A Comprehensive Statistical Analysis on Information Search Behavior using Mediation Procedures

B. Ravikumar[1*], M. Subbiah[2], R. Ramakrishnan[3], Annie Jacob Verghese[4]

[1]Research Scholar, Department of Statistics, Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, INDIA.

[2]Department of Mathematics, L.N. Government College, Ponneri, Tamilnadu, INDIA.

[3]Department of Statistics, National Institute of Epidemiology, Chennai, Tamilnadu, INDIA.

[4]KCG Institute of Technology, Chennai, Tamilnadu, INDIA.

[*]Corresponding Address:

ravistat03@gmail.com

Research Article

Abstract: Decision making has always been a complex task, with difficulty in understanding the difference between the right and wrong choices. Especially, higher education greatly impacts ones career growth, social standing and outlook on life. Such a context demands a deeper understanding of the determinants that influence students' search behavior when applying to higher educational institutions. This work has mainly identified mediation procedures as more appropriate in understanding the complex relationships between various determinants. This study has extended the original work of Verghese (2013) more appropriately using an extensive mediation analysis that describes the direction, magnitude and effect of the variables involved in the study.

Keywords: Single mediation, Search behavior, Higher Education, Serial mediation, Decision making.

Introduction

Higher education provides a considerable value to individuals, to the economies and the society. So it has become important to build a human capital which is capable of facing the challenges in modern economy for which higher education is very important. Education always holds the key in educating the masses which in turn increases the employability (Horn, 2006). At present Higher education has grown so much in isolation in the society and can also be categorized as a commodity in the market. The mass development in higher education has made us to look students as the customers to the system with a fierce competition among educational institutions in admitting the brightest students. In students' point of view, higher education should provide higher salaries upon graduation, a gratifying on-campus life or a simple rewarding professional future. Due to the intensified competition among educational institutions in higher education they increasingly behave as corporations (Jarvis, 2000). The International educational market has now become highly competitive with hundreds of universities increasing and competing with higher education establishments, private training providers and commercial business schools to attract prospective students. The diversity of opportunities available for students is unprecedented in the history of education. When transferring from high school to college education they face a myriad of possibilities. They have to choose between a public and a private university, two-year versus four year colleges and within an institution they have to choose a field of study from engineering, liberal arts, science and the degree types. It is mainly due to the importance associated with institutional and course choice various research initiatives have been instigated mainly to understand the decision-making process of the potential student (Veloutsou *et al*., 2005) There are a numerous challenges faced by higher education institutions (Gaynor, 2010). In particular, their operating environment is undergoing major transformations, such as changing demand patterns, intensifying global competition and decline in funding. The Institutional attention mainly focuses on attracting high quality human resources and students. This focus demands a deeper understanding of which sources post secondary students resort to when applying to higher educational institutions (Soares and Simeos, 2009) and the determinants that influence the students' decision making. The college choice process has changed significantly during the past 50 years for a number of reasons which includes student demographics and in developments in colleges' admissions requirements and marketing practices. In the early 1950's lesser than two of every 10 high school graduates went to college since there was limited guidance literature available to students and their decisions were largely determined by the college's reputation or its facilities. In later 1950's the college process was very straight forward with students making

decisions from a defined limited set of institutions. With the increase in higher education participation rates and a greater number of students an increasingly competitive environment emerged which led to the streamlining of admissions and administrative practices by colleges and universities. In the mid-1970's through the 80's the college choice process became even complex by the increase of information earlier in high school and among families by the mass media. A decline in the number of high school graduates prompted colleges and universities to use more sophisticated business and market oriented techniques to enroll and retain students. Factors such as changing demographics, public policy, institutional practices and marketing techniques all have a noteworthy effect on the college choice process. As the decision-making process is difficult and complex the choice is very challenging as the decision itself. Students experience a great deal of pressure, consternation and opportunity costs through this high involvement, extensive decision-making process. The decision or a mistake of choosing a wrong school may have personal and social risks, teachers, counselors, friends, parents and relatives influence on complicated decision (Kotler and Fox, 1995). The communication of the college is important and it has to clarify what is intangible and should provide students with physical and imagery evidences about the benefits of the college. As there are higher risks associated due to the intangibility of the search of information in order to make a close to rationale or satisfactory choice may be crucial moment for the student (Cubillo *et al*., 2006). Even though there are many studies on identifying patterns of search of information behavior in Education, there is a paucity of literature that used personality, marketing concepts, situational variables and demographics in identifying different segments of information searchers. Dynamics of education environment forces and situational forces are different in developing economies like western countries. Hence, it is important to understand and identify patterns of information search behavior among students in India. Colleges want to develop a method to understand why inquirers decided to apply or not, or why those accepted to the college chose to enroll or not. In this context, Verghese (2013) has studied on understanding the pre-choice external information search behavior of students and its effect on college choice by examining the factors that determine extent of information search for higher engineering education. The main objective of this study is to develop a holistic and theoretically based conceptual framework of student information search for college choice. Beyond the utilization of univariate or multivariate statistical techniques, mediation approach has been applied in the study to understand the effect of important variables such as perceived ability, motivation, perceived benefits and cost on the determinants of information search. However, the present study has identified a scope to investigate the conceptual model developed in Verghese (2013) by applying more extensive mediation analysis. The aim of this study is to understand the diverse dimensions of the decision making process and explaining those factors for identifying the students' choice and the relationships underlying the process at the moment of selecting their college using mediation analysis. More details of mediation has been presented in section 2 together with the nature of data collected and analyzed in Verghese (2013); the idea of a possible extended analysis is summarized in Section 3; data analysis and subsequent discussions can be found in section 4 and section 5 provides the conclusion of the paper.

Methods and Materials

The aim of mediation analysis is to determine the relation between the independent and dependent variable, completely or in part to the mediating variable. Mediation analysis began in the 3rd century BC with Aristotle's identification of material, formal, efficient, and final causes. The efficient cause refers to how a thing comes about and is most similar to the investigation of mediation. In general, the literature focuses on a causal relationship between a cause and an effect. Various concepts of mediation have been developed and applied in the fields of social science, psychology, Epidemiology and agriculture (Wright, 1921 and Wolfle, 1999) The aim of mediation analysis is to determine the relation between the independent and dependent variable, completely or in part to the mediating variable. Mediation analysis began in the 3rd century BC with Aristotle's identification of material, formal, efficient, and final causes. The efficient cause refers to how a thing comes about and is most similar to the investigation of mediation. In general, the literature focuses on a causal relationship between a cause and an effect. Various concepts of mediation have been developed and applied in the fields of social science, psychology, Epidemiology and agriculture (Wright, 1921 and Wolfle, 1999). One of the first substantive examples of a mediation hypothesis in applied research could be found in developing Stimulus-Organism-Response(S-O-R) model (Woodworth, 1928). The concepts of mediation are applied in several fields especially in education. Duncan and Feather man (1972) have developed a mediation model of how father's education affects offspring education that then affects the offspring income. A study was conducted of parents' character on drug abuse and was found that pathways for the effect of parental alcoholism on child alcohol was mediated by stress and negative effect but not by temperamental

sociability (Chassin *et al*,1993). The basic mediation framework involves a three-variable system in which an independent variable causes a dependent variable (Baron and Kenny, 1986; Mackinnon and Dwyer, 1993; Mackinnon, 2008). Recent advances in mediation analysis have been found through by using counterfactual framework (Zhao *et al*., 2000 and Imai *et al*., 2010). Fig 1 depicts a single mediation Model with X_1, X_2,...X_n independent variables passing direct effect (c'_1,c'_2,…,c'_n) to a single dependent variable Y. The mathematical model that describes the Figure 1 involves regression equations relating (X_1, X_2,….X_n) to M and Y

$M = i_1 + a_1 X_1 + \ldots + a_n X_n + e_1$

$Y = i_2 + c_1' X_1 + \ldots + c_n' X_n + bM + e_2$ where e_1 and e_2 are the error terms associated in the regression model.

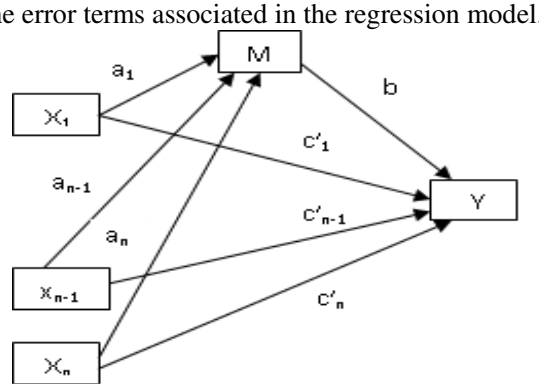


Figure 1: A Single Mediation model with more than one independent variables

The Direct (c'_1, c'_2,…c'_n) and indirect effects (a_ib) can be estimated as a set of separate ordinary least square (OLS) regressions. Hence, Total effect = direct effect + indirect effect = $c_i' + \sum a_ib$. Single mediation model can easily be extended to a multiple mediation model in two ways either in parallel or serial form of augmenting mediation variables in the model. The relation diagram or regression equations involved in such models can be represented in a similar way and Figure 2 illustrates a serial mediation model involving one independent variable (X), two mediation variables (M_1 and M_2) and a dependent variable (Y).

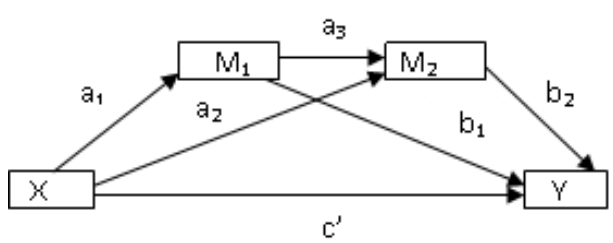


Figure 2: Two Serial Multiple Mediator Model

Direct and indirect variables posses similar symbolic representation compared to figure 1. This serial multiple mediator model can be expressed in a statistical form; the independent variable X is modeled as affecting the dependent variable Y through four paths in which three indirect paths are as follows

$X \rightarrow M_1 \rightarrow Y$, $X \rightarrow M_2 \rightarrow Y$,

$X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$

and a direct path XY. The indirect and direct effects can be estimated using OLS regression as follows

$M_1 = i_1 + a_1X + e_1$

$M_2 = i_2 + a_2X + a_3M_1 + e_2$

$Y = i_3 + a_1X + b_1M_1 + b_2 M_2 + e_3$ where e_1, e_2, and e_3 are error terms

The present work mainly exploits single and serial mediation analyses and more details on similar other topics can be found from many sources such as (Hayes, 2013). An extensive application of mediation analysis could be useful in revealing the relationship between the intervening variables. With this view an attempt has been made to apply single and serial mediation model for a data set that deals with students' search behavior in the choice of courses after their school education (Verghese, 2013).

Table 1: Profile of the respondents referred in the study (Verghese, 2013)

Variables	Counts (%)
Gender	
Male	803(68.4)
Female	371(31.6)
Community	
Unreserved	240(20.4)
Reserved	934(79.5)
Medium of instruction	
Tamil	285(36.8)
English	490(63.2)
Father's Education	
Undergraduate	772(65.8)
Graduate	270(23.0)
Post Graduate	117(10.0)
Mother's Education	
Undergraduate	844(71.9)
Graduate	249(21.2)
Post Graduate	81(6.9)
Father's Occupation	
Agriculture	244(20.8)
Govt. Job	261(22.2)
Pvt. Job	372(31.7)
Self-Employed	264(22.5)
Mother's Occupation	
Agriculture	17(1.4)
Govt. Job	93(7.9)
Pvt. Job	73(6.2)
Self-Employed	26(2.2)
Housewife	964(82.1)
Civic Status	
Urban	416(24.3)
Rural	359(30.6)
Access to internet	
Yes	788(67.1)

No	386(32.9)

A study has been conducted among students who have completed their school education and who have decided to pursue engineering education in Tamil Nadu, India. The sample size for this study is 1174 and the data has been collected from the students of which 632 are from the Government sponsored single window counseling system for Tamil Nadu engineering admissions in Anna University http://online.annauniv.edu/tnea/about.php and rest are from students seeking admissions through management quota available in private engineering colleges. Students were selected from colleges throughout Chennai city in Tamil Nadu, which are geographically separated. The descriptive summary of data is given in table 1:

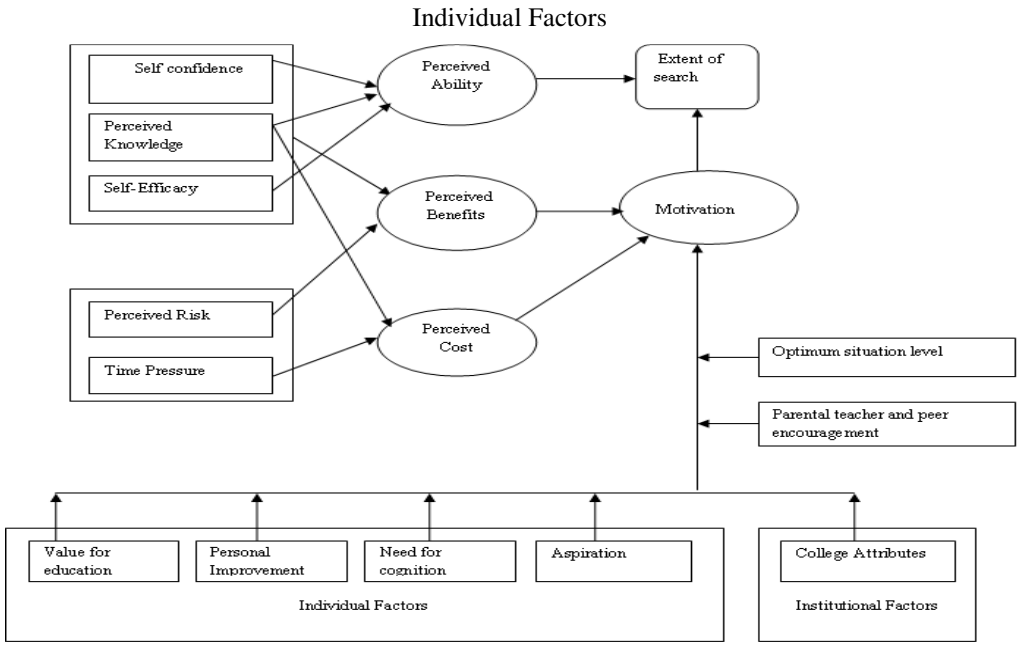


***Figure 3**:* Conceptual model that describes the possible relationships between the different variables involved in the study(Verghese, 2013)

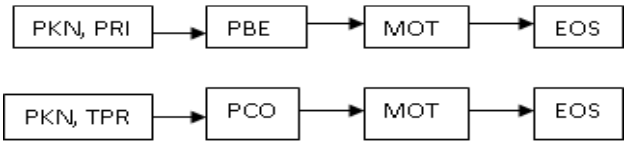
The study focuses on psychological and economic approaches to develop an integrated model of variables influencing extent of search, the effect of which are mediated by perceived ability, perceived benefits, motivation and perceived cost adapted from the Schmidt and Spreng (1996) model for consumer information search behavior. Marketing is relevant to higher education institution because of tremendous competition (Rindfleish, 2003). Adopting a marketing orientation also helps us to understand the student's need better and thereby addressing them more effectively (Kusumawati 2010).

Extended Analyses

Figure 3 provides the conceptual model that describes the possible relationships between the different variables involved in the study on the data detailed in section 2. Verghese (2013) has done mediation analysis apart from other statistical analyses using the variables of interest. This includes a list of mediation analyses comprising the variables from the three factors shown in Figure 1; that is individual, situational, institutional factors are considered as independent variables and perceived ability, Perceived benefits, Perceived costs and motivation as mediating variables in a separate analysis.

However, the model provides much scope to analyses using mediation technique in two folds

1. Combination of variables from three different factors
2. Serial mediation indicated in figure 2:



Hence the present study has focused in the two objectives to investigate the mediation effect more elaborative manner. Further it makes an attempt by including a comprehensive list of variables from the mediation variables. In all the seven cases, extent of search has been treated as the dependent variable.

Table 2: Diferent variables used to analyse the information search behaviour data

Model	Independent variable	Mediating variable	Dependent variable
1	Self-confidence(SEC)	Perceived benefits (PBE)	Extent of Search (EOS)
	Perceived knowledge(PKN)		
	Perceived risks (PRI)		
2	Self-confidence(SEC)	Motivation(MOT)	Extent of Search (EOS)
	Perceived knowledge(PKN)		
	Perceived risks (PRI)		
3	Time Pressure(TPR)	Perceived Cost (PCO)	Extent of Search (EOS)
	Perceived knowledge(PKN)		
4	Time Pressure(TPR)	Motivation(MOT)	Extent of Search (EOS)
	Perceived knowledge(PKN)		
5	Value for Education (VFE)	Motivation(MOT)	Extent of Search (EOS
	Aspiration (ASP)		
	Parent Teacher Encouragement (PTP)		
	Need for Cognition (NFC)		
	Personal involvement (PIN)		
	Perceived Cost (PCO)		
	Perceived Benefits(PBE)		
	College Attribute (CAT)		

Data Analysis

Table 2 provides a comprehensive list of independent, mediation and dependent variables considered in each of the five models. Model parameters in the two regression equations are estimated through OLS approach using a macro MEDIATE for SPSS package (Hayes, 2013). This includes the effect of independent variable (X) in mediation variables (a), effect of mediation variables (M) controlled for X and direct effect c′ of X on the dependent variable Y controlled for M. Also, reporting consists of the standard error (SE) for each of these effects together with p-values associated with testing the statistical significance of respective effects using t-test. The indirect effect (ab) for each case in a model has been summarized with its point estimate as a product of a and b and bootstrap method has been used to find SE, lower and upper limits of 95 % confidence interval. The procedure in the MEDIATE macro is a simple and straight forward approach of declaring the necessary independent, mediation and dependent variables and the SPSS syntax is of the form MEDIATE Y= /X= /M=. These are the only arguments that are necessary for execution of the macro. Bootstrapping is a non-parametric and an increasingly popular method of testing the indirect effect. Many literature studies such as Bollen and Stine (1990), Shrout and Bolger, (2002), Fritz *et al* (2012) have indicated the necessity and usefulness of bootstrap approaches for estimating indirect effects in a mediation analysis. If no other options are provided, the macro will estimate the paths in the model (using OLS) assuming no control variables, the number of bootstraps will be set to 5000, the confidence level will default to 95, only bias corrected and adjusted confidence intervals for the indirect effects. Fig 4 and Fig 5 depict the causal models and numerical summaries of a, b, c′ and ab are presented in Table 3 – 7 respectively for the five models considered in this study. All coefficients presented in the tables are unstandardized with α =. 05 two-tailed is the criterion for statistical significance. Further, interpretation of mediation effects has been followed according to the method described in Zhao *et al* (2011).

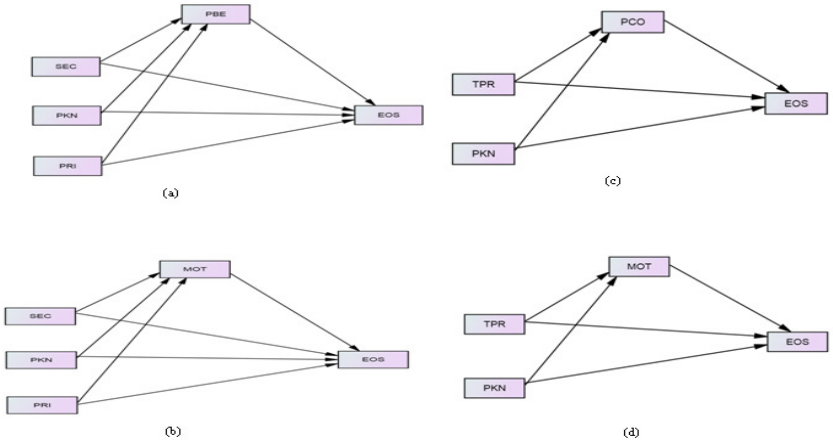


Figure 4: Causal diagram for the relation between the variable in the mediation analyses corresponding to (a) Model 1, (b) Model 2, (c) Model 3 and (d) Model 4

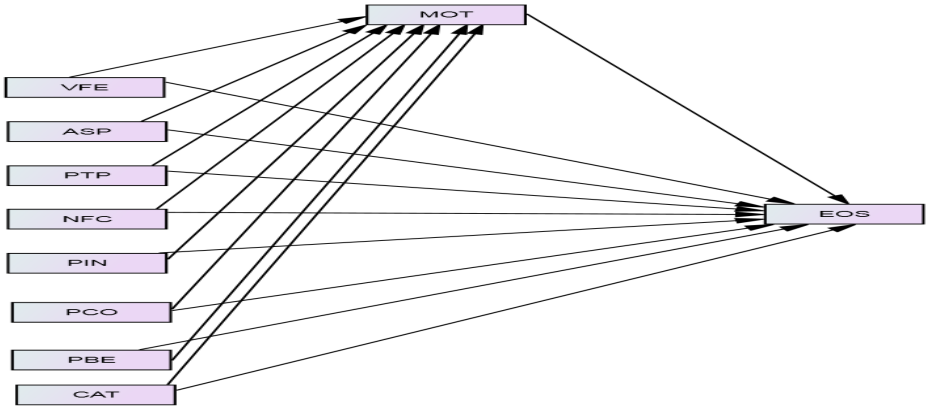


Figure 4: Causal diagram for the relation between the variable in the mediation analyses corresponding to Model 5

From Table 3 it can be observed that, SEC is significantly predictive of the mediating variable Perceived benefits with a = 0.2359, $p < 0.001$. Similarly effects of other two independent variables (PKN, PRI) on mediating variable PBE are significant with respective estimates 0.199 and 0.068. When controlling for independent variable, effect of PBE on the dependent variable EOS is insignificant (b = 0.0959, p = 0.440).

Table 3: Statistical inference related to the two regression approach with PBE as mediator for model 1. LL and UL are the lower and upper limits of bootstrap 95 % confidence intervals

Independent variables	Regression 1			Regression 2						Indirect effect			
	Est (a)	SE (a)	p-val	Est (b)	SE (b)	p-val	Est (c')	SE (c')	p-val	Est(ab)	SE (ab)	LL	UL
SEC	0.236	0.016	0.000	0.096	0.124	0.440	0.107	0.075	0.152	0.023	0.031	-0.036	0.091
PKN	0.199	0.023	0.000				0.058	0.099	0.561	0.019	0.026	-0.029	0.076
PRI	0.068	0.010	0.000				-0.324	0.043	0.000	0.007	0.009	-0.010	0.027

Table 4: Statistical inference related to the two regression approach with MOT as mediator for model 2. LL and ULare the lower and upper limits of bootstrap 95 % confidence intervals

Independent variables	Regression 1			Regression 2						Indirect effect			
	Est (a)	SE (a)	p-val	Est (b)	SE (b)	p-val	Est(c')	SE (c')	p-val	Est(ab)	SE (ab)	LL	UL
SEC	0.188	0.021	0.000	0.576	0.095	0.000	0.021	0.070	0.760	0.108	0.028	0.062	0.164
PKN	0.168	0.029	0.000				-0.020	0.096	0.834	0.096	0.028	0.050	0.164
PRI	- 0.012	0.013	0.000				-0.310	0.042	0.000	-0.007	0.008	-0.022	0.011

Table 5: Statistical inference related to the two regression approach with PCO as mediator for model 3. LL and UL are the lower and upper limits of bootstrap 95 % confidence intervals

Independent variables	Regression 1			Regression 2						Indirect effect			
	Est (a)	SE (a)	p-val	Est (b)	SE (b)	p-val	Est(c')	SE (c')	p-val	Est(ab)	SE(ab)	LL	UL
TPR	0.857	0.018	0.000	-0.213	0.105	0.043	-0.298	0.111	0.007	-0.183	0.090	-0.360	-0.012
PKN	0.204	0.025	0.000				0.143	0.094	0.119	-0.043	0.022	-0.095	-0.005

Table 6: Statistical inference related to the two regression approach with MOT as mediator for model 4. LL and UL are the lower and upper limits of bootstrap 95 % confidence intervals

Independent variables	Regression 1			Regression 2						Indirect effect			
	Est (a)	SE (a)	p-val	Est (b)	SE (b)	p-val	Est(c')	SE (c')	p-val	Est(ab)	SE(ab)	LL	UL
TPR	0.030	0.020	0.140	0.552	0.092	0.000	-0.497	0.063	0.000	0.018	0.014	-0.007	0.049
PKN	0.270	0.028	0.000				-0.050	0.091	0.584	0.149	0.033	0.090	0.219

Table 7: Statistical inference related to the two regression approach with MOT as mediator for model 5. LL and UL are the lower and upper limits of bootstrap 95 % confidence intervals

Independen t variables	Regression 1			Regression 2						Indirect effect			
	Est (a)	SE (a)	p-val	Est (b)	SE (b)	p-val	Est (c')	SE (c')	p-val	Est(ab)	Se (ab)	LL	UL
VFE	0.248	0.034	0.000	0.657	0.104	0.000	-0.239	0.124	0.055	0.162	0.042	0.096	0.269
ASP	0.068	0.026	0.008				0.232	0.091	0.011	0.044	0.024	0.001	0.093
PTP	0.018	0.024	0.452				0.038	0.085	0.659	0.012	0.021	-0.025	0.062
NFC	0.006	0.013	0.664				0.031	0.049	0.532	0.004	0.013	-0.021	0.033
PIN	0.165	0.033	0.000				-0.590	0.118	0.000	0.108	0.039	0.046	0.202

PCO	-0.084	0.020	0.000				-0.429	0.069	0.000	-0.055	0.017	-0.091	-0.026
PBE	0.271	0.036	0.000				-0.181	0.123	0.165	0.178	0.044	0.103	0.276
CAT	0.027	0.010	0.008				0.111	0.036	0.002	0.019	0.010	0.002	0.037

The estimated direct effects of three independent variables on EOS reveal that PRI is significant whereas SEC and PKN are insignificant with EOS. Also all the three 95% bootstrap confidence intervals include zero and hence the indirect effect of the mediation variable PBE is not statistically significant. In the case of Model 2, first two independent variables SEC and PKN are significant in explaining the mediation variable MOT where as PRI is not so (p-value = 0.332). Also the effect b of MOT on the dependent variable EOS when independent variable is controlled has shown a significant value with an estimate of 0.576. For the direct effect, it can be observed that SEC and PKN have insignificant on EOS; but the direct effect of PRI on EOS controlled for MOT is significant. However, in the case of indirect effects, SEC and PKN have significant positive effects on EOS but PRI has insignificant effect on EOS. Further, since these two significant indirect effects together with insignificant direct effect yield a conclusion of Indirect only effect of SEC and PKN on EOS when MOT is a mediating variable.

Table 8: Summary of the mediation effect due to the identified variables on the Extent of Search discussed in five models

Model	Independent variable	Mediating variable	Dependent variable	Mediation Effect
1	Self-confidence(SEC)	Perceived benefits (PBE)	Extent of Search (EOS)	No effect (Non-Mediation)
	Perceived knowledge(PKN)			No effect (Non-Mediation)
	Perceived risks (PRI)			Direct only(Non-Mediation)
2	Self-confidence(SEC)	Motivation(MOT)	Extent of Search (EOS)	Indirect only
	Perceived knowledge(PKN)			Indirect only
	Perceived risks (PRI)			Direct only(Non-Mediation)
3	Time Pressure(TPR)	Perceived Cost (PCO)	Extent of Search (EOS)	Indirect only
	Perceived knowledge(PKN)			Direct only(Non-Mediation)
4	Time Pressure(TPR)	Motivation(MOT)	Extent of Search (EOS)	Direct only(Non-Mediation)
	Perceived knowledge(PKN)			Indirect only
5	Value for Education (VFE)	Motivation(MOT)	Extent of Search (EOS	Indirect only
	Aspiration (ASP)			Complementary Mediation
	Parent Teacher Encouragement (PTP)			No effect (Non-Mediation)
	Need for Cognition (NFC)			No effect (Non-Mediation)
	Personal involvement (PIN)			Competitive Mediation
	Perceived Cost (PCO)			Complementary Mediation
	Perceived Benefits(PBE)			Indirect only
	College Attribute (CAT)			Complementary Mediation

Table 5 provides the estimates for model 3 from which it can be observed that the effects a for the two variables TPR and PKN are significant; also the mediating variable PCO has significant effect on EOS. In the case of direct effects (c′) of TPR and PKN have reversal sign pattern of which effect of TPR is significant but PKN is not so. However, the indirect effects of both variables show significance when PCO is used as a mediating variable; further it can be noted that indirect effect of PKN is negative which is opposite to the corresponding direct effect (c′ = 0.1428 and ab = -0.043) where as the sign pattern for the other variable is same as negative (c′ = -0.2979 and ab = -0.1822). So, PKN has only indirect effect and TPR has complementary mediation (sign of abc′ is positive) when PCO is used as a mediating variable. In case of Model 4, TPR and PKN are the two independent variables (Table 6). Here PKN is significant, however TPR is insignificant (0.140); the mediating variable MOT has significant effect on EOS. The direct effect of TPR is significant with negative estimate (-0.497) whereas PKN is insignificant. However the indirect effect of TPR is insignificant whereas PKN is significant, so PKN has indirect effect only. In the case of Model 5 where eight independent variables (Table 7) are hypothesized for the effect on EOS with MOT as a mediating variable. From table 7 it can be observed that effects of independent variables on MOT are significant except PTP and NFC where as the effect (b) of MOT on EOS controlled for X is found to be significant. While direct effects are considered, four estimates are positive in the case of ASP, PTP, NFC, and CAT where as rest of them have negative estimates. Also, VFE, PTP, NFC, PBE have shown insignificant direct effect when compared to other independent variables. However, all the indirect effects except PCO yield positive estimates with statistical significance for all variables excluding PTP and NFC. Further, based on the sign of abc′ it can be observed that ASP, PCO, CAT have complement mediation and PIN has competitive mediation where as VFE and PBE have only indirect effects. Table 8

summarizes all these observations for quicker comparison of the causal relations hypothesized between the selected variables. Further, this work has considered serial mediation analysis using the combination of Model 1 and Model 2 with PKN and PRI as independent variables, PBE and MOT as Mediating Variable, and EOS as dependent variable that are derived from the conceptual framework (Fig 3). It can be observed that the estimate of PKN is -0.032 with 95 % confidence interval (-0.112, 0.042) and PRI is -0.0134 with confidence interval (-0.048, 0.178) through PBE as mediating variable. Also, the estimate of PKN is 0.156 with 95% confidence interval (0.096, 0.237) and that of PRI is 0.022 with confidence interval (0.004, 0.045) through MOT as mediating variable. A reversal sign pattern in the estimated values can be observed when these results are compared with single mediation analysis summarized in Table 3 and Table 4. It can also be observed that the mediating effect for PRI is significant in the case of serial mediation model but not so in the case of single mediation model. In a similar attempt, Model 3 and Model 4 have been used for serial mediation with PKN and TPR (independent variables), PCO and MOT (mediating Variable), EOS (dependent variable) described in the conceptual model. But there is no appreciable difference can be found in the direction and magnitude of the estimates as well as in statistical significance between serial or single mediation procedures.

Conclusions

When a mediation model has k (k > 1) independent variable, then the analysis has to be done by retaining k-1 variables as covariates and mediating effect of kth variable can be studied. The present work has envisaged this approach by suitably extending an original work on students' search behavior for their choice of higher education (Verghese, 2013). The main objective of this work is to investigate the relationship between the study variables in more elaborative manner using mediation procedures. It has been observed that the magnitude of many regression coefficients is markedly distinct when a model has more than one independent variable. For example, Model 5(Table 7) yields a negative indirect effect for a determinant PCO in contrast to the original study. Similar findings could be observed in the data analysis and hence this present work has studied the effect of variables more comprehensively than the attempts portrayed in the original study. In a similar way the serial mediation that has been originally derived in the conceptual model (Figure 1) but not been computationally attempted has also been studied completely to understand the complex mechanism of the association between the variables. Further, the mediation procedures might be attempted with an alternative statistical paradigm, such as Bayesian methods. Also a Bootstrap or Monte Carlo simulation of the data can be studied to assess the relationship in a more detailed manner.

References

1. Baron, R. M. and Kenny, D. A. "The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations", Journal of Personality and Social Psychology, 51, 1173-1182, 1986.
2. Bollen, K. A., and Stine, R. "Direct and indirect effects: Classical and bootstrap estimates of variability. Sociological Methodology", 20, 115–140, 1990.
3. Chassin L., Pillow, D.R., Curran, P.J., Molina. and Barrera, M. "Relation of parental alcoholism to early adolescent substance use: A test of three mediating mechanisms", Journal of Abnormal Psychology, 102, 1993.
4. Cubillo, J., Sanchez, J and Cervino, J." International students' decision-making process", The International Journal of Educational Management, 101-115. 2006.
5. Duncan, O. D., Featherman, D. L., and Duncan, B." Socioeconomic background and achievement", New York: Seminar Press,. 1972.
6. Gaynor, N. "Globalising higher education: Challenges and contradictions. Policy and Practice", A Development Education Review, 11, 120-126, 2010.
7. Hayes, A. F."Introduction to mediation, moderation, and conditional process analysis: A regression-based approach". New York: Guilford Press, 2013.
8. Hernard, F. "Learning Our Lesson: Review of Quality Teaching in Higher Education", OECD Publishing, 2010.
9. Horn, G." Educational solutions to improve the employability of senior high school learners", South African Journal of Education, 26(1), 113-128, 2006.
10. Imai, K., Keele L., and Tingley, D." A General Approach to Causal Mediation Analysis. Psychological Methods", 15(4):309-334, 2010.
11. Jarvis, P. "The learning society. In: Wilson AL and Hayes ER (eds)", Handbook of Adult and Continuing Education. London: Routledge, pp. 643-659, 2000.
12. Kenneth MacCorquodale and Paul E Meehli., "On a distinction between hypothetical constructs and intervening variables", Psychological Review, 55, 95-10, 1948.
13. Kotler, P., and K.F."A Fox Strategic Marketing for Educational Institutions. 2nd ed. Upper Saddle River", NJ: Prentice-Hall, 1995.
14. Kusumawati. "Student choice criteria for selecting and Indonesian public university: a preliminary finding In", Proceedings of Sydney business school higher degree research student conference, 2010.
15. MacKinnon, D.P. and Dwyer, J.H. "Estimating mediated effects in prevention studies". Evaluation Review, 17(2), 144-158, 1993.
16. MacKinnon, D. P."Introduction to statistical mediation analysis". New York: Erlbaum, 2008.
17. Matthew S Fritz, Aaron B Taylor and David P Mackinnon. "Explanation of Two Anomalous Results in Statistical Mediation Analysis". Multivariate Behavioral Research; 47(1):61-87, 2012.

18. Partick., Shrout and Niall Bolger. "Mediation in Experimental and Nonexperimental Studies: New Procedures and Recommendations," in the Psychological Bulletin 7, 422-445, 2002.
19. Rindfleish, J.M."Segment profiling: reducing risk in higher education management. Journal of Higher Education Policy and Management, 25(2), 147-159, 2003.
20. Soares, A.M. and C. Simoes. "Recruiting higher education studens: information sources and choice factors", Available at: http://marketing-trends-congress.com/2009.pdf(accessed), 2010.
21. Schmidt, J.B and R. Spreng. "A proposed model of external consumer information search", Journal of the Academy of Marketing Science, 24(3), 246-256, 1996.
22. Verghese, A. "A study on student information search behavior in engineering education", an unpublished Ph. D thesis, Indian Institute of Technology, Madras, 2013.
23. Veloutsou, C., R.A. Paton and J. Lewis. "Consultation and reliability of information sources pertaining to university selection". International Journal of Educational Management, 19(4), 279-291 of Marketing 62(2), 60-76, 2005.
24. Wolfe, L.M "Sewall wright on the method of path coefficients: An annotated bibliography. Structural equation modeling", 6,280-291, 1999.
25. Woodworth, R. S. "Dynamic psychology. In C. Murchison (Ed.)", Psychologies of 1925 (pp. 111–126). Worcester, MA: Clark University Press, 1928.
26. Wright S."Correlation and causation". Journal of Agricultural Research, 20, 557-585, 1921.
27. Zhao, X., Lynch, J.G., and Chen, Q. "Reconsidering Baron and Kenny: Myths and truths about mediation analysis". Journal of Consumer Research, 37, 197-206, 2010.