

A DISCUSSION ON THE METHODOLOGICAL USAGE OF FACTOR ANALYSIS IN SERVQUAL STUDIES: SOME IMPLICATIONS OF AN EMPIRICAL STUDY OF EXPORT CREDIT AGENCY IN TURKEY

Sibel DİNÇ AYDEMİR¹
G. Mine GERNİ²
Erdal ŞEN³

ABSTRACT

This paper aims to discuss the different results of factor analysis used to test construct validity and reliability in SERVQUAL studies, considering the fact that our study measuring service quality of Turk Eximbank, export credit agency in Turkey, resulted in more different -but not unusual- findings than those proposed by the designers of the model. These controversial results observed in both our study and various service quality investigations directed us to look more closely into this issue. As Collier and Bienstock (2009) claimed, service quality can be well represented as a formative construct although it is treated as a reflective construct by the traditional approach. It makes us consider again on the SERVQUAL model specification since the results of factor analysis in service quality studies are diverse from originally designed construct proposed by Parasuraman et al. (1985/1988). Hence, this paper entails a discussion of factor analysis and its results in SERVQUAL studies. Perhaps, it might be beneficial to ruminate whether SERVQUAL model is specified by a formative construct or not. Accordingly, alternative validity tests other than, or contributing to, factor analysis can be more appropriate for SERVQUAL model.

Keywords: service quality; SERVQUAL; export credit agency; formative models; reflective models.

¹ Sibel DİNÇ AYDEMİR Gebze Institute of Technology, Kocaeli, Turkey

² G. Mine GERNİ Marmara University, Istanbul, Turkey

³ Erdal ŞEN Gebze Institute of Technology Ph. D. Student, Kocaeli, Turkey

SERVICE QUALITY

According to Parasuraman et al. (1985), it is hard to measure service quality by using single measurement or variable since services have three distinct properties: intangibility, heterogeneity and inseparability. Carman (1990) also stated that service quality has been elusive concept to conceptualize and to measure owing to service intangibility, the problems related to simultaneous production-consumption and the difference between mechanistic and humanistic quality. Hence, researchers have thought that identifying some factors or dimensions enables service quality measurable. Sasser et al. (1978) have approached service performance from three different dimensions: (i) levels of material, (ii) facilities, and (iii) personnel. On the other hand, Grönroos (1984) has claimed that service quality has two main factors: technical quality, considered as physical product of service, and functional quality, the form of how service is delivered. Juran (1986) has emphasized on five factors of service quality concept. These are known as internal quality, hardware quality, software quality, time promptness and psychological quality.

Parasuraman et al. (1985) considered service quality as a ten dimensional construct: tangibility, reliability, responsiveness, competence, access, courtesy, communication, credibility, security and understanding/knowing the customer. In another study (1988), they classified service quality in five dimensions as tangibility, reliability, responsiveness, assurance, empathy as they observed some strong correlations among these ten factors and they developed SERVQUAL that is most widely used instrument in measuring service quality. This scale is grouped into two parts as expectations and perceptions and each part has 22 items.

Babakus and Boller (1992) stated that it is questionable to generalise this instrument to the whole service sector. But, the criticism made by Cronin and Taylor (1992) can be deemed as most important one directed to SERVQUAL. In their study, they based their criticism on that it is not necessary to measure expectations and that SERVQUAL is not feasible for all industries in the service sector and that perceived service quality has not so impact as customer satisfaction on purchasing intention. Whereas, most of the researchers investigating service quality used SERVQUAL scale.

There are a great many studies examining service quality of service organizations in the variety of sectors such as (i) banking-finance sector (Sharma and Mehta, 2004/2005; Chen and Chang, 2006; Hossain and Leo, 2009; Kuo, 2010; Lee and Hwan, 2005; Bülbül and Demirer, 2008; Yılmaz et al., 2007; Çiftçi and Aytakin, 2010; Altan and Atan, 2004), (ii) healthcare sector (Zerenler and Öğüt, 2007; Rahman et al., 2007; Kara et al., 2005; Choi et al., 2005; Canel and Fletcher, 2001), (iii) shipping and traveling sector (Okumuş and Asil, 2007; Çelik, 2009; Alniaçık and Özbek, 2008; Ruiqi and Adrian, 2009; Filiz, 2010), (iv) entertainment sector (Yu and Huang, 2006; Gençer et al., 2008), (v) telecommunication sector (Kang, 2006), (vi) libraries (Zakaria et al., 2009), and also (vii) voluntary agencies (Vaughan and Shiu, 2001), (viii) agencies targeted at aging population (Kuilboer, 2010), (ix)

maintenance and hairdressing services (Fullerton and Taylor, 2002), (x) online service sector (Yang and Fang, 2004), (xi) universities (Gürbüz and Ergülen, 2006).

FACTOR ANALYSIS IN SERVICE QUALITY

Factor analysis is an interdependence technique whose fundamental purpose is to describe the underlying structure among the variables subject to analysis and it facilitates analyzing the structure of correlations among a great number of variables by forming a set of variables which are highly interrelated, namely *factors* (Hair et al., 2010). Moreover, this technique has two uses other than describing the underlying structure among a set of variables: (1) to construct a questionnaire to measure a variable (e.g. learning), (2) to reduce a data set while maintaining as much of the original information as possible (Field, 2009).

More importantly, factor analysis is one of the ways to test construct validity which is defined in general as the extent to which a construct measures that is supposed to measure (Bagozzi, 1991). For researchers to continue their analysis, their constructs must prove valid. This analysis has been most frequently used in almost all fields in social sciences.

One of these fields using factor analysis as a way of validating constructs is service quality. Though widely used constructs, in these service quality studies, factor analysis have been employed in order to test construct validity. But, when examined, there appear nonignorable differences especially in both usage and results of factor analysis in service quality studies. In some studies, it is reported that factor analysis was done but its results are never mentioned (Sharma and Mehta, 2004/2005; Altan and Atan, 2004; Okumuş and Asil, 2007). As for some other studies, it is seen that factor analysis was not employed (Rahman et al., 2007; Çiftçi and Aytakin, 2010; Canel ve Fletcher, 2001; Zerenler ve Öğüt, 2007; Ruiqi and Adrian, 2009).

On the other hand, the results in some studies which even employed factor analysis are very different from originally designed SERVQUAL construct. Filiz (2010) stated that the factor analysis extracted six factors, whereas also Nitecki (1996) mentioned that the factor loadings in his study differentiate from those proposed by who originally designed SERVQUAL scale. In other words, there are three factors extracted not five as Parasuraman et al. (1988) proposed.

Table 1 presents a summary of studies using SERVQUAL, which we mentioned above.

Table 1. A Summary of SERVQUAL Studies

Study	Measurement	Analysis	Factors
Nitecki (1996)	Modified version, 5 dimensions, 22 items	Exploratory factor analysis, Reliability analysis	Three factors
Yılmaz et al. (2007)	Modified version, 7 dimensions, 35 items,	Only reliability analysis (Cronbach's Alpha)	
Bülbül and Demirer (2008)	Original 22 items, 5 dimensions	Exploratory and confirmatory factor analysis, Reliability analysis	Five factors
Hossain and Leo (2009)	Modified version 18 items, four dimensions	Only reliability analysis (Cronbach's Alpha)	
Kuo (2010)	five dimensions, 34 items	Factor analysis and reliability analysis (Cronbach's Alpha)	Five factors
Çiftçi ve Aytekin (2010)	Five dimensions, 22 items	No factor analysis, Reliability analysis	
Canel and Fletcher (2001)	Modified version, five dimensions, 22 items	No factor analysis, Reliability analysis	
Choi et al. (2005)	Modified version, 30 items	Confirmatory factor analysis, Reliability analysis	Four factors
Kara et al. (2005)	Modified version, 6 dimensions, 34 items	Confirmatory factor analysis	Six factors
Rahman et al. (2007)	Modified version, 5 dimensions, 15 items	No factor analysis, Reliability analysis	
Alnıaçık ve Özbek (2008)	Modified version, 5 dimensions, 55 items	Exploratory factor analysis (PCA), Reliability analysis	Number of factors is fixed to five.
Ruiqi and Adrian (2009)	Modified version, 5 dimensions, 22 items	No factor analysis, Reliability analysis	
Zakaria et al. (2009)	Modified version, 3	No factor analysis,	

	dimensions, 25 items	Reliability analysis	
Yu et al. (2006)	Modified version	No factor analysis, Reliability analysis	
Vaughan and Shiu (2000)	Modified version, original 10 dimensions, 40 items	Exploratory factor analysis	Ten dimensions, multi- item scale (ARCHSECRET) modified for voluntary sector with 27 items
Filiz (2010)	Modified version, five dimensions, 26 items	Exploratory factor analysis, Reliability analysis	Six factors
Altan and Atan (2004)	Modified version, 5 dimensions, 22 items	Factor analysis was used but its results are not mentioned	Five factors

As seen from the table, SERVQUAL describing service quality as a 5-dimensional construct seems to have some methodological shortfalls since dimensionality of service quality can depend on the type of services under study (Babakus and Boller, 1992). Carman too (1990) reported that the SERVQUAL dimensions proposed by their original designers are not completely generic. Also, their factor analysis focused on items regarding the perception of quality whereas Parasuraman et al. reported on the factor analysis of the difference between items of expectations and items of perceptions.

Parasuraman et al (1994) stated that the measure of perceptions-only (SERVPERF) must be used if the major goal is to explain the variance in any dependent construct and that the measure of perceptions-minus-expectations difference score (SERVQUAL) is appropriate if the major goal is to identify properly service inadequacies.

These arguments may justify the differences especially in both usage and results of factor analysis in the studies on various services. Or, these differences may stem from some shortfalls of model misspecification (Collier and Bienstock, 2009).

Formative and Reflective Measurement Models

Measurement practices in marketing and business research base traditionally on reflective measurement, in which observed measures or indicators reflect variation in latent constructs although formative measurement gains increasing attention as an alternative measurement approach

(Diamantopoulos, 2008). Contrary to reflective measurement, the direction of causality is from the indicators to the construct, meaning indicators constitute the construct.

The table below manifests the fundamental differences between formative and reflective model.

Table 2. Differences between Formative and Reflective Indicators (Roberts and Thatcher, 2009)

Concept	Formative Indicators	Reflective Indicators
Causality	Indicators cause the construct (Blalock, 1971). In other words, indicators or measures constitute the construct (Fornell and Bookstein, 1982).	The construct causes indicators (Bollen, 1989)
Interchangeability	By excluding an indicator, a part of the construct too is excluded (Bollen and Lennox, 1991).	Excluding an item causes no changes in the construct (Little et al., 1999).
Validity	Correlations are not defined by the measurement model because indicators are exogenous (Bollen, 1989).	Validating indicators can be evaluated by the measurement model (Bagozzi et al., 1991).

The depiction of reflective and formative measurements can enable the comprehension of the differences in question:

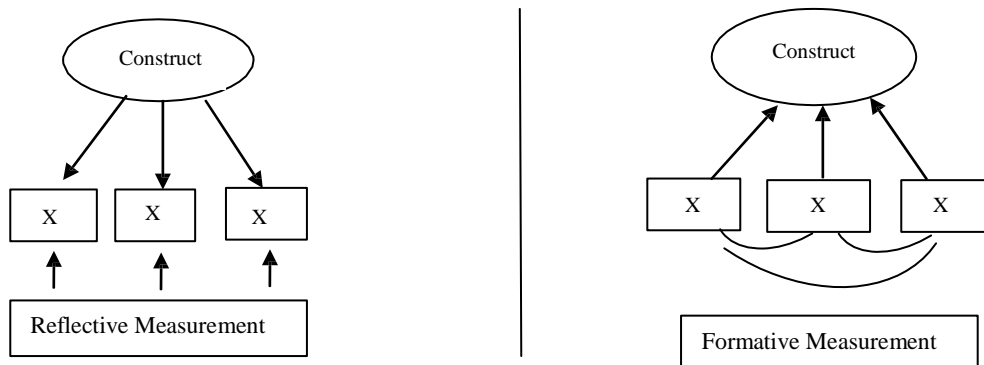


Figure 1. Reflective Versus Formative Measurement Models (Diamantopoulos et al., 2008)

As a consequence of formative construct characteristics, traditional methods to evaluate the validity and reliability of scales comprised of reflective indicators are inappropriate for those with

formative indicators (Roberts and Thatcher, 2009). They also added that one way to assess the validity of a formative construct is by including some reflective indicators to the model.

Additionally, Collier and Bienstock (2009) argued that service quality can be well represented as a formative construct although it is treated as a reflective construct by the traditional approach.

Moreover, Bagozzi (1994) stated that construct validity is not meaningful when indicators form the construct-formative construct.

Freeze and Raschke (2007) stressed that construct validation through confirmatory factor analysis and reliability testing is appropriate for reflective measures and the strength of the path coefficient from indicators to the construct must be evaluated for formative model validation.

So, it would be fair to consider again before applying factor analysis for validating the SERVQUAL scale. According to Diamantopoulos (2006), the variance of error term can be used as a manifestation of construct validity. On the other hand, it is suggested (1) placing formative constructs within a larger model and (2) determining at least two paths from the formative construct to the reflective one if it is supposed to identify a model with formative construct and still to assess its validity through the classical test theory (i.e. factor analysis and Cronbach's Alpha reliability analysis) (MacCallum & Browne, 1993).

RESEARCH METHODOLOGY

In our field research aiming at measuring service quality of Turk Eximbank (Aydemir, 2011), which is the official export credit agency of Turkey, SERVQUAL model of Parasuraman was used. Accordingly, a 22-item scale, based on the work of Parasuraman et al. (1986, 1988) was adopted to reflect exporting firm's expectations and perceptions regarding Eximbank's services.

The model in this research is presented on Figure 2:

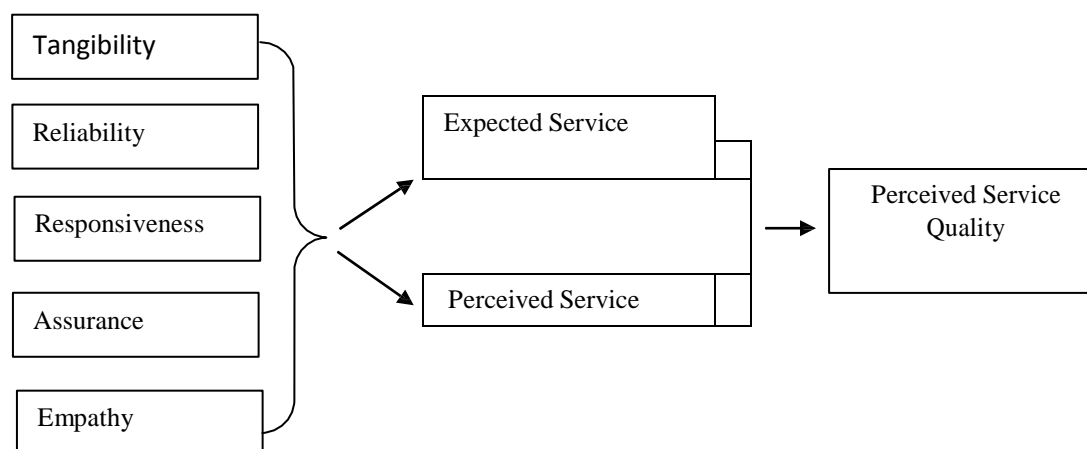


Figure 2. Research Model.

A survey conducted from August to November in 2010 and 'First 1000 Exporters Lists' (Turkish Exporters Assembly, 2010) was used in the selection of the the study sample. 706 of those, customers of Turk Eximbank, agreed to participate in the research. A questionnaire was sent to these exporting firms via e-mail. 127 of those firms responded, meaning that the response rate was almost 18 %. At first, the employees working in foreign trade or finance departments of these firms are interviewed, and then e-mail form of survey was sent to these people.

For data analyses, SPSS 18.00 was employed. To mention about sample characteristics firstly; there are 25 firms in textile, ready-made clothing, footwear and leather, 12 firms in automotive and automotive supply industry, 17 firms in food, agriculture and stockbreeding, 5 firms in chemical-dyeing industry, rubber and plastic products, 23 firms in mining, metal (main and supply) industry, 4 firms in foreign trade companies operating in multiple sectors, 3 firms in construction business and engineering, 8 firms in machine and equipment industry, electrical appliances, 30 firms in other sectors. 75% out of firms consisted of those having employees less than 500. Most of the employees participated in the research had positions in middle level management.

Then, the principal components analysis with varimax rotation method was used in order to test construct validity and reliability. The factor analysis of our field research has given a different solution as contradictory with our study but consistent with the literature. In other words, the observed measures have not loaded on five factors as Parasuraman et al. (1988) proposed. Expectations and perceptions are seperately analysed for validating purposes. Then, the observed data validated three and four factors respectively for expectations and perceptions with total explained variance 73,64 % and 73,67 %. Also, some items were cross-loaded and it was observed that one factor consisted of only one item. Furthermore, the items loading on the factors were far from the structure proposed theoretically. The results of factor analysis mentioned were depicted in Table 3 and 4 below.

Table 3. Factor Analysis Results (Expectations)

Items	Factor 1	Factor 2	Factor 3
E1. They should have up-to-date equipment.	0,824		
E2. Their physical facilities should be visually appealing.			0,823
E3. Their employees should be well dresses and appear neat.			0,669
E4. The appearance of the physical facilities of these firms should be in keeping with the type of services provided.	0,720		
E5. When these firms promise to do something by a certain time, they should do so.	0,892		
E6. When customers have problems, these firms should be sympathetic and reassuring.	0,848		
E7. These firms should be dependable.	0,832		
E8. They should provide their services at the time they promise to do so.	0,892		
E9. They should keep their records accurately.	0,896		
E10. They should not be expected to tell customers exactly when services will be performed. (-)	0,770		
E11. It is not realistic for customers to expect prompt service from employees of these firms. (-)	0,501	0,590	
E12. Their employees don't always have to be willing to help customers. (-)	0,663	0,544	

E13. It is okay if they are too busy to respond to customer requests promptly. (-)	0,508	0,668
E14. Customers should be able to trust employees of these firms.	0,531	0,580
E15. Customers should be able to feel safe in their transactions with these firm’s employees.	0,683	0,540
E16. Their employees should be polite.	0,708	0,509
E17. Their employees should get adequate support from these firms to do their jobs well.	0,761	
E18. These firms should not be expected to give customers individual attention.(-)		0,707
E19. Employees of these firms cannot be expected to give customers personal attention. (-)		0,725
E20. It is unrealistic to expect employees to know what the needs of their customers are. (-)		0,614
E21. It is unrealistic to expect these firms to have their customers’ best interests at heart. (-)		0,710
E22. They should not be expected to have operating hours convenient to all their customers. (-)		

Table 4. Factor Analysis Results (Perceptions)

Items	Factor 1	Factor 2	Factor 3
E1. They should have up-to-date equipment.	0,824		
E2. Their physical facilities should be visually appealing.			0,823
E3. Their employees should be well dresses and appear neat.			0,669
E4. The appearance of the physical facilities of these firms should be in keeping with the type of services provided.	0,720		
E5. When these firms promise to do something by a certain time, they should do so.	0,892		
E6. When customers have problems, these firms should be sympathetic and reassuring.	0,848		
E7. These firms should be dependable.	0,832		
E8. They should provide their services at the time they promise to do so.	0,892		
E9. They should keep their records accurately.	0,896		
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E20. It is unrealistic to expect employees to know what the needs of their customers are. (-)		0,614
E21. It is unrealistic to expect these firms to have their customers' best interests at heart. (-)		0,710
E22. They should not be expected to have operating hours convenient to all their customers. (-)		

As mentioned before, these results were not rare for service quality-SERVQUAL specifically-studies. Nitecki (1996) stated that various replication studies measuring library service quality presents a challenge to a five dimensional SERVQUAL scale.

CONCLUSION

This paper discusses the methodological usage of factor analysis in SERVQUAL studies, especially those used SERVQUAL scale. Some studies validate five dimensional SERVQUAL scale whereas other studies reached different number of factors, namely far from originally designed. Furthermore, it is seen that several studies have applied no validating tests (i.e. factor analysis).

These differences are not unusual for SERVQUAL measurements and may stem from model misspecification. In social sciences, reflective models have mostly been used by researchers whereas models may be specified as formative as well as reflective. Some researchers suggest that SERVQUAL may be well represented by a formative model in contrary to conventional reflective model. On the other hand, it would be better for researchers to understand adequately the conceptual differences between these two models. Otherwise, they may have problems on how that construct is measured.

If SERVQUAL is supposed to be represented by a formative model, then alternative methods are needed to measure this construct.

When any researcher views SERVQUAL as a formative construct and still wants to assess its validity through classical test theory (construct validation through factor analysis and reliability testing through Cronbach's Alpha), then SERVQUAL scale being a formative part of whole model can be used like a mediator having paths to reflective construct (MacCallum & Browne, 1993).

To sum up, the researchers should recognize the differences between a formative and reflective constructs. Also, it might be beneficial to ruminate whether SERVQUAL model is specified by a formative construct or not. If it is, we had better consider alternative validation tests other than factor analysis. We tried to discuss the methodological usage of factor analysis as a validation test in SERVQUAL studies since we encountered various different practices and findings in these studies. Hence, this discussion paper on a introductory basis could shed light new research fields for the future. Any study can investigate which validation methods other than factor analysis could be used for SERVQUAL model. Or, researchers may repeat the studies in which they approached SERVQUAL as a formative construct and in the long run it could be clarified that which construct type represents SERVQUAL well.

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