A Comparative Analysis on the effect to the Research Productivity: A Manual System versus ICT Use without Training

Sujit Kumar Basak[1], Desmond Wesley Govender[2] and Hari Lall Garbharran [3]
[1] Lecturer, Department of Information Technology, Durban University of Technology
P. O. Box 1334, Durban 4000, South Africa
[e-mail: sujitbasakmca@gmail.com]
[2] Senior Lecturer, Discipline of Computer Science Education, University of KwaZulu-Natal
EdgeWood Campus, PineTown, Durban, South Africa
[e-mail: govenderd50@ukzn.ac.za]
[3] Research Co-ordinator, Faculty of Accounting and Informatics, Durban University of Technology
P. O. Box 1334, Durban 4000, South Africa
[e-mail: GarbharranHL@dut.ac.za]

ABSTRACT

This paper is based on a comparative analysis of a manual system versus ICT use without training and its effect on research productivity. The aim of this study was achieved by comparing models. This study was experimental based and the target population was taken from a university. Collected data was analyzed using the WarpPLS 4.0 software. The results of the study show that SPSS, Turnitin and NVivo for data analysis have high significance values on the research productivity than a manual system. On the other hand, AMOS, EndNote and NVivo for literature review have higher significance on the research productivity than ICT use without training.

KEYWORDS

Comparative Analysis, Models, Software, Manual, Training.

1 INTRODUCTION

The history of universities dates back to the 13th century with the establishment of the University of Paris by the Roman Catholic Church and French monarch as one of the first and most significant universities [1]. Universities were initially created as a social entity to create, store and transmit knowledge for various professions, including legal, medical and religious [26]. Since then, they have evolved to become the cornerstone of what is now called 'higher education'.

It is well established that higher education has four objectives: first, to provide formal education and training for various careers; second, to offer outreach services to the community at large; third, to engage in research and prepare scholars to extend the frontiers of knowledge; and fourth, to educate the world towards an intelligent and responsible life [24].

Research is understood "as the creation of new knowledge and/or the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies and understandings" [2], as defined by the university research evaluation system, the Excellence in Research for Australia (ERA).

Ref. [18] concluded that research productivity is more a function of individual motivation than of resource support. Research performance is usually used interchangeably with research productivity [20], [28], [32], [33] to refer to the quantity and quality of research outputs [34].

2 PROBLEM STATEMENT

A survey conducted in 2001 in Norway by [22], cited in [7], that research productivity might seem high, but there were still "inequalities in research output", as raised by [17], cited in [31]. A study conducted by [29] indicated that the research productivity of the academic staff

in Nigerian federal universities was lower in textbook publications, monographs, patents and certified inventions. In a report on the assessment of the research productivity of Nigerian universities by their National Universities Commission, which found that only 20 Nigerian universities (out of over 70) had an acceptable research output [27].

3 AIM, OBJECTIVE AND RESEARCH QUESTIONS

The aim of this research paper is to analyze the effect to the research productivity through using a manual system (without using research software/tools and training) versus ICT use without training.

This aim is achieved through the following objective:

- To examine research productivity using a manual system versus using ICT (*EndNote, NVivo, AMOS, SPSS,* and *Turnitin*) without training.

In order to achieve the above objective the following research question was subject to enquiry.

- To what extent does a manual system versus ICT use without training affect research productivity?

4 LITERATURE REVIEW

4.1 Turnitin

According to [6], Turnitin is a web-based software that helps to check for plagiarism. Ref. [11] conducted a survey and found that 21% of the academic staff significantly improved their assessment practices as a result of using the Turnitin software. [4], cited in [10], reported that:

"Turnitin was the only service that checked for student collusion and copying from the internet within the same service; that instructors save time using electronic detection services and use reports generated to educate students about writing from sources and citation rules; and, that, for affective deterrence, use of electronic services for detecting plagiarism should be coupled with educating students about plagiarism penalties and consequences".

4.2 Analysis of Moment Structure (AMOS)

A study by [12] indicated that the graphical interface of AMOS has the potential to enhance conceptual understanding and communication of the results in undergraduate statistics courses. Ref. [8] and [9], cited in [21], compared a number of statistical methods that are used in the educational research:

"SEM excels in four aspects [8], [9]. First, SEM adopts a confirmatory, hypothesis-testing approach to the data. This requires researchers to build a hypothesis based on previous studies. Although SEM can be used in a model-exploring, data-driven manner, which could often be the case with regression or factor analysis, it is largely a confirmatory method. Second, SEM enables explicit modelling of measurement error in order to obtain unbiased estimates of the relationships between variables. This allows researchers to remove the measurement error from the correlation/regression estimates. Third, SEM can include both unobserved (i.e., latent) and observed variables. This is in contrast with regression analysis, which can only model observed variables, and with factor analysis, which can only model unobserved variables. Fourth, SEM enables the modelling of complex multivariate relations or indirect effects that are not easily implemented elsewhere. Complex multivariate relations include a model where relationships among only a certain set of variables can be estimated".

4.3 NVivo

NVivo is computer software developed by QSR International and it is widely used by academic, government, health and commercial researchers across various research fields. NVivo software can be used for two purposes, namely, for literature review analysis and for the qualitative data analysis (e.g., interview, audio, and video).

4.3.1 Literature Review Analysis

"Literature reviews are a common feature of all dissertations, regardless of discipline or subject matter. However, they are usually overlooked as a form of qualitative analysis, yet the processes involved in building an argument from a body of literature are similar to the processes involved in analysing qualitative data" [15]. Tools like EndNote supports the bibliographic management aspect of a literature review and the qualitative software tool like NVivo can be used for the synthesis process rather than being competitors. Ref. [15] states "only NVivo (to date) has a particular set of tools that is ideal for analysing literature".

4.3.2 Qualitative Data Analysis

According to [3], qualitative data analysis software NVivo helps researchers to link-DataBites, DocLinks, and NodeLinks. According to [30], qualitative data analysis helps in "reducing the volume for raw information, shifting trivial from significance, identifying significant patterns, and constructing a framework for communicating the essence of what the data reveal".

4.4 Statistical Package for the Social Sciences (SPSS)

Ref. [25] and [23] stated that, in education and in the behavioural and social sciences, SPSS is a popular choice and it is a fairly user-friendly statistic software program that is a windows-driven, and offers users a point-and-click way to generate the output. "In the era of computers, it is the high time to use computers in our statistical calculations, through the use of SPSS package during our research project. No doubt, before the advent of the SPSS Package, many researchers have been using computers for their statistical analysis of data, but that process was not economical in terms of time, money and efforts" [14].

4.5 EndNote

Ref. [19] stated that EndNote benefits the following: "improved management of references and the use of those references within citations and lists of references, increased confidence when undertaking academic work". References can be easily entered into the database manually from the existing files or even from online sources [16].

5 METHODOLOGY

This study was experimental based and an average of 28 academic staff attended from a university. The questionnaire was developed from the existing literature and the training was validated using training needs assessment model [5]. The questionnaire for the experiment was validated with the Technology Acceptance Model [13]. Data was collected from the first week to the second week of October 2014. Training was conducted on five software, namely, AMOS, EndNote, SPSS, Turnitin, NVivo (for data analysis and for literature review analysis). Professional trainers were hired to facilitate academics on the above software and one of the software was facilitated by the researcher. The number of participants for each type of software is presented in Table 1.

Table 1: Sampling of the academic staff members who participated in the study for the experiment

Name of the Software	Initially expected total no. of participants for all the three categories	Using a manual system (without using research software/tools (EndNote, NVivo, AMOS, SPSS, and Turnitin) and training) participated	using ICT (EndNote, NVivo, AMOS, SPSS, and Turnitin) without training participated	Total no. of participants participated
SPSS	15*2=30	15	12	27
Turnitin	15*2=30	15	13	28
EndNote	15*2=30	15	12	27
AMOS	15*2=30	15	15	30
NVivo for data analysis	15*2=30	15	12	27
NVivo for literature review	15*2=30	15	11	26
Total	180	90	75	165

6 RESULTS

Having analyzed Figure 1 and Figure 2, it is evident that using ICT (EndNote, NVivo, AMOS, SPSS, and Turnitin) without training on research productivity has higher significance values such as SPSSwot (β =0.27 and R^2 = 0.89), AMOSwot (β =0.69 and R^2 = 0.89), Titinwot (β =0.34 and R^2 = 0.89), EdNotwot (β =0.22 and R^2 = 0.89), NVoDwot (β =0.55 and R^2 = 0.89), NVoLwot (β =0.61 and R^2 = 0.89) as compared to manual system (without using research software/tools) SPSSman (β =0.37 and R^2 = 0.30) , AMOSman (β =-0.45 and R^2 = 0.30), Titinman (β =0.19 and R^2 = 0.30), EdNotman (β =0.30 and R^2 = 0.30), NVoDman (β =-0.82 and R^2 = 0.30), NVoLman (β =0.28 and R^2 = 0.30).

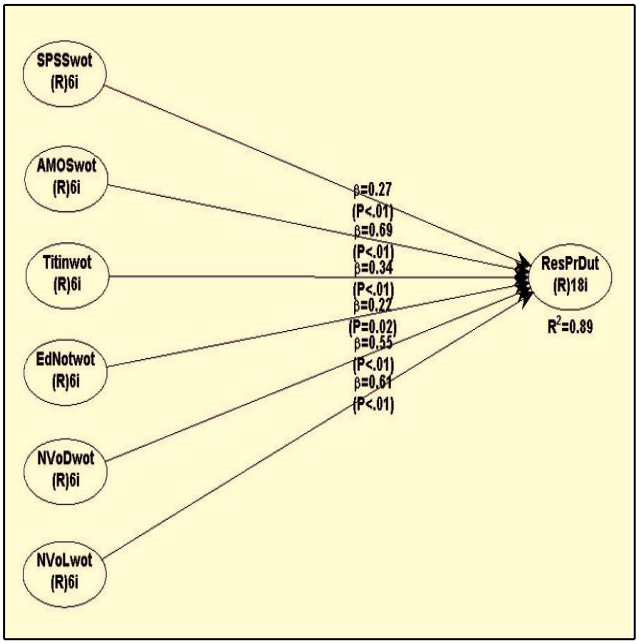

Figure 1: Using ICT (*EndNote, NVivo, AMOS, SPSS, and Turnitin*) without training on research productivity

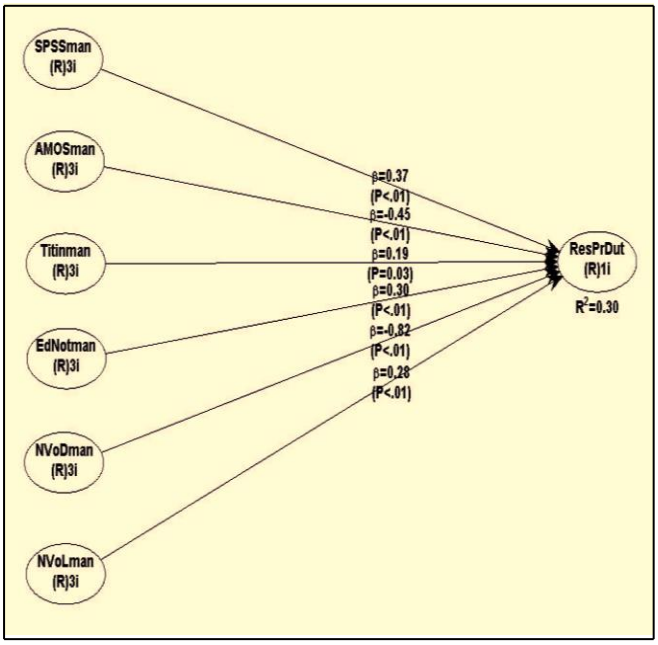

Figure 2: Using a manual system (without using research software/tools (*EndNote, NVivo, AMOS, SPSS, and Turnitin*) and training) on research productivity

6.1 Case comparison and evaluation of ICT without training and a manual system

Table 3, Table 4, Table 5, Table 6, Table 7 and Table 8 represent the comparison of each software ICT use without training and a manual system.

Table 3: Comparison of *SPSS* without training versus a manual system to increase research productivity

Software	***Significance***	***Research Productivity***
Using SPSS without training	$\beta = 0.27$	$R^2 = 0.89$
Using a manual system (without using research software/tools and training)	$\beta = 0.37$	$R^2 = 0.30$

Table 4: Comparison of *AMOS* without training versus a manual system to increase research productivity

Software	***Significance***	***Research Productivity***
Using AMOS without training	$\beta = 0.69$	$R^2 = 0.89$
Using a manual system (without using research software/tools and training)	$\beta = -0.45$	$R^2 = 0.30$

Table 5: Comparison of *Turnitin* without training versus a manual system to increase research productivity

Software	***Significance***	***Research Productivity***
Using Turnitin without training	$\beta = 0.34$	$R^2 = 0.89$
Using a manual system (without using research software/tools and training)	$\beta = 0.19$	$R^2 = 0.30$

Table 6: Comparison of *EndNote* without training versus a manual system to increase research productivity

Software	***Significance***	***Research Productivity***
Using EndNote without training	$\beta = 0.22$	$R^2 = 0.89$
Using a manual system (without using research software/tools and training)	$\beta = 0.30$	$R^2 = 0.30$

Table 7: Comparison of *NVivo (for data analysis)* without training versus a manual system to increase research productivity

Software	***Significance***	***Research Productivity***
Using NVivo (for data analysis) without training	$\beta = 0.55$	$R^2 = 0.89$
Using a manual system (without using research software/tools and training)	$\beta = -0.82$	$R^2 = 0.30$

Table 8: Comparison of *NVivo (for literature review)* without training versus a manual system to increase research productivity

Software	***Significance***	***Research Productivity***
Using NVivo (for literature review) without training	$\beta = 0.61$	$R^2 = 0.89$
Using a manual system (without using research software/tools and training)	$\beta = 0.28$	$R^2 = 0.30$

Table 3 to Table 8 clearly show that SPSS, AMOS, Turnitin, EndNote, NVivo for data analysis, and NVivo for literature review have high significance values on research productivity ($R^2 = 0.89$) than a manual system ($R^2 = 0.30$).

6.2 Correlations using ICT without training and a manual system

Table 9 and Table 10 show the results of the correlations for the indicators of all latent variables between ICT use without training and a manual system.

Table 9. Correlations using ICT without training

	SPSSwot	*AMOSSwo*	*TitinWo*	*EdNotWo*	*NVoDWoT*	*NVoLWoT*
SPSSwot	**1.000**					
AMOSSwo	0.321	**1.000**				
TitinWo	0.280	0.352	**1.000**			
EdNotWo	0.520	0.114	0.625	**1.000**		
NVoDWoT	0.189	0.037	0.331	0.731	**1.000**	
NVoLWoT	0.827	0.200	0.507	0.120	0.681	**1.000**

Table 10. Correlations Using a Manual System (without using research software/tools and training)

	SPSSman	*AMOSSma*	*TitinMa*	*EdNotMa*	*NVoDMan*	*NVoLMan*
SPSSman	**1.000**					
AMOSSma	<0.001	**1.000**				
TitinMa	0.001	<0.001	**1.000**			
EdNotMa	0.309	0.584	0.425	**1.000**		
NVoDMan	<0.001	0.006	0.003	0.1811	**1.000**	
NVoLMan	0.004	0.010	0.017	0.358	0.001	**1.000**

6.3 Model fit and quality indices

Table 11 show the results of the model fit and quality indices.

Table 11. Model fit and quality indices

Manual system	***ICT use without training***
Average path coefficient (APC) = 0.404, Good of P<0.001	Average path coefficient (APC) = 0.447, Good of P<0.001
Average R-squared (ARS)=0.300, Good if P=0.002	Average R-squared (ARS)=0.891, Good if P<0.001
Average adjusted R-squared (AARS)=-0.224, Good if P=0.009	Average adjusted R-squared (AARS)=0.809, Good if P<0.001

7 CONCLUSIONS AND DISCUSSION

The originality of the study is to examine research productivity using a manual system versus ICT use without training. The final results of this study show that ICT use (SPSS, AMOS, Turnitin, EndNote, NVivo for data analysis, and NVivo for literature review) without training has high significance values on the research productivity than a manual system. However, this study used two different methodologies, namely, training needs assessment model (Barbazette, 2006) and the Technology Acceptance Model (TAM) (Davis, 1989). The results of this study will provide knowledge to researchers to identify which types of software influence research productivity, using ICT without training and a manual system.

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