Development of Online Military Aptitude Test

Abstract

Background: *Technological advances influence various stages of recruitment and selection. In India, personnel selection of officers of Indian Armed forces is carried out at different service selection boards and Air Force selection boards located at different parts of the country. These candidates come from different parts of the country without knowing if they have the potential for the Armed Forces.* ***Objective****: Thus the present study aims to develop an online military aptitude test for people to assess their potential for Indian Armed Forces.* ***Method:*** *To achieve this aim, an attempt has been made to develop an online self assessment tool that will facilitate the user to carry out their self-assessment and know their prospective to be in the Armed forces. This tool comprises of three sub-tests that will be assessing user's temperament, personality and cognitive attributes. From a pool of items for three subtests 68 items were retained for the final test after item analysis for cognitive subtest and factor analysis of temperament and personality sub test of the tool. This final test has been uploaded on the World Wide Web.*

Keywords*: Self-assessment, cognitive, temperament, aptitude test.*

Introduction

The nature of work has changed over the years and one of the major determinants of this transformation is change of technology employed in the organizations. In fact, from agricultural societies to industrial and then to post industrial societies, technological changes have played a very significant role. An evident differentiation can be perceived between yesterday and today. Earlier, natural resources defined power and seniority signified status but on the contrary, today power signifies application of knowledge and creativity drives the status. Previously, everyone was competitor but today everyone is a collaborator. Technological advances have profoundly influenced different areas of our science and practice. One such advancement constituting knowledge and creativity that has touched almost every aspect of human life is computer in general and web technology (World Wide Web) in particular.

People are becoming increasingly accustomed to the use of and interact with sophisticated computer systems, which have been designed to assist in their activities in various aspects of life (Tonidandel & Mislevy, 1990). For example, automated teller machine (ATM) for banking, diagnostic aids for physicians (CT scan, PT scan), flight management system (FMS) for pilots, cruise control in cars, and Intelligent Vehicle Highway System (IVHS) in transportation. Automation has also been widely used in military operations during the last decade for increased speed and successful operation in all weather conditions. It has become necessary for the military to consider guided missiles in which the human pilot is absent and targeting the enemy is left to autopilot missiles.

Of the technological advances perhaps the introduction of computers and related technology has had the most profound impact on the science and practice of personnel staffing and selection. Technological advances have given several new avenues for assessment and to tailor assessments to specific needs (e.g. web based assessments, computer adaptive testing). All aspects of staffing and assessment including advertising, initial screening and final selection have been influenced by technological advancements. It influences across the various stages of recruiting and selection.

With this backdrop in mind, the present study explores the possibility of invading new procedure of personnel selection in India through computers and to be more precise through World Wide Web. To achieve this aim, an attempt has been made to develop an online self assessment tool that will facilitate the user to carry out their self-assessment and know their prospects to be in the Armed forces. It will help the user to identify one's interests, personal characteristics and to use the scores of this self-assessment tool to match ones background to possible careers. Therefore, the present tool will look for talent and natural skills in the candidates that are considered important for different military jobs. This tool comprises of three sub-tests that will be assessing user's temperament, personality and cognitive attributes.

Computerized Testing

Computerized testing has received considerable attention in the last few years with increasing impact on selection and personnel development systems (Bartram & Hambelton, 1999). Numerous studies indicate various advantages of computerized testing as compared to traditional paper-pencil test (Legg & Buhr, 1992; Overton, Harms, Taylor, & Zickar, 1997; Vispoel, Rocklin & Wang, 1994). Computerization has profoundly affected psychological research and practice. Presentation of dynamically changing stimuli, on-line data collection

with highly precise measurement of response time, statistical analysis and computer generated interpretation of an individual have been made easier through a computer. One important application involves computerized assessment of individual differences. Such computerized assessment is easy to administer, provide easier results, are less prone to error and in some cases allow less opportunity for cheating. Human raters are also prone to a host of decision-making errors. By removing or reducing the human element from the selection process and introducing a standardized, impartial, technology solution many hope that adverse impact can be significantly reduced or eliminated and more valid decisions can be made. It costs less and has the potential to expand applicant's pools. Clearly computerized assessments of psychological variables are already popular and seem to be growing in usage.

Computerized testing can be done in multifaceted ways. For example testing can be computerized, or computers can also be programmed as per the capability and ability of the user. The former type of testing is known as Computer-based testing and the latter is known as computer adaptive testing.

Computer-based testing

Computer-based testing (CBT), also called e-exam, computerized testing and computer-administered testing, is a technique of administering tests in which the responses are electronically recorded, assessed, or both. It makes use of a computer or an equivalent electronic device. It may be a stand-alone system or a part of a virtual learning environment, possibly accessed via the World Wide Web.

Computer-based testing is particularly well suited to tests consisting of multiple-choice questions, which can be assessed automatically, reducing labor and costs. It gives choices to

the user to use the test according to his/her convenience and it gives more fair and accurate evaluation. Internationally there is a growing number of professionals administering psychological tests by computer.

Computer-adaptive testing

A computer-adaptive testing (CAT) is a method for administering tests that adapts to the examinee's ability level. That is why, it has also been called tailored testing. CAT successively selects questions so as to maximize the accuracy of the exam based on what is known about the examinee from previous questions. From the examinee's perspective, the difficulty of the exam seems to tailor itself to their level of ability. As a result of adaptive administration, different examinees receive quite different tests.

The rise in popularity of adaptive testing is attributable to advantages such as increased test security, spontaneous report, efficiency and superior assessment (Weiss, 1992; Zickar et al., 1999). Test-takers do not waste their time attempting items that are too hard or trivially easy. Like any computer-based test, adaptive tests may show results immediately after testing. Some computerized tests used for personnel selection are Basic Attributes Test (BAT), (Carretta, 1987). It is a computer-based battery that contributes to a US Air Force pilot selection composite known as the Pilot Candidate Selection Method (PCSM). U.S. Air Force (USAF) pilot selection and training procedures have changed substantially in the last several years. Pilot selection procedures were augmented with the introduction of computer-based testing to assess pilot aptitude. Another computerized test is the Computerized Adaptive Screening Test (CAST), which was designed to predict performance on the Armed Forces Qualification Test (AFQT). It includes two subtests: Word Knowledge (WK) and Arithmetic Reasoning (AR). Army recruiters have used CAST since the early 1980's to prescreen enlistment prospects.

Web Based Testing

The development of internet (www) based psychological testing is an extension of the rise of psychometric tests administered using stand-alone computers. The next ten years will be the decade of the Internet in personnel selection. Currently many personnel selection procedure (tests, questionnaires) are translated to an Internet form. One of the very old and popular battery used for personnel selection is *Armed Services Vocational Aptitude Battery* (Segall & Moreno. 1999). It is a multi-aptitude test used by the United States Military to determine eligibility to join, and job qualifications. All persons enlisting in the US military are required to take ASVAB. It determines whether a potential recruit is qualified for the military and for certain military jobs. Military recruiters also claim that it will help a person choose a civilian career, but that is not what it was designed for.

A number of personality scales have been implemented as online instruments, mainly by amateurs but also by professional psychologists (Barak & English 2002). Relatively few evaluations of the psychometric properties of online personality tests have been published. It is relatively easy to present the items of a personality inventory on a World Wide Web page, thus permitting respondents to complete such surveys in a variety of settings convenient to them and permitting the data to be automatically processed and scored.

In general the findings from studies have shown that online measures can be reliable and valid measures, Robins (2001) in an examination of links between self esteem and other personality traits, used data from an online version of a big five personality inventory (John & Srivastava 1999) in a very large sample. Woolhouse and Myers (1999) evaluated a new measure (based on a Jungian personality typology) using both paper-pencil and Internet modes of administration and similarly found that the reliabilities were comparable.

Personnel Selection

Globally, screening, selecting, classifying, and placing of military recruits were among the earliest concerns of the Armed Forces.   At the onset of World War I, effective selection and utilization of military personnel was one of the key interests. In the United States, large numbers of individuals were assessed using the Army Alpha Test and the Army Beta Test for intelligence screening, occupational classification, aptitudes, and special training. Group testing and multiple-choice formats were practical solutions for supporting the needs of the United States military. The leaders of the American Psychological Association mobilized their efforts to assist the military in personnel selection, training, classification, re-education, and treatment (Yerkes, 1921). He examined officer selection procedures based on four different psychological approaches that is officer selection based on academic qualifications and personal record, paper-and-pencil psychological instruments, assessment centers with the use of simulations, and the construct-oriented psychological assessment.

In India, personnel selection of officers of Indian Armed forces are carried out at different service selection boards and Air Force selection boards (SSBs /AFSBs) located at different parts of the country. Presently large number of candidates appear at SSB's/ AFSB's but only few candidates get through. Most of the candidates are unable to clear even stage one (preliminary screening mandatory for selection) and there is therefore constant wastage of money and manpower of the national exchequer and as well as wastage of time and effort of the candidates. These candidates come from different parts of the country without knowing if they have the potential for the Armed Forces. There is no pre assessment tool available at present for filtering the candidates.

Development of Online Self-Assessment Tool

On line self-assessment tool is supposed to look for talent and natural skills in candidates that are considered important for different military jobs. It will facilitate the user to carry out his/her self assessment and know the prospects to be in the Armed Forces. The tool consists of three subtests, namely cognition, personality and temperament. Cognitive sub-test of the tool has 20 items and it measure the abilities like problem solving, decision making and reasoning. "Cognition refers to all processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used." (Neisser, 1976).

The second subtest has 27 items and it analyzes the personality of the individual that is the individual's traits or predispositions of the individual to behave in a particular way across situations. "Personality is that which permits a prediction of what person will do in a given situation." (Cattell, 1950). The personality sub-test of the tool helps to identify ones manifest characteristics. It includes his adjustment to society as a whole, how he takes up the novel situations and adapts to it and also the different strategies he adopts in different situations.

The third sub test, that is, temperament test has 21 items and it taps the latent or hidden aspect of ones personality. Temperament is a general makeup of an individual characterized by ones biological and environmental dispositions towards particular patterns of behaviour. Temperament is defined as that part of the personality which is genetically based. Understanding temperament can help to know ones bent of mind in a particular field. Candidates having access to this knowledge helps them to guide their behavior in a particualr direction. It is an opportunity to anticipate and understand ones reaction. It is also important to know that temperament does not excuse candidate's unacceptable behavior, but it does provide a suitable direction.

Objective

The objective of the study was to develop online self-assessment tool comprising temperament, personality and cognitive parameters. The temperament parameter taps the underlying traits and the personality parameter taps more manifest traits of an individual pertaining to leadership qualities and social adaptability. The cognitive parameter taps intellectual ability of the individual.

Methodology

The study was conducted in two phases. Phase-I covered development of test and phase-II included the conversion of these psychological questionnaires into computerized format. Finally the test is uploaded into Web Server. A thorough literature survey and two brain storming sessions with experts in the personnel selection was carried out. Based on the input and literature available the temperament, personality and cognitive requirements were identified for serving in Armed forces in India. On the basis of above information and existing selection procedure, a pool of 180 items were prepared which include items for temperament sub-test (n = 60), items for personality sub-test (n = 60) and items for cognitive sub-test (n = 60).

Sample

A sample of 149 male students of XI – XII class studying in Sainik schools was taken. The choice of the schools was guided by volunteer participation and ready cooperation extended by school authorities and students. They were administered self assessment tool comprising of three subtests. A 5-point Likert type scale (1 = very true, 2 = true, 3 = neutral, 4 = false and 5 = very false) was used as the response format. Thirty-six items in personality subtest and 49 items in temperament subtest were reverse scored in order to prevent any response pattern.

Development of Final Test

On the basis of the responses of 149 subjects, two 60 x 60 inter correlation matrix (temperament test and personality subtest) was prepared and submitted to Principal Component method of factor analysis followed by Varimax method of rotation. Principal Component factor analysis guided the reduction of the number of items. For temperament sub test of online self assessment tool, the analysis yielded three factors with 21 items clustered in factorial solution. Thirty nine items were found redundant as these items have very low factor loadings (< .40). Factor 1 (eigenvalue = 5.53, variance = 9.22 %) had 09 items, factor 2 (eigen value = 2.77, variance = 4.63 %) had 09 items and factor 3 (eigenvalue = 2.58, variance = 4.30 %) had 03 items. For personality sub test, the analysis yielded three factors with 27 items clustered in factorial solution. Thirty-three items were found redundant as these items have very nominal factor loading (< .40). Factor 1 (eigenvalue = 6.54, variance = 10.90 %) had 12 items, factor 2 (eigen value = 3.38, variance = 5.64 %) had 10 items and factor 3 (eigenvalue = 2.59, variance = 4.32 %) had 05 items. For the Cognitive sub test of online self-assessment tool item analysis was carried out. The analysis yielded 20 items with difficulty index .30 and discrimination level (validity index) 0.15. Both temperament and personality subtest assess three broad skills clustered in three factors. Factor one is related to one's leadership skills, factor two is associated with the executive skill and finally factor three is linked with the adaptive skill of the individual.

Psychometrics properties of the online self-assessment tool

Cronbach's alpha was calculated for the three subtests for recommended candidates and screened out candidates (Table 1).

Table 1 Cronbach's alpha for 3 subtests for recommended and screened out candidates

Sub test	Recommended (N=106)	Screened out (N =56)
Temperament subtest (27 items)	0.34	0.65
Personality subtest (21 items)	0.41	0.68
Cognitive subtest (20 items)	0.52	0.77

Predictive validity of the self-assessment tool for recommended and non recommended candidates was also calculated. Wilkes Lambda (0.56) was significant at .01 level revealing that the two groups are significantly different from each other. Results of predictive group membership showed that 80.4% of the original grouped cases were correctly classified. Further results reveal that tool is able to predict 81% of recommended candidates and 79.9% of non-recommended candidates.

	Predicted Group Membership		Total
Actual group	Recommended	Non Recommended	
Recommended	*86*	20	106
Non Recommended	32	*127*	159
% Recommended	*81.1*	18.9	
Non Recommended	20.1	*79.9*	

<u>Conversion of the tool into computerized format</u>

The three subtests of the tool would be converted into computerized format and will be uploaded on the website. The user can access the Online Self-Assessment Tool through the following web site: http://drdo.org. The homepage will show general information about the tool followed by three subtests. Each test has its own instructions, examples and test items.

As a candidate responds to all test items of a particular test and clicks on the "Submit" button the next consecutive test will appear. When all the three tests are completed the system will calculate the score obtained by the candidate and the result & suggestion page will be displayed. With the help of this input, candidate will have self awareness about his capability. The suggestion provided will help him know his aptitude and potential for Indian Armed Forces thereby enabling him to take appropriate decision about his career.

Conclusion

Self-assessment tool can become a useful tool for Indian Armed Forces as well as for the candidates appearing at Service Selection Boards (SSB) and Air Force Selection Boards (AFSB). It will help the candidates to know about their prospects in Indian Armed Forces before actually going to SSBs/AFSBs. This will help in saving time and money of the national exchequer as well as saving time and effort of the candidates. It will also help the Armed Forces by getting filtered, interested and potential candidates for recruitment.

A large number of researches have been carrying out to study the efficacy of such computerized tools (e.g., Lucas, Mullins, Luna and McInroy, 1990; Slack and Slack, 1997; Slack and Van Cura, 1998). However there is scarcity of literature within assessment and selection (Arvey et al., 1990; Schmitt et al., 1993; Shotland and Alliger, 1998). Even though computers are integral part of our lives, there are significant demographic, educational, and socio- economic differences in their access and use (Wiechmann and Ryan, 2003). Thus, further researches can be carried out to examine how computerized and online testing differs from the of traditional selection tests.

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