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# Key personality traits of engineers for innovation and technology development

Jeanine M. Williamson<sup>a,\*</sup>, John W. Lounsbury<sup>b,1</sup>, Lee D. Han<sup>c,2</sup>

<sup>a</sup> University of Tennessee Libraries, 1015 Volunteer Boulevard, Room 152, Knoxville, TN 37996, United States

<sup>b</sup> Department of Psychology, University of Tennessee, Knoxville, TN 37996-0900, United States

<sup>c</sup> Transportation Engineering Program, University of Tennessee, Department of Civil & Environmental Engineering, 112 Perkins Hall, Knoxville, TN 37996-2010, United States

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### ABSTRACT

Focusing on new roles of engineers for technological innovation and internal entrepreneurship, we examined the personality traits of 4876 engineers versus 75,892 non-engineers. Engineers scored higher on Tough-Mindedness and Intrinsic Motivation; but lower on Assertiveness, Conscientiousness, Customer Service Orientation, Emotional Stability, Extraversion, Image Management, Optimism, Visionary Style, and Work Drive. All but four of these traits were positively related to engineers' career satisfaction. Overall, the results are not encouraging for the new roles of engineers such as intrapreneurship. Findings were discussed in terms of occupational profiling of engineers as well as career planning, selection, training, and professional development of engineers.

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## Introduction

In today's fiercely competitive, global marketplace—with its emphasis on rapid, continuous innovation and need for ongoing adaptation to an increasingly complex world—the human resource capital configuration of companies is undergoing corresponding dramatic changes (Geisler and Wickramasinghe, 2009). Among these are demands for engineers to play more consequential roles in all phases of the innovation process in global corporations. Such roles require knowledge, skills,

\* Corresponding author. Tel.: +1 865 974 9164; fax: +1 865 974 9242.

E-mail addresses: [jwilliamson@utk.edu](mailto:jwilliamson@utk.edu) (J.M. Williamson), [jlounsbu@utk.edu](mailto:jlounsbu@utk.edu) (J.W. Lounsbury), [ghan@utk.edu](mailto:ghan@utk.edu) (L.D. Han).

<sup>1</sup> [Ecareerfit.com](http://ecareerfit.com).

<sup>2</sup> Tel.: +1 865 974 7707.

and personal traits which go well beyond those found in standard taxonomies such as the Dictionary of Occupational Titles and its successor, O\*NET (2012) or Occupational Network—an online occupational database comprising a mix of knowledge, skills, abilities, and other personal traits for a wide range of occupations. Menzel et al. (2007) contend that engineers must function more entrepreneurially in their companies, in an intrapreneur role. In their view, the core competences of intrapreneurs include a number of new qualities not found in traditional engineering job descriptions, such as embracing revolutionary change, teaming with other disciplines, visionary thinking style, flexible problem-solving, risk-taking, and comfort with uncertainty. Similarly, as idea innovators working in new product development settings, engineers would be expected to possess curiosity, self-motivation, intuition, emotion management, self-awareness, and creativity (Amabile and Gryskiewicz, 1988). In a similar vein, Uljin et al. (2007) propose that engineers engaged in new product development and innovation diffusion should have competencies in people skills, social networking, team facilitation, risk management, and customer responsiveness, among others.

Then, too, as noted by Davis (1999), successful technological innovation requires a unique combination of not only entrepreneurial competences at the level of the individual contributor, but also corresponding managerial skills. Engineering managers who function in an intrapreneur capacity will need the attributes outlined above. They will also need to identify, motivate, influence, and guide the innovation-related behavior of engineers so as to facilitate overall corporate innovation and competitiveness. From a broader perspective, there is an emerging and strongly held consensus among national policy analysts that the future prosperity and security of the United States is imperiled by the eroding human resource capital in science, technology, engineering, and mathematics (National Science Foundation, 2012). Among the critical areas for improving the education and training of engineers to compete in the global marketplace and function in international settings are the new roles and soft skills noted above as well as open-mindedness, cross-cultural sensitivity, social awareness, and emotional intelligence (Del Vitto, 2008).

Some companies have successfully integrated intrapreneurial roles with other innovative strategies for commercial technology. For example, 3M jointly promotes entrepreneurship and intrapreneurship as part of new venture teams, intra-company technology exchange, and customer driven innovation to help foster the commercialization of technology in its electronic business (Conceicao et al., 2002). In smaller firms, the intrapreneur role may have to be combined with other roles, such as lead manager or founder, to facilitate the development of new products and services to expand profit (Camelo-Ordaz et al., 2012). In larger organizations, the intrapreneur role is often adopted by middle management and by ad hoc positions designated by the company to develop new business ventures in the existing organization (Roupas, 2008).

While there is a nascent conceptual literature on characteristics of engineers purported to be important for successful intrapreneurship and new technology innovation, there is a dearth of empirical research bearing on these issues. As noted by Davis (1999), we do not know whether any of the proposed attributes are necessarily descriptive of, say, intrapreneurial engineers. At the present juncture, one important question to ask is what are the key personal attributes of engineers at the beginning of the 21st century? Two other important, related questions are: do these attributes differ from the ones portrayed in extant occupational taxonomies like O\*NET, and how do they correspond to the new roles engineers will be expected to adopt—such as intrapreneurship, technology change advocate, and innovation co-facilitator?

To address these questions, our focus in the present study is on one key attribute of engineers—their personality traits. There are five main reasons for choosing personality traits as our unit of analysis. First, personality traits are recognized as one of the main components to be considered in any job analysis or job description, which are referenced by the commonplace acronym KSAO, or Knowledge, Skills, Abilities, and “Other” personal characteristics, with personality traits typically representing the other personal characteristic of job incumbents (cf. Muchinsky, 2012). O\*NET (2012), for example, lists personality traits as well as key areas of knowledge, skills, and educational requirements for all occupations listed. Second, personality traits can be assessed in a reliable, standardized manner such that personality trait scores can be meaningfully compared across situations, time periods, and diverse samples of people. Third, personality traits have been found in

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