Chapter 6
Determination
of the
Factors

Contents

This chapter presents the procedure followed for conducting Factor Analysis and the results that were generated using Factor Analysis.

Determination of the Factors for measuring online banking service quality:

The first objective of the study is to determine the factors of service quality of online banking services.

With the help of the literature review and Delphi study conducted, a list of items was identified that were observed to be used for analysing service quality across various industries. These items were adapted for measuring online banking services.

6.1 Exploratory Factor Analysis:

Factor analysis is a statistical technique for identifying and analysing the underlying structure or dimensions (factors) that explain patterns of correlations among a set of variables. It is extensively used in psychology, sociology, economics, and other social sciences. The basic purpose of factor analysis is to reduce data dimensionality by collecting and reflecting shared variance among variables with a reduced amount of factors. All 38 items from Section A of the questionnaire (See Annexure I) were subjected to factor analysis, using the principle component analysis extraction method which was followed by a varimax rotation. This procedure produced two factors where the decision to include an item in a factor was based on the factor loadings being greater than +0.5 (Hair et al., 1995 as cited in Abdullah et al., 2011).

Table 6.1: Results of factor analysis (factor loadings)

Sl. No.	**Statements**	**Factor 1**	**Factor 2**
1.	I feel the bank's website/app has a quick response time.	0.642	
2.	When faced with any problem with the website/app my problems are handled effectively.	0.685	
3.	It is easy for me to navigate services on the bank's website/app.	0.580	
4.	The benefits that I get using the facilities of online banking are more compared to the cost (i.e. internet cost) that I incur.	0.592	

5.	I feel the fee charged while using online bank serviecs are not high.	0.601	
6.	The app/website has all the features of offline bank services.	0.581	
7.	The app/website does not take much time to respond to my request/instruction.	0.717	
8.	The app/website has the option to solve any problem that the customer is facing.	0.720	
9.	I get customised attention (eg. shortcuts, a pop-up of previously used services) while using the bank website/app.	0.616	
10.	I feel satisfied with the speed and ease at which a service is delivered by the online portal of the bank.	0.684	
11.	I am comfortable with the associated costs involved in online banking (such as the cost of internet connectivity and the cost of a computer/mobile phone).	0.613	
12.	I am comfortable paying the charges for a service consumed through the bank's website/app.	0.614	
13.	The app/website allows me to avail all banking services online.	0.628	
14.	I feel comfortable with the time taken to complete a transaction through the bank's website/app.	0.617	
15.	My bank is prompt in solving the problems faced by the customer while using the bank's app/website.	0.702	
16.	The bank's website/app always functions properly.	0.807	
17.	My bank provides customer service assistance regarding banking related queries via telephone.	0.756	
18.	It is easy to learn to use the services provided in the bank's website/app.	0.607	
19.	I use online bank services because a section of my friends/colleagues also use them.	0.521	
20.	I feel the services provided by the bank through its online portal matches my demand.	0.618	
21.	My bank provides me with information and services according to my preferences.	0.627	
22.	My bank takes care of the personal information collected from me.		0.559
23.	I feel that services provided through the online portals of the bank gives me an extra advantage.		0.635

24.	I intend to use online bank services in the coming future.		0.773
25.	I feel that other people expect me to use online banking services.		0.677
26.	I feel satisfied after the use of an online service through the bank websiite/app.		0.690
27.	I feel my education qualification has helped me in using the bank's website/app.		0.755
28.	I willingly perform online banking activities for my banking needs.		0.749
29.	The services delivered by my bank through the online portals are accurate as promised by the bank.		0.600
30.	I feel more comfortable using online banking services when the platform is the official banking website/app.		0.688
31.	I intend to use online bank services frequently.		0.741
32.	People who are important to me think that I should use online bank services.		0.646
33.	I feel satisfied with the services provided to me through the online platforms of the bank.		0.658
34	I feel the education qualification of a customer makes it easy to use the bank's website/app.		0.754
35.	The instructions provided by the bank are clear and understandable to me.		0.641
36.	The clarity of instructions/guidelines to use the bank's website/app has an impact on my perception of online bank service quality.		0.621
37.	I intend to use new technology to access online bank service.		0.732
38.	My bank keeps me informed in a language that I can understand.		0.669

The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy was conducted to quantify the degree of intercorrelations among the variables and the appropriateness of exploratory factor analysis. The KMO value derived is 0.985 which is above 0.8 and is considered to be meritorious (Hair, et al., 2019). The Bartlett test of sphericity value is below 0.05 indicating that there exists a significant correlation among at least some of the variables. The anti-image correlation depicted that all variables are above 0.7 which indicated that all the variables are highly adequate for factor analysis. The eigenvalues for both the factors extracted are more than 1. The percentage of variance is 64.531 which is considered to be satisfactory in social science research (See Annexure II).

The reliability of the items retained after conducting factor analysis was measured by computing Cronbach's Alpha value. The value derived was 0.974 which is above 0.70 suggesting that the items have relatively high internal consistency.

With the help of Exploratory Factor Analysis (EFA), two factors were derived out of 38 items. The first factor was inclusive of all the App/Website Performance items, where the performance of the app/website has a major role in the service quality perception of the consumer. The second factor was inclusive of Aptitude of the User items. These items revolved around consumer satisfaction, intention, education level, etc. Hence, the factors have been named as "App/Website Performance" and "Aptitude of the User".

Cronbach's alpha value was calculated for each of the factors to check the reliability of the data. The reliability coefficients of all the items are above 0.90 suggesting that the items have relatively high internal consistency.

Table 6.2: Reliability Analysis

FACTORS	CRONBACH'S ALPHA
App/website based Performance	0.967
Aptitude of the User	0.968

6.2 Confirmatory Factor Analysis:

The very first step of verifying the conceptual model that is formed by the exploratory factor analysis is to conduct a Confirmatory Factor Analysis (CFA). The two factors were then subjected to CFA, to test the model fit of the factors. This was done using Analysis of a Moment Structure (AMOS). The estimates derived from CFA for each of the items were more than 0.5. The path diagram along with the standardized factor loadings are shown in Figure 6.1.

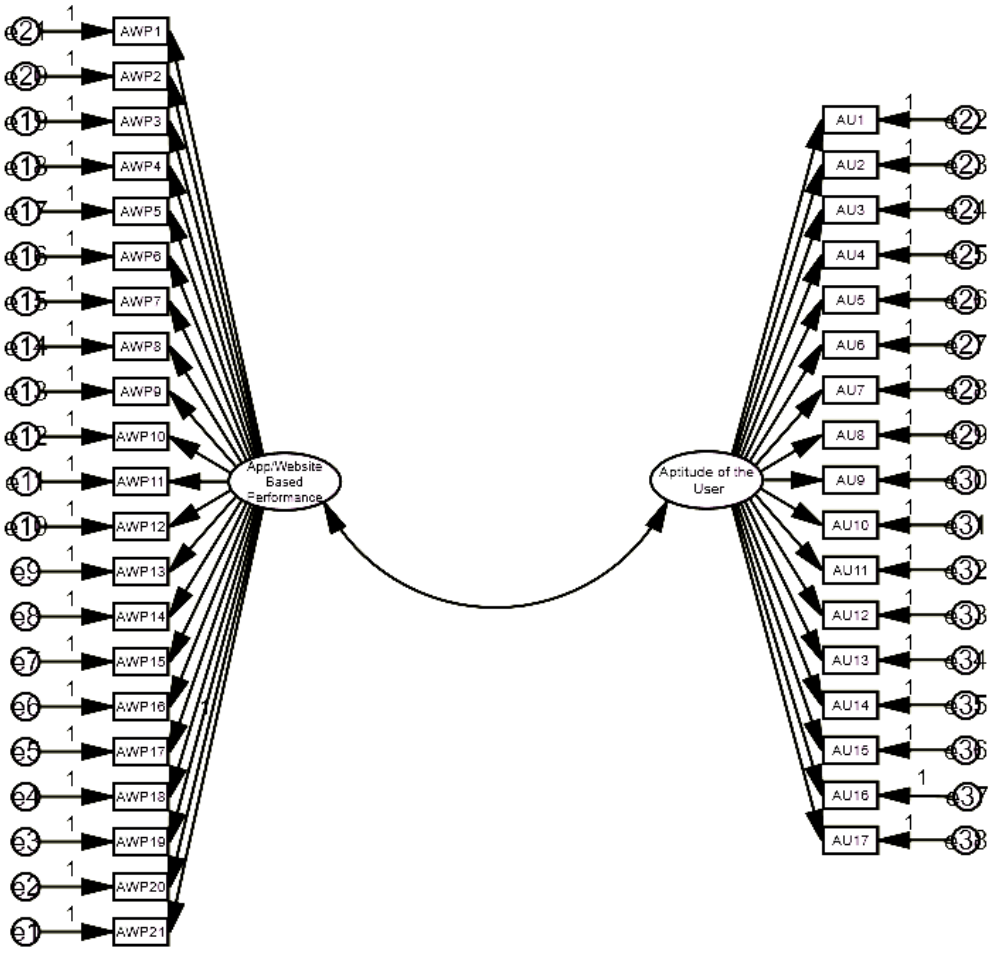

Figure 6.1: Path Diagram

6.2.1 Model Fit Indices:

The model fit indices are shown in Table 6.3. The CMIN/DF (Chi-square minimum/degree of freedom) indicates the difference between the observed and expected covariance matrix. The value of CMIN/DF derived from the study is 4.55. A value less than 5 is considered to be a reasonable fit for CMIN/DF as identified by Marsh & Hocevar, (1985). The Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI) values range from 0 to 1. The GFI and AGFI value derived is 0.806 and 0.8 respectively. Researchers Baumgartner & Homburg, (1995) considered a value of 0.8 and above to be acceptable in a large dataset. The CFI (Comparative Fit Index) and Tucker-Lewis Index (TLI) values were more than 0.9, which is the accepted value. The Root Mean Square Error of Approximation (RMSEA) value derived is 0.069, and a value less than 0.08 is considered

to be acceptable. The standardized RMR (Root Mean Square Residual) value derived was below 0.05, which is considered to be acceptable. The values derived are shown in Table 6.3.

Table 6.3: Model Fitness Indices

Index	**Value**
CMIN/DF	4.55
GFI	0.806
AGFI	0.80
CFI	0.911
TLI	0.906
RMSEA	0.069
Standardised RMR	0.0320

Overall the model can be considered to have a good fit. This was followed by conducting validity and reliability test.

6.2.2 Validity Test:

A validity test can be defined as an evaluation of the capability of an instrument to measure a particular construct. The validity of the model derived in CFA is measured. The three major validity tests that are conducted to measure the overall validity are:

1. Content Validity
2. Construct Validity
3. Nomological Validity

6.2.2.1 Content Validity:

Content Validity is the degree to which the contents of the items appropriately represent the universe of all relevant objects being studied. This indicates that the content of the

phenomenon has been adequately and thoroughly described by the researcher. This is not measured using quantitative measures.

Three rounds of the Delphi technique were conducted and three separate structured questionnaires were designed for each of the rounds. This was done to verify the variables which were identified through a literature review. For conducting this technique a total of 7 banks were selected (Refer 5.2)

A total of 10 bank officials were selected for the Delphi process from the selected banks. The bank officials were informed beforehand, that the response would be kept confidential and that the process would include more than two rounds. The responses received by the bank officials helped in refining the questionnaire to be used for the study.

6.2.2.2 Construct Validity:

Construct Validity helps in analysing if the set of items observed reflects the construct that is to be measured. Construct Validity has two main components – Convergent Validity and Discriminant Validity. Fornell & Larcker, (1981), has suggested a procedure to measure the two components, which has been discussed below-

a. **Convergent Validity**: It is defined as "the extent to which the two measures are correlated within the same construct" (Hair, et al., 2012). For this purpose two criteria are checked, namely AVE and factor loadings. The Average Variance Extracted (AVE) values were calculated and the formula for the same is given below-

$$\text{AVE} = \frac{\sum \lambda^2}{n}$$

Where,

λ = standardised factor loadings

n= total number of items

Those factor loadings that were calculated to be greater than 0.5 are deemed acceptable. Further, the Composite Reliability (CR) value was also calculated for the two factors. A

CR value of more than 0.6 is considered to be acceptable. The formula to calculate CR is –

$$CR = \frac{(\sum \lambda)^2}{(\sum \lambda)^2 + (\sum \epsilon)}$$

Where,

λ = standardised factor loadings

ϵ = variance of the error term (1- λ^2)

The Average Variance Extracted (AVE) and composite reliability coefficients are indicators used to evaluate the quality of a measurement tool. The AVE specifically quantifies the proportion of variability captured by a construct in comparison to the variability caused by measurement inaccuracies. In simpler terms, AVE helps determine how well a measure aligns with the underlying concept it is meant to assess (Fornell & Larcker, 1981). This means that a higher AVE value indicates better convergent validity, which means that the measure is effectively capturing the intended construct rather than being influenced by measurement error.

Composite Reliability is a metric that assesses how consistent the items in a scale are in measuring a particular construct. In other words, it gauges the degree to which the items in a measurement tool work together effectively. According to Netemeyer, et al., (2003), composite reliability is a valuable tool in evaluating the reliability of a set of observed variables used to represent an underlying, unobserved construct.

To calculate the Composite Reliability for a construct, one can add up the squares of the standardized factor loadings for each item are added and then divided by the total of the variance of the error term for those items. This calculation provides a measure of the shared variance among the observed variables, which serves as an indicator of the reliability of the latent construct they are meant to represent. In essence, a higher composite reliability score signifies greater internal consistency and reliability in the measurement of the construct. Table 6.4 below displays the factor loadings of the items, and the calculated AVE and CR values for each variables.

Table 6.4: AVE & CR values

FACTORS	FACTOR LOADINGS	AVE	CR
APP/WEBSITE BASED PERFORMANCE (AWP)		0.768	0.968179
AWP1	0.642		
AWP2	0.685		
AWP3	0.580		
AWP4	0.592		
AWP5	0.601		
AWP6	0.581		
AWP7	0.717		
AWP8	0.720		
AWP9	0.616		
AWP10	0.684		
AWP11	0.613		
AWP12	0.614		
AWP13	0.628		
AWP14	0.617		
AWP15	0.702		
AWP16	0.807		
AWP17	0.756		
AWP18	0.607		
AWP19	0.521		
AWP20	0.618		
AWP21	0.627		

APTITUDE OF THE USER (AU)		0.647779	0.968891
AU1			
AU2	0.559		
AU3	0.635		
AU4	0.773		
AU5	0.677		
AU6	0.690		
AU7	0.755		
AU8	0.749		
AU9	0.600		
AU10	0.688		
AU11	0.741		
AU12	0.646		
AU13	0.658		
AU14	0.754		
AU15	0.641		
AU16	0.621		
AU17	0.732		
	0.669		

The AVE scores above 0.5 are accepted in testing the validity of the factors. The AVE values derived for both factors are more than 0.5. It is recommended (Hair, et al., 2012) that the reliability of a construct be at least 0.70. The CR value derived for both factors is more than 0.9. Thus, the AVE and CR value derived denotes that the construct validity holds good for the factors.

b. **Discriminant Validity:** The degree to which the results of one particular measure do not correlate with the results of other variables that are conceptually distinct is what is meant by the term "discriminant validity." It was defined by Hair et al. (2012) as the degree to which two notions that are conceptually similar are distinct from one another.

An examination of the AVE is necessary in order to determine the discriminant validity of the scale. According to Fornell and Larcker, the discriminant validity can be inferred to be true if the square root value of the AVE of a particular variable is greater than the correlation of that variable with each of the other variables that make up the scale. This is one of the conditions that must be met for the discriminant validity to be valid (1981). The correlation between the items is displayed below in Table 6.5, along with the square root of the AVE score for each measurement.

Table 6.5: Squared root AVE Scores

Variables	**AWP**	**AU**	**Squared root AVE**
AWP	1	0.914	0.876
AU	0.914	1	0.805

It can be seen from Table 6.5 that the Squared root AVE of both the variables are above 0.8 indicating a strong correlation among the variables.

6.2.2.3 Nomological Validity:

This form of validity can be described as the extent to which the scale can make correct predictions about other concepts within the same theoretical model (Hair et al., 2012). The nomological validity of the scale can be determined if there is a positive and significant correlation between the variables. This would establish the scale's nomological validity.

Table 6.6: Correlation among the variables

Variables	**AWP**	**AU**
AWP	1	0.914
AU	0.914	1

The nomological validity can be measured by analysing whether or not the correlations between the various constructs in the model have a possible linkage as is expected in the model. The correlation factors of the variables that have positive values that are significant at the.01 level are displayed in Table 6.6. These values indicate that nomological validity has been established.

6.3 Overview of the results derived in this chapter:

The first objective of the study was to determine the factors to measure the service quality of online banking services. For this purpose, the items of the study were subjected to EFA. As a result of EFA, two factors were produced which were named – App/Website Performance (AWP) and Aptitude of the User (AU). All the assumptions required to conduct EFA were fulfilled and the reliability of the two factors were calculated using Cronbach's Alpha value. With scores above 0.9, the results indicated that there exists relatively high internal consistency. EFA was followed by CFA to test the model fit of the factors. The values of the model fitness indices derived in this chapter were within an acceptable range and were considered to have a good fit. To check the validity of the model three validity tests were conducted namely – Content Validity, Construct Validity, and Nomological Validity. All three validity tests were conducted and the results established the existence of all the aforementioned validity.

Service Quality of online banking is based on some of the characteristics of the app/website such as proper functioning of the app/website, service assistance, response time, etc. It is also affected by the personal characteristics of the user such as intention of the consumer to use it, educational qualification of the consumer, access to technology, etc.

Reference:

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