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# Factors affecting Researcher's choice of quantitative techniques softwares

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## Introduction

Information Technology has been defined in various ways by different authors. Over the years, IT has been conceptualized and measured differently by different researchers. The majority of the authors, however, parallel Information Technology with computer systems. It can be summarized from above definitions that IT concept came from a merging of computer with telecommunications technologies. Many researchers have defined Information Technology as a term that encompasses all forms of technology utilized to create, capture, manipulate, communicate, exchange, present, and use information in its various forms(business data, voice conversation, still image, motion pictures, multimedia presentation, another forms, including those yet not conceived (Poku&Vlosky, 2002).

The purpose of this study is to examine the types of the quantitative techniques software used for the research and the factors which affect the usage of that particular software so that it can effectively enhance the skills of the academic researchers.

## Review of literature

Research and higher education are complementary to each other. According to the available official statistics the expenditure on R&D in the field of Science &Technology as a percentage of gross domestic product (GDP) was 0.8 percent during the year 2005-06 in India. For perspective, countries spending the most on S&T as a percent of their GDP were Israel (5.11percent), Sweden (4.27 percent), Japan (3.11 percent), South Korea (2.95 percent), the United States (2.77percent), Germany (2.74 percent) and France (2.27 percent). Among other countries, China (1.54 percent),Russia (1.74 percent), U.K. (1.88 percent) and Brazil (1.04 percent) have spent more than India.

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The emergence of Quantitative Technique Software in the twenty-first century has helped different researchers in the physical and social science to improve in the quality of research. Most renowned researchers in adopting this software in their data analysis have been able to identify the immense contribution to research findings (Adetola, 2013). Any quantitative research cannot be done effectively without Quantitative Technique Software.

Different popular Quantitative Technique Software programs, which are SPSS, e-view, SAS, MATLAB, MINITAB, STATA, Mathematical and lots more have been utilized by people across all disciplines for many years and are quite user friendly.

Table 1: Percentage Enrolment in different Disciplines/ Subjects at Ph.D Post Graduate level in Higher Education 2012-13

| Discipline | Ph.D. | Post Graduate |
|---|---|---|
| Agriculture & Allied | 4.39 | 0.61 |
| Commerce | 3.21 | 8.04 |
| IT & Computer | 1.93 | 9.34 |
| Engineering & Technology | 17.45 | 6.34 |
| Foreign Language | 3.16 | 4.83 |
| Home Science | 0.68 | 0.21 |
| Indian Language | 6.14 | 8.78 |
| Law | 0.84 | 0.76 |
| Management | 4.47 | 16.92 |
| Medical Science | 6.50 | 4.17 |
| Science | 20.61 | 8.75 |
| Social Science | 18.27 | 20.58 |
| Other | 12.35 | 10.69 |

Data source: AISHE Portal (www.aishe.gov.in)

**Objectives of the study**

1. To study various software and statistical tools used by researchers.
2. To find various factors considered important by researchers in their choice of quantitative techniques software.

**Methodology of the study**

The main objective of this research is to find the factors considered to be important for adoption of quantitative techniques software by academic researchers. This study is exploratory in nature with primary objective of providing insights into the subject. The study covered existing literature and opnions of the academic researchers to extract the factors affectig the usage of quanitative technique software.

***Designing the survey's questionnaire***

Data were collected by means of a structured questionnaire. The questionnaire consisted of two sections; A & B. Section A of the questionnaire is pertaining to respondent profile which includes the demographic data such as age, gender, income etc. However the demographic analysis has not been covered in this article.

Section B of the questionnaire included statements regarding the usage of quantitative technique software. All statements employed a five-point Likert scale where 1 means "Strongly Disagree" and 5 – "Strongly agree". The reason why we have chosen to employ the five-point Likert scale is that this scale will provide a better normal spread of observations for the conducting the research. The instructions and a supply of questionnaires were developed in English that allows the respondents to understand the survey's questions in more convenient way.

***Sampling and Survey***

The sample was collected from three different universities i.e. Osmania University, Prof. Jayashankar Agricultural University and University of Hyderabad. A total of 400 questionnaires were distributed to Teaching Staff and Research Scholars at the three universities. 327 completely filled questionnaires were returned giving a response rate of 81.75%. The sample selection was based on simple random sampling. Each member of the population has an equal chance of being chosen in simple random sampling. The selection of each unit is not affected by the selection of other units. In terms of the sample field, the selection of three universities for the study includes the three famous universities. The inclusion of the three universities, one state university, one central university and one specializing university increased the reliability through the variablity.

***Analysis and Interpretation***

The profile of the sample (Table 2) was heavily weighted in terms of University (Osmania 54%, University of Hyderabad 26% and Agricultural University 20%); and the respondents breakdown was Teaching Staff 42% and Research Scholars 58% respectively.

Table 2: Sample distribution

| | Osmania University | Hyderabad Central University | Prof. Jayashankar Agricultural University | Total |
|---|---|---|---|---|
| Teaching Staff | 53 | 47 | 38 | 137 |
| Research Scholars | 124 | 39 | 26 | 190 |
| Total | 177 | 86 | 64 | 327 |

Exploratory factor analysis (EFA) and principal components analysis (PCA) were used to investigate the relationships among interval-level variables in a simpler (more parsimonious) way. Both of these approaches allow the computer to determine which, of a fairly large set of items, "hang together" as a group, or are answered most similarly by the participants. Principal Component Analysis with Varimax rotation was conducted to assess the underlying structure for the 26 items of the Questionnaire. The communalities represent the relation between the variable and all other variables (i.e., the squared multiple correlation between the item and all other items). With principal factor axis factoring, the initial values on the diagonal of the correlation matrix are determined by the squared multiple correlation of the variable with the other variables.

The values in the extraction column indicate the proportion of each variable's variance that can be explained by the retained factors. Variables with high values (>0.5) are well represented in the common factor space, while variables with low values (<0.5) are not well represented. All the communalities were sufficiently high to proceed with the rotation of the factor matrix.

Initially, the factorability of the 26 items was examined. During three rounds, a total of seven items were eliminated because they did not contribute to a simple factor structure and failed to meet a minimum criteria of having a primary factor loading of 0.4 or above, and no cross-loading of 0.3 or above.

The process of subjecting the variables to Principal Component Analysis with Varimax rotation was continued resulting in 8 factors with 19 variables. The factor loading matrix for this final solution of the eight factor structure with nineteen items is presented in Table 3, Figure 1, Table 4 and Table 5.

**Table 3: Total Variance Explained**

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 2.693 | 14.174 | 14.174 | 2.693 | 14.174 | 14.174 | 1.966 | 10.345 | 10.345 |
| 2 | 2.222 | 11.697 | 25.871 | 2.222 | 11.697 | 25.871 | 1.892 | 9.958 | 20.303 |
| 3 | 1.589 | 8.362 | 34.233 | 1.589 | 8.362 | 34.233 | 1.702 | 8.960 | 29.263 |
| 4 | 1.508 | 7.936 | 42.168 | 1.508 | 7.936 | 42.168 | 1.686 | 8.875 | 38.138 |
| 5 | 1.426 | 7.505 | 49.674 | 1.426 | 7.505 | 49.674 | 1.503 | 7.911 | 46.050 |
| 6 | 1.201 | 6.320 | 55.994 | 1.201 | 6.320 | 55.994 | 1.378 | 7.251 | 53.300 |
| 7 | 1.095 | 5.763 | 61.756 | 1.095 | 5.763 | 61.756 | 1.332 | 7.008 | 60.309 |
| 8 | 1.010 | 5.318 | 67.074 | 1.010 | 5.318 | 67.074 | 1.285 | 6.765 | 67.074 |
| 9 | .906 | 4.768 | 71.842 | | | | | | |
| 10 | .823 | 4.333 | 76.175 | | | | | | |
| 11 | .741 | 3.898 | 80.073 | | | | | | |
| 12 | .653 | 3.435 | 83.508 | | | | | | |
| 13 | .612 | 3.219 | 86.727 | | | | | | |
| 14 | .575 | 3.027 | 89.754 | | | | | | |
| 15 | .492 | 2.590 | 92.344 | | | | | | |
| 16 | .446 | 2.346 | 94.690 | | | | | | |
| 17 | .390 | 2.052 | 96.742 | | | | | | |
| 18 | .319 | 1.680 | 98.422 | | | | | | |
| 19 | .300 | 1.578 | 100.000 | | | | | | |

Extraction Method: Principal Component Analysis.

Figure 1: Scree Plot

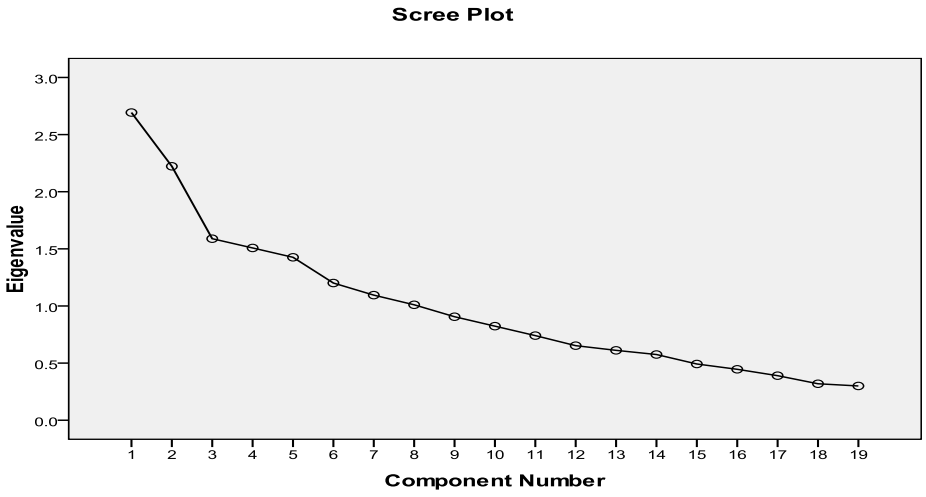

Table 4: Rotated Component Matrix(a)

| | Component | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Factor 1 | Factor 2 | Factor 3 | Factor 4 | Factor 5 | Factor 6 | Factor 7 | Factor 8 |
| V26 | 0.764 | | | | | | | |
| V24 | 0.686 | | | | | | | |
| V13 | 0.596 | | | | | | | |
| V5 | | 0.705 | | | | | | |
| V9 | | 0.567 | | | | | | |
| V14 | | -0.745 | | | | | | |
| V15 | | | 0.864 | | | | | |
| V25 | | | -0.537 | | | | | |
| V21 | | | | 0.844 | | | | |
| V18 | | | | 0.564 | | | | |
| V19 | | | | -0.577 | | | | |
| V22 | | | | | 0.769 | | | |
| V16 | | | | | 0.511 | | | |
| V4 | | | | | | 0.742 | | |
| V6 | | | | | | 0.706 | | |
| V1 | | | | | | | 0.818 | |
| V20 | | | | | | | | 0.798 |
| V7 | | | | | | | | 0.514 |
| V3 | | | | | | | | -0.424 |

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Table 5: Identified Factors and their variables

| | | |
|---|---|---|
| 1 | Factor 1 | Creating Multiple Tables, Training , application ( V13, 24, 26 ) |
| 2 | Factor 2 | Editing Data, Easy Maneuverability in data analysis, complex analysis (V5, 9, 14) |
| 3 | Factor 3 | High Reliability in using the Q.T softwares |
| 4 | Factor 4 | Analysis Time in QT S/w, Manual analysis, User friendly (V18, 19,21) |
| 5 | Factor 5 | Research User Friendly, Learning QT S/w ( V16, 22) |
| 6 | Factor 6 | Data Entering and Data Coding in QT S/w ( V4, 6) |
| 7 | Factor 7 | Preparation of Questionnaire ( V1) |
| 8 | Factor 8 | Sampling is Easy, Data Cleaning, Accuracy ( V3, 7, 20) |

The factors were named, as shown in the table 6, based on the variable loading. The eight factors were Hands on Training, Easy Maneuverability, High Reliability, User Friendly, Time Saving, Data Entry & Coding, Questionnaire Design and Data Preparation.

Table 6: Factor Names

| | |
|---|---|
| Factor 1 | Hands on Training |
| Factor 2 | Easy Maneuverability |
| Factor 3 | High Reliability |
| Factor 4 | User Friendly |
| Factor 5 | Time Saving |
| Factor 6 | Data Entry & Coding |
| Factor 7 | Questionnaire Design |
| Factor 8 | Data Preparation |

**Conclusion**

In brief, the findings of the Study supported eight factors as factors affecting Researcher's choice of quantitative techniques softwares. These findings further support the view that perceptions differ from Research Scholar to Teaching Faculty and University to University.Research in Indian is witnessing a noticeable shift with new softwaresslowly replacing traditional tools and techniques with new tools and techniques. With growth in the number of quantitative techniques softwaresvery little has been written on why researchers adapt particular software. This paper points out the factors which may provide a comprehensive solution for understanding the researcher's behavior with respect to quantitative techniques software selection.

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