Can Employees’ Personality and Cultural Characteristics Be Used to Predict their Best Fit With Software Testing Job Tasks?

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Abstract

This paper presents a review of characteristics that might be appropriate factors to predict job success, followed by a preliminary model that could be incorporated into a more specific model once data becomes available for testing the model. The eventual model could add value to the process of making software testing task assignments by considering certain employee traits that would lead to an increased chance of putting the right employee in the right job at the right time, resulting in improvements in quality and productivity of software testing activities.

1. Introduction

Organizational reliance on information technology, and its contribution to gaining a competitive advantage, has changed significantly over the past 20 years. The expense of the technology had at one time made ownership enough to set one company apart from others in its industry. The cost of technology has decreased over time, making strategic uses of software a strategic component. Widespread use of both hardware and software has resulted in complex organizations relying on complex information systems. The increased complexity of organizational structures, facilitated by an evolution in information technology, has long been recognized [8]. With globalization and the advent of large multinational organizations, many companies find themselves sitting on a foundation of a labyrinth of entangled software linked together over time.

Strategic partnerships, alliances, and corporate buyouts are also recent trends that have contributed to the complexity and dispersed nature of organizations, resulting in organizational silos, or units, with poor communication channels that are often forced to both compete and cooperate with each other [10]. These changing organizational structures have not only made the systems themselves more complex, the situation has brought together people from around the world working together to solve difficult problems.

Software testing centers have long been either nonexistent or given little attention. However, the increased complexity of software development has led to recognition of the need to focus on software testing as a critical component of the software development lifecycle. The complexity of software testing itself has become increasingly complex, especially in large organizations.

Software testing often involves globally dispersed teams that may include different organizations, especially with the increased use of offshore outsourcing, engaging a variety of societal and organizational cultures and norms. Past research has examined the impacts of personality traits on project teams, and specifically software engineering teams [5].

The current organizational environment has resulted in a need for greater understanding of the intersection of personality, culture, and technical expertise of individuals in a software testing environment. While many past studies have examined the use of personality traits as determined by tools such as the Myers-Briggs Type Indicator (MBTI) to determine best personality indicators of success, the authors suggest that personality tests may be an appropriate tool,
but alone are not enough to determine successful indicators in a software testing environment. Personality traits, culture, and technical expertise together may better reveal the best determinants for building a successful software testing team.

Many authors and management speakers discuss the IT combination of people, process, and technology and their experiences indicating that the biggest issues involve the people aspect. This project addresses those people aspects and proposes a model to study the influence of culture, personality, and technical expertise on job success of software testers, with an expected eventual outcome of higher-quality software once a final model is developed to identify predictors that can be used to produce the desired outcome.

The sections below describe the theoretical basis of this project, results of interviews, and a proposed model. The final section includes suggestions for further research to refine the model and test its usefulness in an actual software testing environment.

2. Theoretical basis

Research related to software testing success was reviewed, with some of those findings described in the introductory section. Substantial literature on software testing has been available for many years in computer science and engineering publications, but research from a managerial viewpoint is much more limited. Publications exist that identify types of software testing and some of the possible causes of problems involving errors that escaped the testing process. Whittaker [12] suggested that software testing is the least understood aspect of software development and suggested some solutions, such as a better understanding of the role of software testers.

The other general topic reviewed for this project is related to characteristics of software testers that might have an effect on their success. Personality tests have been studied and used for many years in an attempt to determine the types of jobs that are the best fit for an individual. More recent research has suggested that cultural differences appear to affect the way some people work individually and as team members. In the following sections a theoretical foundation is presented to examine the effect of integrating personality traits, culture, and technical expertise have on software testing activities.

2.1 Personality

Research in the fields of Psychology and in Management provide some of the basis for this project. Some research describes the use of personality tests in general, while other reports are specifically related to aspects of software development.

Studies have been published and some applications exist that involve the use of personality tests (e.g., the Myers-Briggs Type Indicator) and other similar measures as factors in determining the best job fit for employees. In addition to job fit, tests of this type may be used to determine best practices for managing different types of employees. According to Sample [9], the Myers-Briggs (MBTI) instrument has developed a very good record regarding reliability and validity when it is used appropriately.

A theoretical basis also exists regarding the effect of personality characteristics on team performance. Bradley and Hebert [1] determined that personality types are an important factor in successful team performance and suggested that complex tasks in IS development need a balanced team of opposite personality types. Kaiser and Bostrom [6] and White [11] also studied the effects of personality characteristics on teams and applied the use of MBTI to information systems development project teams, although not directly toward software testing.

According to Chilton et al. [2], stress has been increasing among software developers, possibly resulting in lower productivity. They studied the fit between a software developer’s preferred cognitive style and that developer’s perception of the cognitive style required for the existing job environment. Their results indicated that a wider gap between the preferred cognitive style and the required cognitive style resulted in a performance decrease.

Although numerous personality instruments are available, this paper has narrowed the focus to the MBTI as a basis for developing the preliminary proposal for a model.

2.2 Culture

Research on cultural differences provides another aspect of characteristics of employees that might affect job performance. The Geert Hofstede [4] research on cultural differences provides an extensive basis for the cultural aspect of this project. His research is regularly used as a basis for studies regarding effective ways to work with people in different cultures. Ford et al. [3] reported that information systems (IS) studies that cited Hofstede’s research on national culture focused predominantly on issues related to IS management and that little work had been done related to IS development and operations.

Although offshore software testers reside around the world, most of the testers studied for this project
reside in India. For this study, cultural differences between the United States and India were reviewed. Hofstede identified five cultural dimensions, which are Power Distance Index, Individualism, Masculinity, Uncertainty Avoidance Index, and Long-Term Orientation. In developing the preliminary model, Geert Hofstede’s Cultural Dimensions research was used as a basis for cultural characteristics. Those characteristics compared between the US and India are described briefly below, as they could be an important factor in software testing team success.

The Power Distance Index identifies the extent that different members of a group see inequality versus equality in a power struggle. The dimension of Individualism is the extent that individuals assume an identity beyond a group. Masculinity or Femininity refers to the role of gender in a culture. The Uncertainty Avoidance Index refers to the significance of structured or unstructured events as related to behavior of a culture. The Long-Term Orientation measures values in terms of values of the future as opposed to values of the present.

Measurements for the United States and India appear to be equal or close to equal on the Masculinity/Femininity and Uncertainty Avoidance Indexes. However, there are measurable differences on others. The United States ranks Individualism as the highest dimension. India’s index is about half the index of the United States. This comparison suggests that more training and structure should be given those testers in India. Power Distance is the highest index for India and is the next to lowest of the five dimensions in the United States. This indicator suggests more equality within the US culture. It can be suggested from these measures that cultures with a high index in this dimension are more followers than leaders.

The Long-Term Orientation Index is the lowest of the indexes for the United States, but it is second highest in India. These results suggest that India values thrift, perseverance, predictability, whereas the values indicated by the index for the US are connected to respect for tradition and obligations.

2.3 Technical Expertise

Numerous studies have occurred in recent years related to desired knowledge/skills for IS professionals. A survey of IS practitioners in 2001 [13] listed the following as the top five critical knowledge/skill sets required by industries:

1) Interpersonal communication skills,
2) Interpersonal behavior skills,
3) Personal motivation and working independently,
4) Critical thinking, and
5) Creative thinking.

None of the specific skills related to software, hardware, programming, etc., were in the top five characteristics required.

A more recent survey of IS managers [14] had some similar results. In addition to identifying knowledge/skill sets critical to keep in house, survey participants were asked what critical skill was most often missing from entry-level candidates. The most consistent response was “communication.”

3. Interview data

To determine how the research findings compare with current knowledge/skills needed by software testers, interviews were conducted with several software testing managers. Results are described below in sections related to the research topics. Although the interview discussions did not target the specific topics found from the research, comments were often related to the topics described above.

One software testing manager indicated that his initial interview questions are related to intangibles, including 1) self motivation, energy level, flexibility; 2) team orientation; 3) integrity, sense of quality; 4) process discipline; 5) communications and interpersonal skills. A weighted system is used for the specific characteristics desired. The “intangibles” represent over half of the total weights available. This manager mentioned that communication skills, both verbal and written, are very important and are evaluated during the interview process. Questions are also asked about their ability to work on teams and their experience in being a team leader, as leadership is a desired characteristic. In discussions about technical expertise, the interview questions include general questions on concepts of client/server architecture, followed by questions on skill levels with databases, ending with questions on programming. The biggest problems in finding the right persons for software testing jobs were indicated to be candidates’ lack of desired technology skills and a poor work ethic.

Other interviewees discussed problems with cultural differences. Some managers indicated that workers in India do not like to ask questions or to provide bad news. They were also described as being better at streamlining an existing project effort than in finding innovative solutions. Language differences were also mentioned, with some indications that face-to-face communication works well between testers from India and the US but that written communications are less successfully understood.
Additional cultural differences included: 1) a greater interest among the Indian culture in work advancement compared with quality of life issues; and 2) a greater likelihood of regular job changes for those employed in India.

4. Model development

A tool to assist in making assignments of software testing activities based on characteristics of testers could result in reduced errors and thus higher quality, lower cost software testing. The information gathered for this project through literature reviews and interviews forms the basis for a preliminary model. This model depicts the categories of personality, culture, and technical experience that might be correlated with job success, including specific results that might be influenced by a category. For example, an individual’s personality would influence the results of a Myers-Briggs Type Indicator score, and technical expertise of the individual would influence the person’s ratings on work experience. This preliminary model is designed to test data to see what factors of personality, culture, and technical expertise might be best used to predict job success, which is measured by such data as employee evaluations, awards, rewards, and employee job satisfaction. (See Figure 1.)

![Figure 1. Preliminary Model](image-url)
5. Follow-up research

This study is a first stage in the development of a tool that could be used to recommend the most productive combination of software testers for a particular testing activity, regardless of tester location. Testers would be more likely to be successful when assigned to tasks that are the best fit for their talents, which should create a better environment for the tester and a better software product for the organization, with fewer defects.

Data was not available for use with this preliminary model, but it is anticipated that Structured Equation Modeling (SEM) or logistic regression techniques would be appropriate for further development of the model that would assess the influence of various characteristics on job performance, once data is available. SEM [7] is considered to be a powerful model building approach, combining several techniques such as Factor Analysis, Multiple Regression, and Analysis of Variance. This tool is effectively used for relationships in which there are many variables influencing other variables and is expected to be the first method used for further development of the model. Several tools may be used to find the best tool. The eventual model that will be derived from this study will try to determine some predictor of characteristics that will lead to higher quality, lower-cost software testing.

This model could be very useful in making effective and efficient job hires and assignments. The use of this tool to enhance the process of considering employee traits when making software testing task assignments provides the organization with an increased chance of putting the right employee in the right job at the right time, thus increasing the chances of high quality, high productivity, and decreased defects.

Once in use and working as desired, this model could be expanded in the future for use in other areas such as software development and other IT tasks, with the potential for improving employee output in a variety of IT functions.

6. References


