Enhancing the Productivity, Innovation and Wellbeing of Technical Employees-What We Know and Don't Know: A Conceptual Study and Literature Review From Technical and Managerial Orientation Perspective

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Abstract— *A primary goal of managers in any organization is to increase the productivity of its operations. With rising competition and a corresponding increase in work place stress levels, there is a resurgence of interest related to innovation and wellbeing in the organizational context as well. In this setting, improving the productivity , innovativeness and wellbeing of technical employees is of paramount importance as these professionals often represent the core knowledge competency of an organization . This is why, getting the best out of the technical employees, who often are the lifeblood of innovation and productivity, should be a primary goal of managers. However, managing technical professionals poses challenges for managers as these professionals are a class of knowledge workers who have unique requirements and understanding these differences and acting accordingly is important to attract, retain and motivate them. Managing technical employees poses a further challenge as when technical workers themselves are promoted to managerial roles, the transition sometimes becomes challenging due to the differing orientations of technical vs. managerial mindsets. Such differing orientation has implications for enhancing productivity, innovativeness and wellbeing of technical employees. This paper carried out a literature review to find out whether a user friendly and integrated conceptual model is available to understand this technical-managerial dichotomy and the consequent implications so that technical talents can be managed better. From a user perspective, this review highlights the need for further research and the development of a more integrated and cohesive framework in this area.*

Keywords—Technical professionals, Technical orientation, Managerial orientation, Productivity, Innovation, Wellbeing.

I. INTRODUCTION

In today's economy, technological innovation can provide the potential for altering the competitiveness of organizations. In fact, as Porter (1990,1998)highlighted, in the modern economy, not only an organization's but also a nation's competitiveness depends on the capacity of its industry to innovate and upgrade. With the growing demand for innovation and productivity, the importance of technical (often referred to as STEM: Science, Technology, Engineering and Mathematics) professionals is also increasing as these professionals are often 'the lifeblood of innovation,creativity and therefore future revenues for organization'(Badawy, 2007). Accordingly, to enhance the growth and profitability of an organization, the proper management of technical professionals is very important becausein even the most advanced high technology operations, it is the people and how they are led, motivated, organized and rewarded that ultimately determines success (Barsh, Capozzi& Jonathon,2008) .Thus, the issue of technology and innovation management is intertwined with the issue of people management. However, with its focus on 'processes and technologies'- Technology and Operations management discipline has often failed to put the required emphasis on people. On the other hand, human resource development typically focuses on management and leadership talent. As such, there is a lack of well researched management framework to help practicing managers properly lead and manage the technical employees in the

organization. This is why, this study reviewed published research and theories on the topic to understand whether there is a framework that can be used by organizational managers to achieve better outcome in terms of productivity , innovativeness and wellbeing of technical employees.

II. PURPOSE

The purpose of this paper is to review a sample of the literature relating to the factors that can enhance the productivity, innovation and wellbeing of technical professionals at the work place.

III. LIMITATIONS

The scope of this review is by design limited to a cross-section of the literature in this area. As such, it cannot, and does not, attempt to be an examination of the full range of the literature, but a sampling of important and influential works only.

IV. DISCUSSION

In today's highly competitive, globalized world-improving productivity and innovation within the organization is a key priority for management. Especially in technology based or manufacturing based organizations, the expertise of technical professionals is a key competitive advantage that organizations wish to utilize. However, research has suggested that managing and getting the best out of technical employees poses unique challenges as technical professionals often'look for different things from employers' (Rothwell, Kim & Williams, 2014)and 'Understanding the differences is essential for attracting and retaining these workers '(American Productivity and Quality Center [APQC] Study,2012).This assertion is in line with Huang and Lin's(2006) finding that management's style of dealing with employees is crucial for employee involvement and can play an important role in innovation performance. Although technical innovation is recognized as an important competitive advantage essential to organizations engaged in operations **,** many organizations struggle to unleash the innovative energies of their technical employees as they fail to understand these differences and unique requirements . On the other hand, there is a growing recognition of the importance of employee wellbeing by management not only from a humane perspective, but also from a productivity perspective. Research has suggested that employee productivity is associated with job satisfaction (Bockerman, 2012). Asignificant body of research also indicates that poor person– supervisor and person-organization fit is associated with both dissatisfaction and job burnout (Kristof-Brown, Zimmerman, & Johnson,2005).If the unique requirements remain misunderstood and unfulfilled at work, psychological or behavioral pathology can develop within a person with the consequent detrimental impact on productivity andeven physical health(Danna and Griffin,1999; Kristof-Brown &Guay, 2011).This is why, to enhance well-being and consequent productivity oftechnicalprofessionals – management needs to understand the unique characteristics and requirements of these professionals.This understanding is going to become more important in near future as a recent PWC (Price Waterhouse Cooper) report (Millenials at work: Reshaping the workplace) found that the 'Millennial' generation wants to have work places which are in tune with their innate values and thinking styles.

On the other hand , an engineer's task today is often not finished with conception of an idea or a prototype ,rather he/she needs to make the attempt towards linking technology and business aseven brilliant ideas do notmove themselves to the market .This is why increasingly technical professionals are expected to understand the business side of the equation as well.Over the years, moving technical experts into leadership and business management roles has been pursued as an effective strategy to address this issues of technical talent management as well as commercial feasibility of technical innovations. In fact, The benefits of technical experts developing management and business competencies were highlighted half a century ago, when Peter Drucker called for technical experts to take responsibility for leadership within their areas of expertise (Drucker,1977). Later on, Lowendahl (1997) highlighted the need for technical experts to occupy leadership and management positions as they were more readily accepted by their peers. Kouzes and Posner (2002) argued that "to enlist people in a vision, leaders must know their constituents and speak their language". In line with this suggestions, Garnier (2008) highlighted that productivity of R&D departments can be increased by having managers who are leaders in their respective fields and can guide and inspire their teams to achieve greatness. More recently Duke,Fuqua School of business' white paper (2016) on 'empowering high-potential STEM talent to take on leadership roles' quoted that –'Everyone with backgrounds in the STEM disciplines can be and should be a corporate leader.'

But in placing such expectations , organizations often undermine the challenge inherent in achieving such combination as has been highlighted by number of studies (e.g.M.K. Badawy, 1982; T.DeLong,1982; Preston and

Biddle, 1994; Burke and McKeen, 1994.;Eisner, 1997; Watkins, 2004) . M.K. Badawy (1982)cited the difficulty some technical personnel experience in acquiring management and business competencies from technical specialist positions. DeLong provided empirical evidence which illustrated the opposing relationship between managerial and technical functions based upon different career orientations. Subsequent research (Preston and Biddle, 1994; Eisner, 1997) highlighted that managerial/business orientation requires a different value system than technical orientation and if technical experts try to apply the same skills and behaviors to the managerial role (Burke and McKeen, 1994) that could lead to a failure of the transition (Watkins, 2004). A research by University of Michigan, Graduate School of Business found out that even if a person has the managerial talent to attain upper level management position, unresolved internal conflict between his technical and managerial orientations may lead to a low level of job satisfaction with its resulting negative implications for productivity and individual well-being (Hill &Kahng, 1986).This finding is in line with Walsh's (2003) suggestion that the transition from a technical expert toa business manager 'requires strong motivation and commitment to change deeply ingrained patterns.'

Thus, recognizing and understanding these 'deeply ingrained patterns' is essential not only to help with proper management of technical professional but also as an invaluable tool for deepening the technical professionals' self-awareness – a key element in leadership development and commercial acumen building. These deeply ingrained patterns are what cognitive psychologists and organizational behavior practitioners call'mental models' or 'mindsets'. This mindset creates deeply ingrained assumptions and generalizations that influence how we understand the world and ourselves and consequently how we react.

Though some previous research has tried to identify relevant dimensions of such mindset, unfortunately, the literature review revealed a dearth of empirical research and user-friendly integrative framework in this area. To quote some relevant previous finding-Holland's (1966, 1985) theory of vocational choice and guidance hypothesized six vocational types (i.e. realistic, investigative, artistic, social, enterprising, and conventional-RIASEC). Using Holland's RIASEC diagnostic model, Raymond Hill and Pamela Roselle (1985) found that managers scored significantly higher on the Conventional, Enterprising, and Social themes of Holland's theory than did technical specialists. Technical specialists, on the other hand, scored significantly higher on the Artistic theme than did managers. The managers had a "business mind set" relative to the specialists who are notably disinterested in this area. Expanding on the constructs of self-concept, Schein's (1996) career anchor model identified technical/functional as a separate career anchor from Managerial with the former's focus on 'knowledge and skills' and the latter's aspiration to rise in the organization to higher levels of authority and responsibility. Preston and Biddle(1994) also highlighted that technical professionals possessed different work values (values or goals which individuals want to achieve through their work) than their managerial counterparts. Clarke (1998) suggested that one of the most difficult decisions facing a technical expert was whether to stay technical or move into a management role. Drotter,Noel& Ram Charan in their 'Leadership pipeline' model (2000) highlighted the inability to make required changes in the value system as the primary reason for failure of transition from a technical to a managerial role . However, their research did not go into the details about origins of such differences. Gridley (2007) used Sternberg and Wagner's Thinking Styles Inventory (TSI) to compare artists and engineers, and found that engineers preferred to organize their thinking more hierarchically and preferred to work with input from others. Using the Personal Style Inventory (PSI), Jeanine Williamson, John Lounsbury& Lee Han (2013) did a meta-analysis of the traits of 4876 engineers versus 75,892 non-engineers, and found that Engineers differed from other occupations on 11 of the 13 traits under study and nine of these 13 traits were positively and significantly related to the career satisfaction of engineers.

But as the brief literature review shows, although it is well understood that technical professionals have unique requirements and there is sometimes a polar relationship between technical and managerial orientation, previous researchers looked at this dichotomy from a symptomatic perspective. As such, existing literature gives a fragmented view and these researches do not go into the details of how to manage such differences towards greater productivity and wellbeing at the work place. Rather, the fragmentation into multitude of dimensions means theories on technical and managerial orientation and the related concepts remain heterogeneous and disintegrated. Also, these studies are static in the sense that no suggestion for growth or development is highlighted.

However, it is important to remember that an individual does not have an unchangeable, rigid identity- rather as Super's (1996) career development theory suggests, career choice and development is essentially a process of

developing and unfolding a person's self-concept. The work of Stanford cognitive psychologist Hazel Markus (1986) and other modern behavioral scientists have also shown that people have many possible self- concepts and they are shaped by history as well as environment stimuli,Thus, it should be possible for a vast majority of technical professionals to include the desired management/business competency schema into the self-concept through self-insight and a consequent program of development, provided there is awareness at a sufficiently early level of their career (Compton,1999; Menzel, Aaltio& Ulijn,2007; Baruah& Ward,2014). To support the technology based economic growth, such combination is becoming increasingly important for technical professionals even if they do not want to make a transition to management positions(Nicolaidis& Kosta,2011).As Peter Senge (1990) highlighted- growth involves identifying, clarifying, and changing one's mental model and its component assumptions. To facilitate this, a supporting framework assisting self-reflection, identification and deconstruction of deeply held beliefs can help with new ways of looking at an old problem.

But ,unfortunately ,there is a lack of integrative, cohesive and user friendly framework which can help technical specialists as well as management professionals working in industries to develop self-insight and understand how technical and management skills need to interplay to enhance productivity, innovation and well-being in the organization. In previous studies, the issue has predominantly been examined using a one-dimensional measure- In particular, focusing primarily on individual differences. However, there is a lack of empirical research that have examined the organizational factors and the managerial behavior that are required to develop an environment that enhances the productivity, innovativeness and wellbeing of technical professionals. The result is that organizational managers are left with common sense approach and a few commoditized literature to lead and manage their technical talents. As such, organizations often fail to manage technical and innovative people well and few organizations possess the capability to sustain innovation over the long-term (Adams, Bessant & Phelps, 2006; Flynn, Dooley, O'sullivan&Cormican, 2004).

As such, a framework incorporating synthesis of previous research findings as well as new studies to understand the salient organizational and management factors can help to achieve better organizational outcomes in terms of innovation and productivity of technical professionals.

V. SUMMARY

This paper has tried to give a brief summary of available literature on what managers can do to increase the productivity, innovativeness and wellbeing of technical professionals. But, as the review shows, this area remains under researched and under theorized. In addition, the findings from previous researches remain fragmented and there is a lack of integrative, cohesive and user friendly conceptual framework which can help professionals to develop self-insight and understand how technical and management skills need to interplay in organizations. As such, more research and a synthesis of findings is needed in this area .If future researchers look into this area, this can help with identifying mechanisms for better synergy between the competing technical and managerial orientations and thereby foster greater creativity, well-being and productivity in the organization .

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