio-technical framework is often utilized to identify the structures and activities (including training) that support the technology–worker relationship [5] but has not examined the role of management intermediaries in providing these activities [6,7]. The role of management in this relationship may be suggested by studies which advocate the importance of “managerial perceptions” of technology-driven workplace changes in the provision of supportive AMT activities [8–10]. To date, studies on “managerial perceptions” have been limited exclusively to operations managers. Researchers have failed to recognize the role of human resource (HR) managers in the provision of supportive activities as worker training and development. This may be an important omission. Recent research suggests the importance of integrating the insights of HR management within the operations context to provide more value-added human resource practices [11]. As traditional assessors and purveyors of workforce development in many firms, HR perceptions regarding technology-driven changes to the workplace may be central to the provision of effective long-term workforce development.

The uncertainty of the business environment may have a direct influence on the utilization of AMTs and workforce development activities (WDA) to address shifting workplace needs in an AMT environment [12]. As the uncertainty of the business environment demands new changes in plant processes and products, HR perceptions of workplace requirements should also change. It is proposed that these changing HR perceptions will result in the greater provision of WDA and supportive processes.

By ignoring the valuable knowledge and experience that HR managers possess concerning the provision of appropriate developmental activities, manufacturing firms may be sacrificing the full potential of their technological investment. We suggest that the perceptions of HR managers are important to consider because they are often responsible for the long-term development of workforce skills and abilities within AMT manufacturing environments. More specifically, the study analyzes the social and human aspects of implementing advanced technologies and seeks to identify if there is a relationship between HR managers’ perceptions of advanced technologies and the developmental activities required to improve the skill level of the workforce.

This paper seeks to answer the following research questions: (1) “Do HR managers’ perceptions of advanced technologies influence the firms’ explicit emphasis on workforce developmental activities?”, and (2) “Does the level of uncertainty in firms’ external environment have an affect on HR managers’ perceptions?” Based on previous research, we propose that the perceptions of HR managers have a significant influence on the amount of emphasis given to WDA in firms that emphasize the implementation of AMTs.

Furthermore, as the uncertainty of the external environment increases, HR managers should perceive an increase in workplace requirement resulting in the greater provision of workplace developmental activities.

2. Literature review

2.1. Social–human dimension of AMTs

Recent literature has emphasized that the successful implementation of AMTs must be supported by the workforce, and failing to address their needs and concerns before adopting such technologies can be devastating [13,14,6]. Lewis and Boyer [15] suggest that AMT machinery is not the sole problem of AMT failures; rather, it is the inadequate attention to implementation factors, such as workforce training. Ghani and Jayabalan [14] note that the implementation of AMTs in many organizations has failed mostly for underestimating the scope or importance of the preparation of employees, regardless of technology level. Chung [4, p. 283] states, “Improper attention to the human aspect of implementing technology has been identified as a primary cause of failures in terms of flexibility, responsiveness, reliability, and quality.”

The preceding research illustrates the importance of integrating human factors with the unique technical needs imposed by AMTs to successfully implement advanced manufacturing systems. This integration has its roots in the socio-technical framework that seeks to maximize technological performance by optimizing an organization’s social and technological subsystems [5]. Recent research has shown that by linking organizations and technologies, the need to develop business infrastructure including training to expand skills and abilities increases [6]. Studies suggest that workforce development is an important adjunct to the use of new AMTs to promote organizational performance and industry competitiveness [16,7].

At present, research on the socio-technical theory has focused on the relationship between technology and the individual worker. One supporting viewpoint for understanding the socio-technical concept is the human-centered technology philosophy which attributes successful design and implementation of technology to the human and social element of an organization [17]. As an organizational component of a firm’s manufacturing infrastructure, the workforce represents “human factors” in the social dimension of the human-centered technology philosophy. Several authors have described this general approach to study work system design with specific regards to the human–technology interface [18,17,4]. For purposes of this study, WDA will be part of the social dimension by supporting the human element in the implementation of AMTs. The human-centered system design philosophy provides the opportunity to assess how HR managers perceive which type of workforce skills are needed from changes in advanced technology.

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