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Thinking styles of technical knowledge workers in the systems of innovation paradigm

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Abstract

The management of technology embodies human choice and freedom, and as such, it may not detach from philosophy and psychology, particularly in the *innovation*, *knowledge* and *learning* paradigm. This paradigm heralds knowledge workers in *systems of innovation* with renewed emphasis on information and intellectual capital as the primary assets for production. The thinking styles and cognitive preferences for technical knowledge workers are pertinent for sustaining the interrelationships between economic and environmental, social and political, science and technology agents, institutions and organisations. Based on a 2005 survey and descriptive statistics of primary data obtained from 330 respondents, this paper provides a review of cognitive mechanisms while discussing the ranking of preferred thinking styles for engineering and technology management in the new paradigm. Logical, problem solving, conceptualising, analysing and interpersonal thinking styles were ranked in the top five by a judgemental sample comprising engineering, science and technology oriented professionals in supervisory, middle to senior management positions.

Keywords: Thinking styles; Behavioural preferences; Technology management

1. Introduction

It is widely acknowledged that the context of systems of innovation implies increased exploitation of information, knowledge and technology. This context is also used to describe the modern era for cultural, economic, environmental, and socio-political development. Extrapolating from an OECD definition [1], innovation includes the application, creation, diffusion, transformation and use of new {ideas, forms of organisations, methods, practices, processes, products, services, systems and technology}, to foster economic development and growth, to generate wealth and prosperity, and to uplift cultural and social well-being.

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With globalisation and the ongoing transition to the systems of innovation paradigm, information and intellectual capital have become the primary means for production, as well as the key differentiators in economic, environmental, social and political development. Information and intellectual capital assets are fundamentally embedded in cognitive human beings, and considering the portability of information and readily mobile nature of intellectual capital, this makes knowledge workers the crucial resource for competitive advantage [2]. By force of circumstances, the systems of innovation paradigm and the challenges of globalisation provide impetus for the command-and-control management doctrines (cf. [3]) of the preceding industrialisation and mass production era to be reconnected to the fundamental disciplines of psychology [4] and philosophy. While psychology relates to the study of mental characteristics and human behaviour, philosophy encourages critical thinking and debate on issues related to human choice, freedom and value. Thus, the thinking styles and behavioural preferences of technology managers, their motivation [5], roles [6] and responsibilities are significant issues for the information, innovation, globalisation, knowledge and learning generation. In his view of engineering as ethics, Sjursen in [7] argues that the responsibility of engineering and technology disciplines in the globalised economy 'goes well beyond technical and empirical' but, must equally embrace the interrelationship between technological expertise and human values, with renewed regard to aesthethic, cultural, educational, environmental, economic, health, religious, resource allocation, safety, and sentimental issues.

The global dimension for systems of innovation also means that knowledge workers operate as highly mobile specialists or generalists with outreach far beyond geo-political boundaries. With so much of the knowhow that underpinned the preceding era of industrial production in explicit form, the challenges for managing highly mobile knowledge workers in the innovation era require better understanding of human mental processing modes. In the new systems of innovation dispensation, the cognitive preferences of knowledge workers of every persuasion take on a new significance, and this is also true for practitioners in Engineering and Technology Management occupations and professions.

Considering that engineering and technology managers may be viewed as a special subgroup of knowledge workers, if so, what cognitive preferences should they adapt to and adopt, and in particular, what attitudes should they exhibit as pertinent agents of the innovation generation? The rest of the paper includes a brief introduction to the concept of systems of innovation, knowledge and learning interaction in Section 2, and occupational cognitive preferences in Section 3. The ranking of thinking styles is presented in Section 4 with a discussion on the ramifications for cognitive preferences in engineering and technology management summarised in Section 5. The descriptive statistics of primary data presented in Section 4 arises from a 2005 judgemental survey and feedback obtained from 330 respondents. The respondents were supervisory, middle to senior level managers and generally had engineering, science and technology orientation.

2. Innovation, knowledge and learning

2.1. Systems of innovation

Using the abstract form illustrated in Fig. 1, the concept of systems of innovation may be concisely described in terms of a knowledge value-chain comprising three broad recursive subsystems and associated linking processes that include:

a) discovery and invention of ideas;
b) development, diffusion and proving of ideas, and conversion into new forms of knowhow and knowledge; and