Role of placement in determination of service quality measurement of higher education in India

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Abstract

In this research paper the methodological development of a new model, namely SQM-HEI (**S**ervice **Q**uality **M**easurement in **H**igher **E**ducation in **I**ndia) for the measurement of service quality in higher educational institutions is developed. Three dimensions are arrived namely Teaching Methodology(TM), Environmental Change in Study Factor (ECSF) and Disciplinary Action(DA). The Placement is considered as the mediating factor for the outcome of education. For conducting an empirical study, data were collected from final year students of higher educational institutions across Tamilnadu. 1600 valid questionnaires were used for the analysis. The SQM-HEI captures the authentic determinants of service quality within the higher education sector. The developed 30-item instrument has been empirically tested with AMOS 7.0. The developed model is tested for Structural Equation Model and Bayesian estimation and testing. The SEM model output reveals that the RMSEA=0.049, GFI= 0.987 and NFI = 0.928. all the fit indices concludes the best fit of the model. The results from the current study are crucial because previous studies have produced scales that bear a resemblance to the generic measures of service quality, which may not be totally adequate to assess the perceived quality in higher education.

Introduction

In higher education, quality measurement is intensifying with increased emphasis on education accountability. Nonetheless, many researchers used the adapted version of SERVQUAL to evaluate students' course experience within a business school as part of the quality assurance system (Rigotti and Pitt, 1992; McElwee and Redman, 1993; Hill, 1995; Cuthbert, 1996; Oldfield and Baron, 2000). Ho and Wearn (1996) incorporated SERVQUAL into HETQMEX, a higher education TQM excellence model. Whilst in nurse education, Hill et al. (1996) devised a quality instrument for post-registration nurse education derived from existing literature sources for module management. The conclusion appears to be that many researchers are undertaking customization of established service quality dimensions in higher education in their measurement instruments.

There are many gray areas in the debate over how to measure service quality. The argument regarding the gaps (SERVQUAL), perceptions-only (SERVPERF) and EP approaches to measuring service quality is still unresolved as there are valid issues and suggestions on either side of this debate. The general view appears to be that, although SERVQUAL, SERVPERF and EP were designed as generic measures of service quality that have cross-industry applicability, it

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is important to view the instruments as basic 'skeletons' that often require modification to fit the specific application situation and supplemental context-specific items. Without doubt the use of these approaches as a means of measuring service quality throughout the marketing sectors may have been tested with some degree of success, but this may not be the case for other service sectors, namely, higher education.

With all these seemingly irreconcilable problems associated, perhaps the time has come to 'bury' the existing instruments and attempt to reconstruct or redefine service quality from a new and different perspective. Thus, the general conclusion appears to be that industry-specific service quality measures may be a more viable research strategy to pursue (Zeithaml et al., 1985; Finn and Lamb, 1991; Cronin and Taylor, 1992; Brown and Koenig, 1993). As it stands, the generic measures of service quality may not be a totally adequate instrument by which to assess the perceived quality in higher education, although their impact in the service quality domain is undeniable.

On the other hand, HEdPERF (Higher Education PERFormance), a new and more comprehensive performance-based measuring scale that attempts to capture the authentic determinants of service quality within the higher education sector. The 41-item instrument has been empirically tested for unidimensionality, reliability and validity using both exploratory and confirmatory factor analysis. Therefore, the primary issue addressed in that paper is about comparing different measures of the service quality construct within a single, empirical study utilizing customers of a single industry namely higher education.(Firdaus,2005a)

Firdaus 2005b, empirically explained that in terms of unidimensionality, reliability, and validity, HEdPERF explained variance within the higher education setting is better in comparison to SERVPERF. The study only examined the respective utilities of each instrument within a single industry, in only one national setting, any suggestion that the HEdPERF is generally superior would still be premature.Service quality has attracted considerable attention within the higher education sector, but despite this, little work has been concentrated on identifying its determinants from the standpoint of students being the primary customers. Thus, it would seem rational to develop a new measurement scale that incorporates not only the academic components, but also aspects of the total service environment as experienced by the student. Likewise, there are many areas of disagreement in the debate over how to measure service quality, and recent research has raised many questions over the principles on which the existing instruments are founded. Although these generic instruments have been tested with some degree of success in wide-ranging service industries, but their replication in higher education sector is still hazy.

Mahapatra(2007) evolves a systematic integrated approach for modeling customer evaluation of service quality applied to technical education through a survey instrument known as EduQUAL, specifically proposed for the education sector, is used to measure the satisfaction level of different stakeholders.

From the existing literature summarized above, the researcher identified that SERVQUAL, HEdPERF, EduQUAL and other similar studies are empirically tested on academic aspects & non academic aspects. The researcher identified that there exist a gap in the research pertaining to higher education Service quality evaluation in India.

The proposed 30-item instrument has been empirically tested for unidimensionality, reliability and validity using both exploratory and confirmatory factor analysis (CFA). Such valid and reliable measuring scale would be a tool that Higher Educational institutions could use to improve service performance in the light of increased competition with the development of global education markets. The results from the current study are crucial because previous studies have produced scales that bear a resemblance to the generic measures of service quality, which may not be totally adequate to assess the perceived quality in higher education. Furthermore, previous researches have been too narrow, with an over- emphasis on the quality of academics and too little attention paid to the non-academic aspects of the educational experience and placement.

Surveys generally fall into one of two categories, descriptive or relational. Descriptive surveys are designed to provide a snapshot of the current state of affairs while relational surveys are deigned to empirically examine relationships among two or more constructs either in an exploratory or in a confirmatory manner. The current study is a relational survey that seeks to explore the relationship between Teaching Methodology (TM), Environmental change in Study factor(ECSF), Disciplinary Action (DA), Placement as the mediating factor and the outcome as the quality education. The developed research model **SQM-HEI** (**S**ervice **Q**uality **M**easurement in **H**igher **E**ducation in **I**ndia), specifically proposed for the higher education sector in India, is used to measure the quality of higher education.

PILOT STUDY

Prior to beginning actual data collection with the procedure described above, the researcher utilized similar procedures to conduct a pilot study to ensure that the survey materials and procedure were clear and did not provoke any confusion or problems for participants. The draft questionnaire was eventually subjected to pilot testing with a total of 100 final year students spread across the different regions and varied type of institutions, and they were asked to comment on any perceived ambiguities, omissions or errors concerning the draft questionnaire. The feedback received was rather ambiguous thus only minor changes were made. For instance, technical jargon was rephrased to ensure clarity and simplicity. The revised questionnaire was subsequently submitted to three experts (an academician, a researcher and a NAAC peer team committee member) for feedback before being administered for a full-scale survey. These experts indicated that the draft questionnaire was rather lengthy, which in fact coincided with the preliminary feedback from students. Nevertheless, in terms of number of items in the questionnaire, the current study conforms broadly with similar research work (Cronin and Taylor, 1992; Teas, 1993a; Lassar etal., 2000; Mehta etal., 2000; Robledo, 2001) that attempted to compare various instruments for measuring service quality.

CONSTRUCT MEASURES AND DATA COLLECTION

Data were collected by means of a structured questionnaire comprising six sections namely A, B, C, D, E & F . Section A consists of ten questions pertaining to Teaching Methodology (TM). Sections B consists of five questions pertaining to Environmental Change in Study factor(ECSF). Section C consists of eight questions relating to disciplinary measures taken by the Institutions(DA). Section D consists of five questions related to the placement related activities & in the part E two questions provide an overall rating of the service quality, satisfaction level. Finally in the part F thirteen questions pertaining to student respondent's demographic profile information were given.

All the items in Sections A to E were presented as statements on the questionnaire, with the same rating scale used throughout, and measured on a seven-point, Likert-type scale that varied from 1 highly dissatisfied to 7 highly satisfied . In addition to the main scale addressing individual items, respondents were asked in Section E to provide an overall rating of the service quality, satisfaction level.

For conducting an empirical study, data were collected from final year students of higher educational institutions across Tamilnadu. The reason for selecting the final year students is due to the reason that they could have had more exposure to the education system in all its phases. Assurance was given to the respondents that the information collected from them will be kept confidential and will be used only for academic research purposes.

Data had been collected using the "personal-contact" approach as suggested by Sureshchandar etal.(2002) whereby "contact persons" (Registrar or Assistant Registrar) have been approached personally, and the survey was explained in detail. The final questionnaire together with a cover letter was then handed personally or mailed to the "contact persons", who in turn distributed it randomly to students within their respective institutions. A total of 2000 nos. of questionnaire were circulated to four regions across the length and breadth of the Tamilnadu State comprising of 12 government universities, 16 government colleges , 12 aided colleges, 10 deemed universities & 61 self financing colleges. Of these 1749 were collected. Out of the questionnaires that were collected 149 were not usable due to insufficient and / or incomplete data. As a result, a total of 1600 valid questionnaires were used for the analysis, leading to a response rate of 80 per cent. The number of usable questionnaires were 1600 for a population size of nearly three lakhs students in Tamilnadu higher educational institutions was in line with the generalized scientific guidelines for sample size decisions as proposed by Krejcie and Morgan (1970). Hence, the sample size for the analysis is 1600.

The sampling procedure used for the study was stratified random sampling. The stratification has been done based on the region Chennai, Coimbatore, Madurai, Tiruchirappalli, and nature of institution, Government University, Government college, Aided college, Private University and Self financing college. While selecting the institutions from each category, non-probabilistic convenience and judgmental sampling technique was used. However, within such institutions, the respondents were selected by stratified random sampling.

PROCEDURE FOR DATA ANALYSIS

The data collected were analyzed for the entire sample. Data analyses were performed with Statistical Package for Social Sciences (SPSS) using techniques that included descriptive statistics, Correlation analysis and AMOS package for Structural Equation Modeling and Bayesian estimation and testing.

STRUCTURAL EQUATION MODELING

The main study used structural equation modeling (SEM) because of two advantages: "(1) estimation of multiple and interrelated dependence relationships, and (2) the ability to represent unobserved concepts in these relationships and account for measurement error in the estimation process" (Hair et al., 1998, p. 584). In other words, a series of split but independent multiple regressions were simultaneously estimated by SEM. Therefore, the direct and indirect effects were identified (Tate, 1998). However, a series of separate multiple regressions had to be established based on "theory, prior experience, and the research objectives to distinguish which independent variables predict each dependent variable" (Hair et al., 1998, p. 584). In addition,

because SEM considers a measurement error, the reliability of the predictor variable was improved. AMOS 7.0(Arbuckle and Wothke, 2006), a computer program for formulating, fitting and testing structural equation models(SEM) to observed data was used for SEM and the data preparation was conducted with SPSS 13.0.

Linear structural equation models (SEMs) are widely used in sociology, econometrics, management, biology, and other sciences. A SEM (without free parameters) has two parts: a probability distribution (in the Normal case specified by a set of linear structural equations and a covariance matrix among the "error" or "disturbance" terms), and an associated path diagram corresponding to the causal relations among variables specified by the structural equations and the correlations among the error terms. It is often thought that the path diagram is nothing more than a heuristic device for illustrating the assumptions of the model.

Structural equation models with latent variables (SEM) are more and more often used to analyze relationships among variables in marketing and consumer research (see for instance Bollen, 1989; Schumacker & Lomax, 1996, or Batista-Foguet & Coenders, 2000, for an introduction and Bagozzi, 1994 for applications to marketing research). Some reasons for the widespread use of these models are their parsimony (they belong to the family of linear models), their ability to model complex systems (where simultaneous and reciprocal relationships may be present, such as the relationship between quality and satisfaction), and their ability to model relationships among non-observable variables (such as the domains in the SQM-HEI model) while taking measurement errors into account (which are usually sizeable in questionnaire data and can result in biased estimates if ignored).

As is usually recommended, a confirmatory factor analysis (CFA) model is first specified to account for the measurement relationships from latent to observable variables. In our case, the latent variables are the four perception dimensions and the observed variables the 30 perception items. The relationships among latent variables cannot be tested until a well-fitting CFA model has been reached. In our case, the relationships among overall quality of education, the mediating impact of placement with the TM, ECSF, DA dimensions are of interest. This modeling sequence stresses the importance of the goodness of fit assessment. As a combination of regression, path and factor analyses, in SEM, each predictor is used with its associated uncontrolled error and, unlike regression analyses, predictor multi-collinearity does not affect the model results.

EVALUATION OF MODEL FIT

According to the usual procedures, the goodness of fit is assessed by checking the statistical and substantive validity of estimates, the convergence of the estimation procedure, the empirical identification of the model, the statistical significance of the parameters, and the goodness of fit to the covariance matrix. Since complex models are inevitably mis specified to a certain extent, the standard test of the hypothesis of perfect fit to the population covariance matrix is given less importance than measures of the degree of approximation between the model and the population covariance matrix. The root mean squared error of approximation (RMSEA) is selected as such a measure. Values equal to 0,05 or lower are generally considered to be acceptable (Browne & Cudeck, 1993). The sampling distribution for the RMSEA can be derived, which makes it possible to compute confidence intervals.

These intervals allow researchers to test for close fit and not only for exact fit, as the $\chi 2$ does. If both extremes of the confidence interval are below 0.05, then the hypothesis of close fit is rejected in favor of the hypothesis of better than close fit. If both extremes of the confidence

interval are above 0.05, then the hypothesis of close fit is rejected in favor of the hypothesis of bad fit.

Several well-known goodness-of-fit indices were used to evaluate model fit: the chi-square $\chi 2$, the comparative fit index (CFI), the unadjusted goodness-of-fit indices (GFI), the normal fit index (NFI), the Tucker-Lewis Index (TLI), the root mean square error of approximation (RMSEA) and the standardized root mean square error residual (SRMR).

BAYESIAN ESTIMATION AND TESTING IN SEM

With modern computers and software, a Bayesian approach to structural equation modeling (SEM) is now possible. Posterior distributions over the parameters of a structural equation model can be approximated to arbitrary precision with AMOS, even for small samples. Being able to compute the posterior over the parameters allows us to address several issues of practical interest. First, prior knowledge about the parameters may be incorporated into the modeling process in AMOS. Second, we need not rely on asymptotic theory when the sample size is small, a practice which has been shown to be misleading for inference and goodness-of-fit tests in SEM (Boomsma, 1983). Third, the class of models that can be handled is no longer restricted to just-identified or over-identified models. Whereas each identifying assumption must be taken as given in the classical approach, in a Bayesian approach some of these assumptions can be specified with perhaps more realistic uncertainty.

HYPOTHESES DEVELOPMENT

Mediation refers to a process or mechanism through which one variable (i.e., exogenous) causes variation in another variable (i.e., endogenous). Studies designed to test for moderation may provide stronger tests of mediation than the partial and whole covariance approaches typically used (e.g., Baron & Kenny, 1986; Bing, Davison, LeBreton, & LeBreton, 2002; James & Brett, 1984). It is useful to distinguish between moderation and mediation. Moderation carries with it no connotation of causality, unlike mediation which implies a causal order.

Based on the arguments discussed above the researcher formulated the following hypotheses.

- Demographic and socio economic environments influence the different dimensions of service quality.
- The dimensions of service quality influences the placement as the mediating factor.
- Dimensions of service quality positively influences the quality of education.

A mediator hypothesis is supported if the interaction path (TM, ECSF,DA x Placement) are significant. There may also be significant main effects for the predictor (service quality) and mediator (Placement). Therefore, this research seeks to explore whether the relationship between service quality and TM, ECSF, DA are fully or partially Mediated by Placement. The analysis was done with SPSS 13.0 & AMOS 7.0 software packages. The following sections presents the construction and validation of Structural Equation Model of SQM-HEI mediated model with the dimensions TM, ECSF,DA, the mediating parameter placement and the outcome of the quality education. And also the SQM-HEI mediated model is tested with Bayesian testing and estimation.

REGRESSION MODEL OF THE SQM-HEI MEDIATED STRUCTURAL EQUATION MODEL

In hierarchical regression, the predictor variables are entered in sets of variables according to a pre-determined order that may infer some causal or potentially mediating relationships between the predictors and the dependent variable (Francis, 2003). Such situations are frequently of interest in the social sciences. The logic involved in hypothesizing mediating relationships is that "the independent variable influences the mediator which, in turn, influences the outcome" (Holmbeck, 1997). However, an important pre-condition for examining mediated relationships is that the independent variable is significantly associated with the dependent variable prior to testing any model for mediating variables (Holmbeck, 1997). Of interest is the extent to which the introduction of the hypothesized mediating variable reduces the magnitude of any direct influence of the independent variable on the dependent variable.

Hence the researcher empirically tested the hierarchical regression for the model conceptualized in the figure 1, with in the AMOS graphics environment. The path diagram for the hypothesized mediated model is given in the path diagram.

The analyses conducted, the parameter estimates are then viewed within AMOS graphics. Figure 1 displays the standardized parameter estimates.

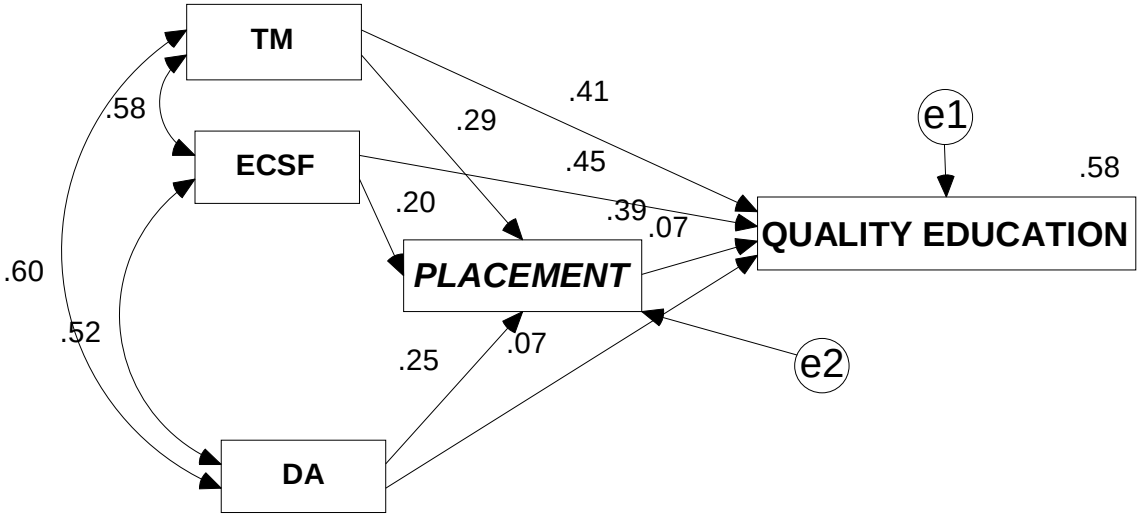


FIGURE 1: STANDARDIZED PARAMETER ESTIMATES FOR MEDIATED SQM-HEI MODEL

The regression analysis revealed that the student's perception on the various dimensions of service quality, ECSF explained 0.45 of the quality education, followed by TM which explains 0.41 of the quality education. The R^2 value of .58 is displayed above the box quality education in the AMOS graphics output. The visual representation of results suggest that the relationships between the dimensions of quality education and the mediated factor. The TM resulted a significant impact on the mediated factor, Placement. The DA resulted very limited influence on the quality education. It shows that the students perception towards the disciplinary measures taken by the management towards the outcome of education quality is insignificant, where as the impact of the same is very high on the mediating variable. Very high covariance between DA & TM reveals that students have a high regard on the teachers in shaping their career. The covariance between TM & ECSF is very high, which means that the TM & ECSF play a

indispensable role in the outcome of the quality education. According to Hoyle, (1995) a model is a statistical statement about the relation among variables, in the present study reveals the relationship among the various dimensions of quality & the outcome of the quality education.

BAYESIAN ESTIMATION AND TESTING FOR REGRESSION MODEL OF SQM-HEI MEDIATED STRUCTURAL EQUATION MODEL

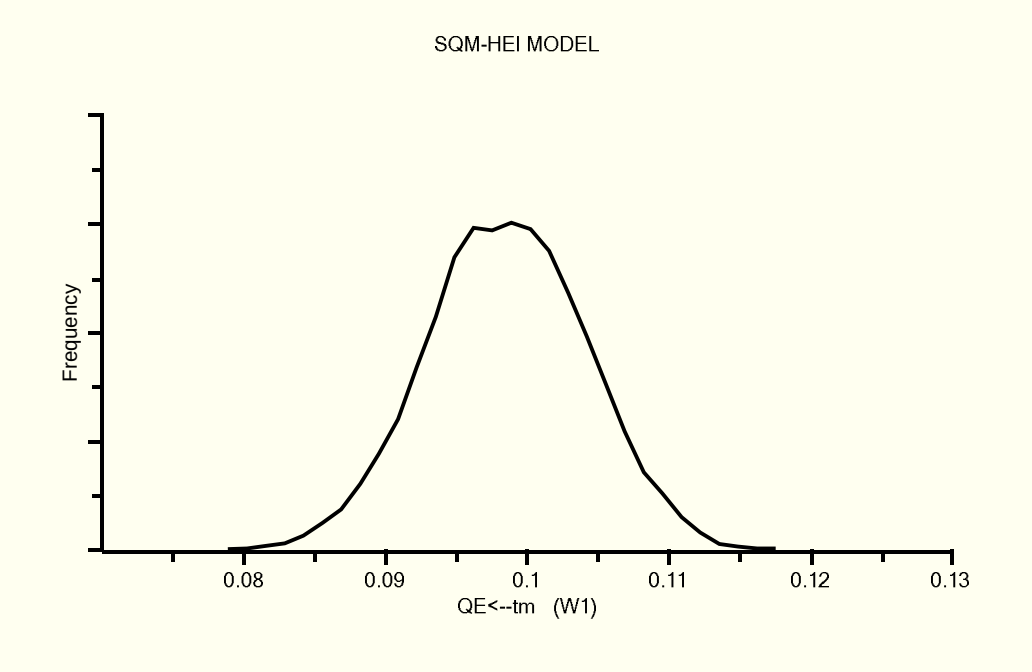
The research model is a SEM, while many management scientist are most familiar with the estimation of these models using software that analyses covariance matrix of the observed data (e.g. LISREL, AMOS, EQS), the researcher adopt a Bayesian approach for estimation and inference in AMOS 7.0 environment((Arbuckle & Wothke, 2006). Since it offers numerous methodological and substantive advantages over alternative approaches.

The Bayesian convergence distribution of the SQM-HEI mediated regression model. In this research the researcher has adopted for the procedure of assessing convergence of MCMC(Markov Chain Monte Carlo) algorithm of maximum likelihood. To estimate the MCMC convergence the researcher has adopted two methods namely, convergence in distribution, convergence of posterior summaries. The values of posterior means accurately estimate the SQM-HEI mediated SEM model. From the above table the highest value of Convergence Statistics (C.S) is 1.001 which is less than the 1.002 conservative measure (Gelman et al. 2004).

POSTERIOR DIAGNOSTIC PLOTS OF SQM-HEI MEDIATED REGRESSION MODEL

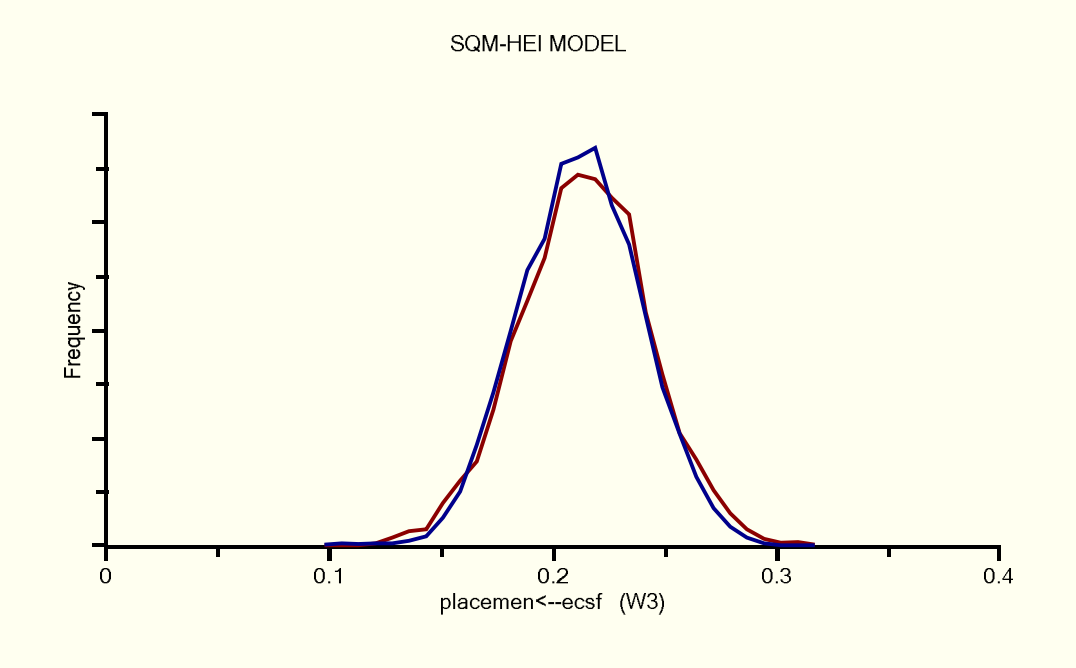
To check the convergence of the Bayesian MCMC method the posterior diagnostic plots are analyzed. The following figures shows the posterior frequency polygon of the distribution of the parameters across the 70 000 samples. The Bayesian MCMC diagnostic plots reveals that for all the figures the normality is achieved, so the structural equation model fit is accurately estimated.

Figure 2: Posterior frequency polygon distribution of the Quality education and TM, regression weight(W1) .



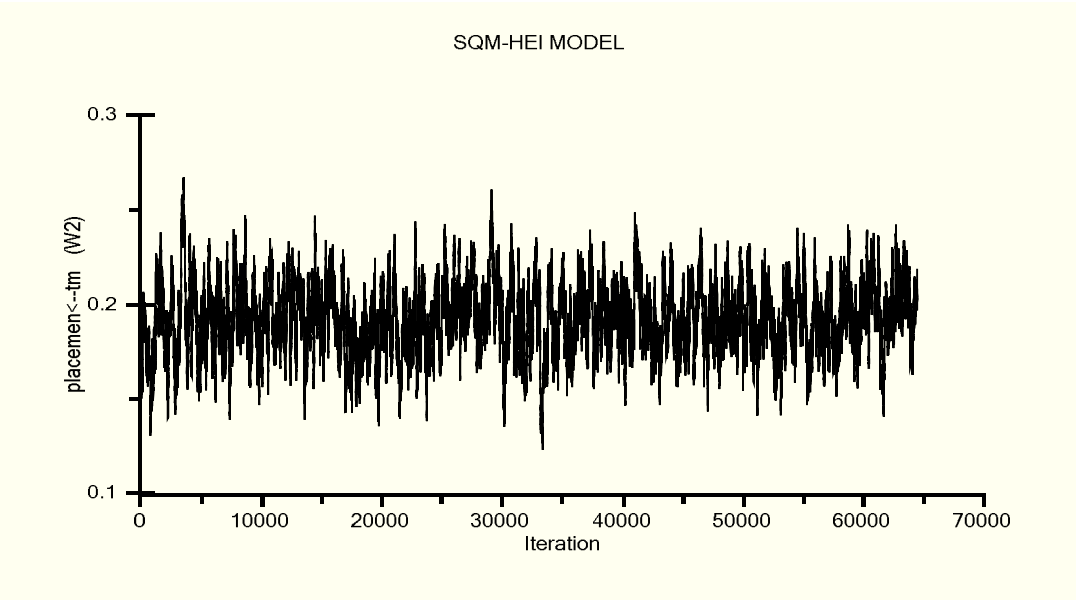
To ensure that Amos has converged to the posterior distribution is a simultaneous display of two estimates of the distribution, one obtained from the first third of the accumulated samples and another obtained from the last third. The following figures shows the simultaneous display of two estimates of the distribution for the mediated factor Placement with the other dimensions across 55 000 samples. From the three figures it is observed that the distributions of the first and last thirds of the analysis samples are almost identical, which suggests that Amos has successfully identified the important features of the posterior distribution of the relationship between the mediated factor Placement and other quality dimensions.

Figure 3 Posterior frequency polygon distribution of the first and last third of the samples of the SQM-HEI regression model for the mediated factor Placement and ECSF



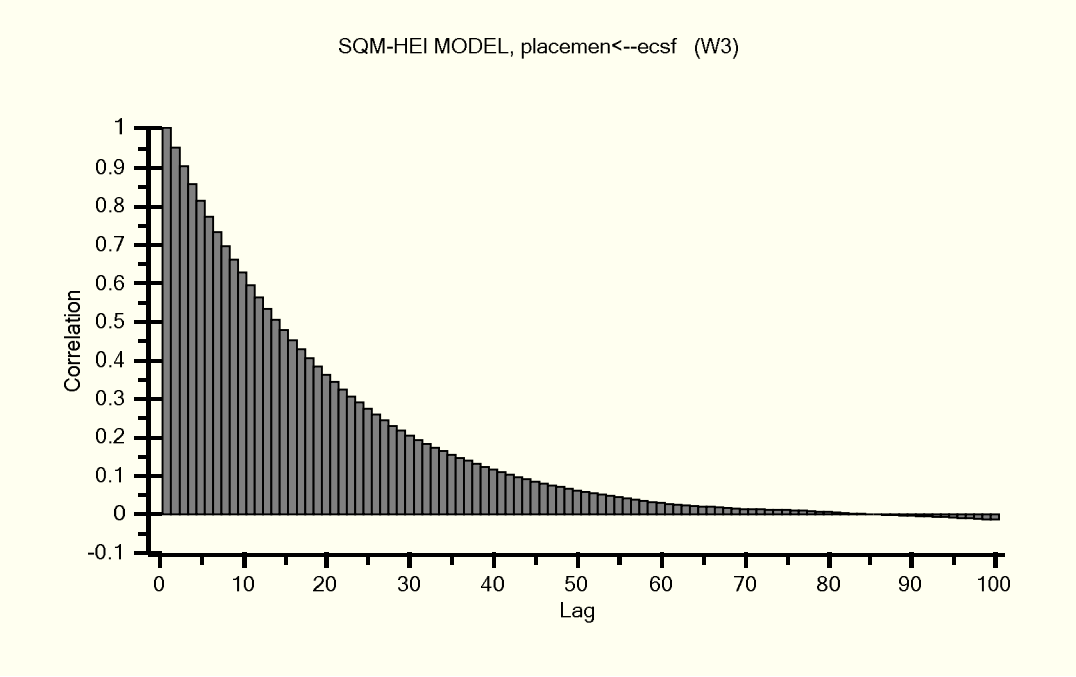
The trace plot also called as time-series plot shows the sampled values of a parameter over time. This plot helps to judge how quickly the MCMC procedure converges in distribution. The following figures shows the trace plot of the SQM-HEI model for the mediated factor Placement with other dimensions across 70 000 samples. All the three figures exhibits rapid up-and-down variation with no long-term trends or drifts. If we mentally break up this plot into a few horizontal sections, the trace within any section would not look much different from the trace in any other section. This indicates that the convergence in distribution takes place rapidly. Hence the SQM-HEI MCMC procedure very quickly forget its starting values.

Figure 4 Posterior trace plot of the SQM-HEI regression model for the mediated factor Placement and TM



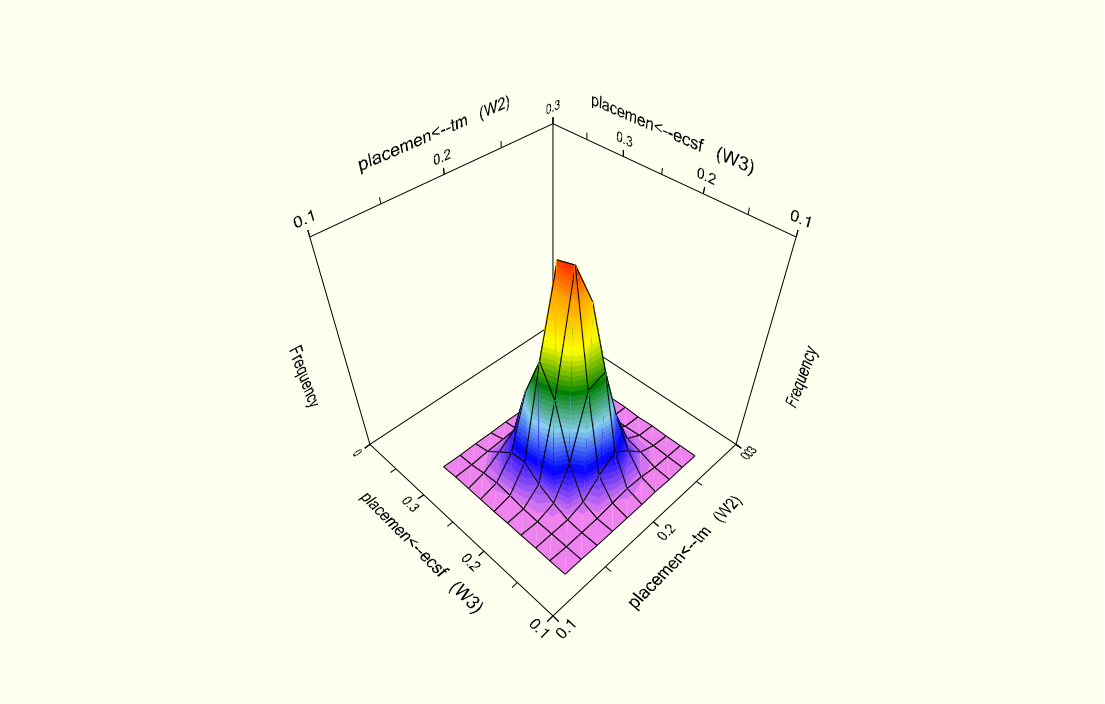
To determine how long it takes for the correlations among the samples to die down, autocorrelation plot which is the estimated correlation between the sampled value at any iteration and the sampled value k iterations later for k = 1, 2, 3,…. is analyzed for the SQM-HEI regression model. The figures shows the correlation plot of the SQM-HEI model for the mediated factor Placement with other dimensions across 70 000 samples. The three figures exhibits that at lag 90 and beyond, the correlation is effectively 0. This indicates that by 90 iterations, the MCMC procedure has essentially forgotten its starting position. Forgetting the starting position is equivalent to convergence in distribution. Hence it is ensured that convergence in distribution was attained, and that the analysis samples are indeed samples from the true posterior distribution.

Figure 5 Posterior correlation plot of the SQM-HEI regression model for the mediated factor Placement and ECSF



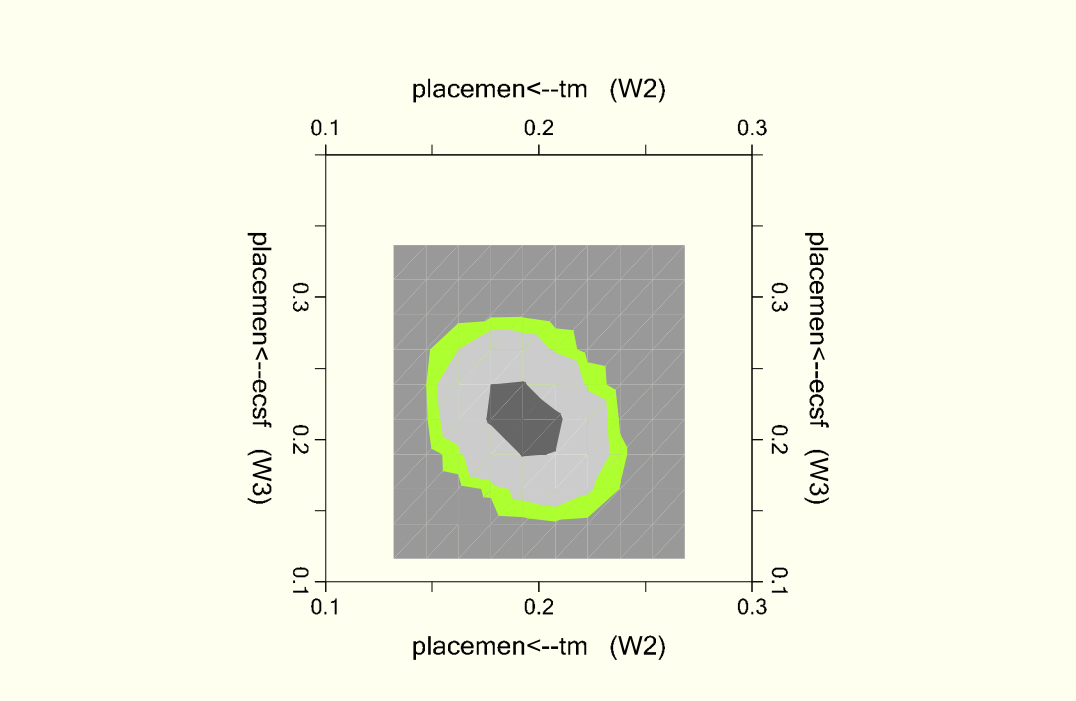
Even though marginal posterior distributions are very important, they do not reveal relationships that may exist among the two parameters. Hence to visualize the relationships among pairs of Parameters in three dimensional the following figures provides bivariate marginal posterior plots of the SQM-HEI model for the mediated factor Placement with other dimensions across 70000 samples. From the three figures it reveals that the three dimensional surface plots also signifies the interrelationship between the mediating variable Placement with the other dimensions TM, ECSF, and DA.

Figure 6: Three-dimensional surface plot of the marginal posterior distribution of the mediating factor placement with the TM & ECSF



The following figures displays the two-dimensional plot of the bivariate posterior density across 50 000 samples. Ranging from dark to light, the three shades of gray represent 50%, 90%, and 95% credible regions, respectively. From the three figures, it reveals that the sample respondent's responses are normally distributed.

Figure 7: Two-dimensional plot of the bivariate posterior density for the regression weights Placement to TM and Placement to ECSF



The various diagnostic plots featured from figure of the Bayesian estimation of convergence of MCMC algorithm confirms the fact that the convergence takes place and the normality is attained. Hence absolute fit of the SQM-HEI regression model. From the SQM-HEI regression model which is empirically tested with mediating factor placement with the dimensions TA, ECSF, DA and the overall service quality it is evident that the higher educational institutions should concentrate on the placement as the mandatory aspect of higher education which is not the case in developing countries.

The SQM-HEI mediated model argued that the placement is the better interactions of the Quality of Education in India. The model reveals that the quality of education is based on the best faculty (TM), the excellent physical resources(ECSF), a wide range of disciplines (DA) which paved the diverse student body and to improve the employability of the graduates(Placement as mediating factor) coming out of the higher educational institutions in India. The above model proves that the placement is the mediated factor for various dimensions of quality education. SQM-HEI model would help in identify three service areas to be focused in the Higher Educational Institutions for improving the quality of education – namely TM, ECSF & DA. These three dimensions of quality correlated between the sub dimension variables And it is very necessary for improving the quality of higher education in India. The educationist says that, education is a change of behavior of students. Hence the higher educational institutions should come forward to adapt the sub dimensions of quality variables to enhance the outcome of education.

Conclusion

Parents are investing money on their children's higher education, in anticipating immediate return on their investment as the immediate placement from the higher education. In the study area, the mindset of the people is not towards the entrepreneurship, but towards an immediate employability. There are many educational institutions in the study area concentrating their efforts towards achieving a very high level of on campus placement as the ultimate objective. They never fail to quote the same in all their promotional campaigns. The mediated SQM-HEI model empirically proved that the placement is the mediated factor for the quality higher education.

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