International Journal of Finance, Economics and Trade (IJFET)
ISSN 2643-038X

Conceptual Model to Assess Factors Affecting Productivity of University Staff; An Exploratory Factor Analysis Approach

Research Article

Hamed Taherdoost[1*], Mitra Madanchian[2], Mona Ebrahimi[2]

[1] University Canada West, Vancouver, Canada.
[2] Research Club (Research & Development Departement), Hamta Group | Hamta Business Corporation, Vancouver, Canada.

Abstract

Productivity of university members has been defined in different forms; however, no specific definition is presented to evaluate factors that determine the productivity of university members. This study intends to provide a certain definition for the productivity of university members including five major constructs that impact productivity and employs an Exploratory Factor Analysis Approach to propose a conceptual model for evaluation of the impact of these factors on the productivity of the staff in university.

Introduction

A range of different definitions has been provided to describe the productivity of university members. However, no certain standards and measures are stated to evaluate the productivity of university members. In this study, productivity is defined as the cost per learning unit for each student [1]. Productivity is mainly considered as positive if the education cost is less than the quality of student learning.

To evaluate the productivity of university members and design the research model, five main factors are introduced in this study to be measured including Organizational Behaviour, Environmental Conditions, Motivational Factors, Academic Qualification and Leadership Methods. These measures will be evaluated using the Exploratory Factor Analysis Approach that is a complex multivariate statistical method involving many linear and sequential steps to realize the structure of large sets of variables. A five-step guide is suggested to implement the Exploratory Factor Analysis in a case university.

In this paper, a specific definition for the productivity of university staff and its main constructs will be discussed, a conceptual model will be provided in the next section, and the Exploratory Factor Analysis will be employed in five major steps to investigate the responses received from questionnaires in a case university in the last section.

Methodology – Exploratory Factor Analysis (EFA)

This is a widely used statistical approach that is commonly applied in researches in psychology, education, social science, and information system topics. Exploratory Factor Analysis (EFA), and Confirmatory Factor Analysis (CFA) are two main classifications of factor analysis [2]. Exploratory Factor Analysis (EFA) is the best choice when there is not any understanding of the nature of the number of factors [3].

Exploratory Factor Analysis (EFA) is a sequential and linear approach that aims to reduce the number of variables, evaluate construct validity in a survey, assess multicollinearity among correlated factors, examine the structure of variables, assess the functionality of proposed theories, and develop theoretical constructs. Five steps have been employed in this study to utilize EFA including, Evaluation of Data Suitability for EFA, Factor Extraction Method, Factor Retention Method, Selection of Rotational Method, Interpretation, and Labeling [4]. Also, to evaluate the research model, a questionnaire has been designed that consists of 21 items to measure the predefined factors [5]. To measure each item the five Likert scales from 1 strongly agreeing to 5, being strongly disagree was utilized. Then, the questionnaire was distributed among 155 academic staff and after data filtering, 146 responses remained for further analysis [6, 7].

***Corresponding Author**:
Hamed Taherdoost,
University Canada West, Vancouver, Canada.
E-mail: hamed.taherdoost@ucanwest.ca | hamed.taherdoost@gmail.com

Received: October 20, 2021
Accepted: December 01, 2021
Published: December 02, 2021

Citation: Hamed Taherdoost, Mitra Madanchian, Mona Ebrahimi. Conceptual Model to Assess Factors Affecting Productivity of University Staff; An Exploratory Factor Analysis Approach. *Int J Financ Econ Trade.* 2021;4(5):108-112. doi: http://dx.doi.org/10.19070/2643-038X-2100014

Background and Analysis

In this paper, the factors affecting on productivity of university members are evaluated using exploratory factor analysis. However, there is no specific definition for university productivity [8], it is indicated [9] that there is a lack of suitable and standard indicators to measure the university members' productivity. For this study, productivity is defined as the cost per learning unit for each student [1]. In fact, the productivity is considered as positive if the education cost is less than quality of student learning.

Organizational Culture which is the values or shared perceptions kept by faculty [10], known as one of the factors affecting productivity. Another construct influencing the productivity is environmental conditions. A good environment can increase personal ability and productivity and develop personal values. Empowerment which is defined as the process of increasing intrinsic motivation is the psychological concept related to the university members' beliefs and emotions about their job and organization. On the other hand, according to [11], it refers to power and decision sharing in an organization. Empowerment is one of the major factors to improve productivity [12]. Another component which may have effect on productivity of university members is motivational factors. Motives will lead to starting and continuing activities. Management Method is one of the principal tasks of manager and the process of effecting and directing the activities related to the members job. Loke [13] stated that Management is one of the significant factors influencing on efficiency, productivity and effectiveness. Sulo, Kendagor [14] introduced academic qualifications and funding as two other factors effecting on academic staff productivity.

In order to evaluate the research model, a questionnaire has been designed consists of 21 items to measure the seven introduced factors [15]. To measure each item the five Likert scale from 1 being strongly agree to 5, being strongly disagree was utilized. Then the questionnaire was distributed among 155 academic staff and after data filtering, 146 responses were remained for further analysis [5].

Cronbach's alpha method was used for reliability testing. As it is shown in Table 1, the Cronbachûs Alpha with the range between 0.865 to 0.884 which prove that constructs are deemed to have adequate reliability [16-20].

In next step, the KMO (Kaiser-Meyer-Olkin) index is a measure of sampling adequacy, and the sphericity statistic tests. Table 2 indicates that the degree of common variance among the variables is quite high [21, 22].

Since [23] mentioned that principal components analysis (PCA) is useful if researcher has initially developed an instrument with several items and is interested in reducing the number of item, then for this study this method was used as factor extraction method.

After extraction phase and in order to decide how many constructs to retain for rotation, the K1 - Kaiser's [24] method was applied because this approach is the best known and most used in practice [25] because of its theoretical basis and ease of use [26]. As it is indicated in Table 3, five factors should remain for further analysis.

Table 1. Cronbach's alpha Results for the Survey.

ITEM	Scale Mean if Item Deleted	Cronbach's Alpha if Item Deleted
CUL 1	78.507	0.872
CUL 2	78.664	0.874
CUL 3	79.329	0.884
EMP 1	78.589	0.876
EMP 2	78.260	0.874
MOT 1	78.343	0.871
MOT 2	78.171	0.865
MOT 3	78.185	0.867
ENV 1	78.637	0.871
ENV 2	78.706	0.868
ENV 3	78.575	0.866
ACQ1	78.575	0.865
ACQ 2	79.027	0.872
ACQ 3	78.856	0.873
ACQ 4	78.911	0.875
MAN 1	78.411	0.868
MAN 2	78.034	0.869
MAN 3	78.069	0.868
FUN 1	77.980	0.869
FUN 2	77.986	0.869
FUN 3	78.404	0.872

Table 2. KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.815
Bartlett's Test of Sphericity	Approx. Chi-Square	1793.876
	df	210
	Sig.	.000

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	6.931	33.003	33.003	6.931	33.003	33.003	4.077	19.416	19.416
2	2.317	11.033	44.036	2.317	11.033	44.036	2.922	13.915	33.331
3	1.957	9.318	53.355	1.957	9.318	53.355	2.811	13.385	46.715
4	1.676	7.98	61.334	1.676	7.98	61.334	2.214	10.543	57.258
5	1.24	5.907	67.241	1.24	5.907	67.241	2.096	9.983	67.241
6	0.968	4.607	71.849						
7	0.916	4.36	76.208						
8	0.765	3.642	79.85						
9	0.629	2.993	82.844						
`10	0.559	2.663	85.506						
11	0.528	2.514	88.021						
12	0.471	2.241	90.262						
13	0.433	2.062	92.324						
14	0.344	1.638	93.962						
15	0.29	1.381	95.343						
16	0.265	1.264	96.607						
17	0.184	0.875	97.481						
18	0.177	0.842	98.323						
19	0.152	0.722	99.045						
20	0.122	0.581	99.626						
21	0.079	0.374	100						
Extraction Method: Principal Component Analysis.									

In order to decide if variables might relate to more than one factor, rotational approach was applied. Since the factors are not correlated, therefore, Varimax rotation was used [4, 27]. The results are shown in Table 4.

Conceptual Model

According to the results, only one of the items which is the item 3 of organizational culture should be deleted since the loading factor is below 0.5 and none of the items load over 0.5 on two factors.

Furthermore, one of the Funding items loads on Motivational Factor which can be deleted for further analysis although since it makes sense to be included in Motivational Factor, it also can be considered as Motivational Factor item. The final step, the five factors need to be labelled based on theoretical, subjective, and inductive process. Therefore, factors are labeled as Organizational Behavior, Environmental Conditions, Motivational Factors, Academic Qualification and Leadership Methods.

Therefore, the conceptual model can be proposed as shown in Figure 1.

Conclusions

Five aspects of university staff productivity were evaluated through a five-step Exploratory Factor Analysis Approach and implemented in a case university to investigate their impact on productivity. Therefore, fundamental information about EFA with a stepwise and user-friendly guideline was provided to demonstrate the impact of Organizational Behaviour, Environmental Conditions, Motivational Factors, Academic Qualification, and Leadership Methods on the productivity of university members.

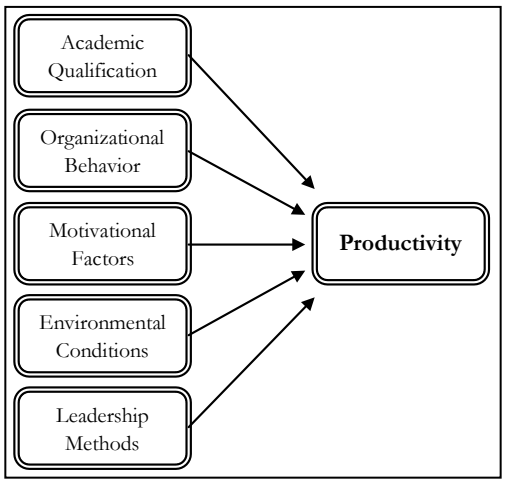
The five-step guide for implementation of exploratory factor analysis includes (1) evaluation of sample size adequacy using correlation matrix, Kaiser-Meyer-Olkin (KMO) and Bartlett's Test

Table 4. Rotated Component Matrix.

	Component				
	1	2	3	4	5
CUL 1	0.117	0.157	0.115	0.306	0.576
CUL 2	0.049	0.27	-0.145	0.316	0.565
CUL 3	-0.331	0.088	0.208	0.343	0.208
EMP 1	0.157	0.049	0.013	0.007	0.785
EMP 2	0.167	-0.026	0.286	-0.037	0.701
MOT 1	0.106	0.183	0.812	0.051	0.082
MOT 2	0.487	0.13	0.694	0.184	0.102
MOT 3	0.462	0.145	0.683	0.183	0.055
ENV 1	0.044	0.854	0.193	0.014	0.097
ENV 2	0.11	0.908	0.165	0.07	0.085
ENV 3	0.157	0.805	0.216	0.134	0.203
ACQ1	0.403	0.474	0.08	0.558	-0.082
ACQ 2	0.214	0.43	-0.04	0.649	-0.108
ACQ 3	0.335	-0.128	0.091	0.677	0.135
ACQ 4	-0.008	0.031	0.075	0.693	0.242
MAN 1	0.678	0.204	-0.018	0.32	0.129
MAN 2	0.785	0.051	0.23	0.136	0.068
MAN 3	0.864	0.174	0.088	0.114	0.137
FUN 1	0.849	0.063	0.219	0.056	0.14
FUN 2	0.727	0.059	0.311	-0.011	0.239
FUN 3	0.074	0.182	0.84	-0.034	0.073

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 7 iterations.

Figure 1. Proposed Conceptual Model to Assess Productivity (MAP) of University Members.



techniques, (2) choosing factor extraction methods such as principal components analysis, principal axis factoring, image factoring, maximum likelihood, alpha factoring, unweighted least squares, generalized least squares and canonical, (3) selecting factor retention methods using; cumulative percentage of variance, K1 - Kaiser's, scree Test, minimum average partial approaches and parallel analysis, (4) selection of rotational method, whether orthogonal rotations or Oblique rotation and finally, (5) interpretation and labeling of factors.

References

[1]. Barr RB, Tagg J. From teaching to learning a new paradigm for undergraduate education. Change: The Magazine of Higher Learning, 1995; 27(6): 13-25.
[2]. Taherdoost H, Madanchian M. Empirical Modeling of Customer Satisfaction for E-Services in Cross-Border E-Commerce. Electronics. 2021 Jan;10(13):1547.
[3]. Taherdoost H. Exploratory Factor Analysis; Concepts and Theory. Advances in Applied and Pure Mathematics, 2014: 375-382.
[4]. Taherdoost H. Evaluation of Customer Satisfaction in the Digital Environment: Development of a Survey Instrument. InDigital Transformation and

Innovative Services for Business and Learning, IGI Global. 2020: 195-222.
[5]. Taherdoost H. Handbook on Research Skills: The Essential Step-By-Step Guide on How to Do a Research Project. 2021: Amazon Kindle.
[6]. Taherdoost, H., Determining Sample Size; How to Calculate Survey Sample Size. International Journal of Economics and Management Systems, 2017: (2) 237-239.
[7]. Taherdoost H. Sampling Methods in Research Methodology; How to Choose a Sampling Technique for Research. International Journal of Academic Research in Management, 2016; 5(2): 18-27.
[8]. Weiss D. The relationship between faculty group development & faculty productivity in higher education. Temple University. 1998.
[9]. Doellefeld S. Faculty Productivity: A Conceptual Analysis & Research Synthesis. State University of New York: NY, U.S.A. 1998.
[10]. Morris I, R M. Effective organizational culture is key to a company's long-term success. Industrial Management, 1992; 34(2): 28.
[11]. Chang LC, Liu CH. Employee empowerment, innovative behavior and job productivity of public health nurses: A cross-sectional questionnaire survey. International journal of nursing studies. 2008 Oct 1;45(10):1442-8.
[12]. Scott P. Higher education reformed, London: Falmer press, 2000.
[13]. Loke C. Leadership behaviors: effect on job satisfaction, productivity and organizational commitment. Journal Nursing Management, 2001; 9(4): 191-204.
[14]. Sulo T, Kendagor R, Kosgei D, Tuitoek D, Chelangat S. Factors affecting research productivity in public universities of Kenya: the case of Moi University, Eldoret. Journal of Emerging Trends in Economics and Management Sciences. 2012 Oct 1;3(5):475-84.
[15]. Taherdoost H. How to design and create an effective survey/questionnaire; A step by step guide. International Journal of Academic Research in Management (IJARM). 2016 Aug 1;5(4):37-41.
[16]. George D, P Mallery. SPSS for Windows step by step: A simple guide and reference. 4th ed ed. 2003: Boston: Allyn & Bacon.
[17]. Hair JF. Multivariate Data Analysis. fifth ed ed. 1998, Englewood Cliffs, NJ.: Prentice Hall.
[18]. Nunnally J. Psychometric Theory. Second Edition ed. 1978, New York: NY: McGraw-Hill.
[19]. Whitley BE. Principals of Research and Behavioural Science. 2002, Boston: McGraw-Hill.
[20]. Robinson J. Triandis theory of interpersonal behaviour in understanding software privace behaviour in the South African context, in School of Human & Community Development, University of the Witwatersrand: Johannesburg. 2009: 108.
[21]. Leech N, K Barrett, G Morgan A. SPSS for intermediate statistics: Use and interpretation. 2nd ed. London: Lawrence Erlbaum Associates. 2005.
[22]. Taherdoost H. Validity and Reliability of the Research Instrument; How to Test the Validation of a Questionnaire/Survey in a Research. International Journal of Academic Research in Management, 2016; 5(3): 28-36.
[23]. Netemeyer RG, Bearden WO, Sharma S. Scaling procedures: Issues and applications. Sage Publications; 2003 Mar 12.
[24]. Kaiser HF. The application of electronic computers to factor analysis. Educational and psychological measurement. 1960 Apr;20(1):141-51.
[25]. Fabrigar LR, Wegener DT, MacCallum RC, Strahan EJ. Evaluating the use of exploratory factor analysis in psychological research. Psychological methods. 1999 Sep;4(3):272.
[26]. Gorsuch R. Factor Analysis. 1983: Hillsdale, NJ: Erlbaum.
[27]. Taherdoost H. Electronic service quality measurement: development of a survey instrument to measure the quality of e-service. International Journal of Intelligent Engineering Informatics. 2019;7(6):491-528.