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Study on the factors affecting customer purchase activity in retail stores by confirmatory factor analysis

Estudio sobre los factores que afectan la actividad de compra de los clientes en las tiendas minoristas mediante el análisis factorial confirmatorio

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ABSTRACT:

This paper tries to study impact of socioeconomic profile of respondents' influence variables like store image, customer loyalty & satisfaction in terms of price, quality, loyalty, customer care, payment preference and factors which influence the purchasing power of consumers through confirmatory factor analysis(CFA) which is done by R language, where factor structure is assessed through chi-square statistics. It is found that certain relationships for consumer profile, price, image appears to be significant in terms of purchasing behaviour. This study is an extension of previous study based on EFA & it uses the output of exploratory factor analysis for its result.

Keyword: Store image, Customer satisfaction, Customer Loyalty, Retail Store

RESUMEN:

Este trabajo intenta estudiar el impacto del perfil socioeconómico de las variables de influencia de los encuestados como imagen de tienda, fidelidad y satisfacción del cliente en términos de precio, calidad, lealtad, atención al cliente, preferencia de pago y factores que influyen en el poder adquisitivo de los consumidores a través del análisis factorial CFA) que se hace por lenguaje R, donde la estructura del factor se evalúa a través de las estadísticas de chi-cuadrado. Se encuentra que ciertas relaciones para el perfil del consumidor, el precio, la imagen parecen ser significativas en términos de comportamiento de compra. Este estudio es una extensión de un estudio previo basado en EFA y utiliza el resultado del análisis factorial exploratorio para su resultado.

Palabra clave: imagen de la tienda, satisfacción del cliente, lealtad del cliente, tienda minorista

1. Introduction

The customers process information at their own end and approval retail stores to have them materialize. They approach different stores to explore product views and to ship in order to fulfil their needs and desired requirements. They also update themselves about offers and enjoy good brand portfolio. The particular behaviour of selecting a particular retail outlet depends on certain behavioural

parameters influenced by reference group, culture, family etc. Here store-image is a major input apart from shopping experience factors which help in patronizing the behaviour. Apart from their traditional factors with the dynamic change in factors like money and luxury it is essential for consumers to evaluate retail stores along with their terms.

Economic provides impetus for customer's change in demand patterns. The psychology, lifestyle of individual is affected by liberalized economy, information flow, technical change, improving literacy, income growth. All this combining impact on individuals purchasing and consumption behaviour. As a result of which the dramatic change that retail industry in India has gone through. So due to sudden booming industry gains, big retails are in a competition to keep loyal customer into their kitty. So, they want to make the customer loyal. So, customer patronization is the theme of retail industry in India.

India has vast middle class and almost untapped retail industry are the key attractive faces for global retail giants want to enter into newer markets, which in turn will help the India Retail Industry to grow faster.

A large young working population with average age of 24yrs, nuclear families in urban areas, along with increasing working women population are some factors which are attracting newer businessmen to enter the India Retail Industry. The factor of Indian Retail Industry looks maximizing. Purchasing power of Indian urban consumer is growing and branded merchandise in various categories like lifestyle products that are widely accepted by urban India consumer. So focus of customer patronization in depending on branding of retail houses where they are keen to provide values and quality product to the consumers. This customer value providing capacity is the sustainable competitive advantage to the retail stores. As Retail accounts for nearly 10% of country's GDP and around 8% of total employment, retailing in India is on a booming scale.

The trends that are driving the growth of retail sector in India are: -

- Low share of Organising Retailing.
- Falling Real Estate Price.
- Increase in disposable income and customer aspiration.
- Increase in expenditure for luxury items.

The retailing diaspora in India is fast developing as shopping malls are continuously becoming familiar in large cities. When it comes to development of retail space specially the malls, the Tier II units are no longer behind the race. State Govt. of Odisha is giving facilities to many retail houses to bring out their establishment in Bhubaneswar. India is being seen as a potential goldmine for retail investors from over the world and latest research has rated India as top destination for an attractive emerging retail market. Even though India has well over 5 million retail outlets, the country severely lacks the facility that can resemble a good retail house of international repute.

The organized retail sector is expected to grow stronger than GDP growth in India. Retailing has seen such a transformation over the past decade that its very definition has undergone a sea change. Retail today has changed from selling a product or service to selling a hope, an aspiration and above all an experience that a consumer would like to repeat.

For manufacturers and service providers the emerging opportunities is urban market is to capture and deliver better value to the customers through Retail. In test of time and investment, innovative concepts and models will survive. So, specialist retailers who are specialized by use of modern management technology backed with seemingly unlimited financial resources. Retailing in India is currently Rs. 20,238 billion and organized retail is Rs. 1,020 billion. For retail country things are now brighter and better. More challenges will come to the manufacturers and service providers when market power shifts to organized retail.

Retail sector provided phenomenal inputs to the productivity of goods and services in a larger extent. So the most developed countries, retail sector in the driving force for economy. Here in India, retail industry has come forth as one of the most dynamic and fast paced industry. Day by day new ventures are going the bandwagon of retail. The Indian Retail Industry is gradually itching towards becoming the next boom industry.

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2. Review of literature

The literature review that was undertaken served to provide a theoretical base in order to develop and justify the research initiative. The purpose of this chapter is to carefully examine existing literature

associated with the topic of research. By providing a review of literature, the researcher attempts to not only explain the need for the proposed study but also to appraise the shortcomings and gaps in previous studies. Furthermore, a literature review aids in making the researcher aware of the current progress in the area of study and offers possible insights into the problem statement. As described in the introduction to the thesis, the objective of the current study is to understand the role of different factors in influencing the buying behavior and decision–making of consumers. The following objectives were addressed through the review…

- To understand the role of shoppers buying behaviour in shoppers decision-making.
- To describe the various dimensions of store image and the role store image plays is shaping shoppers' satisfaction and store loyalty.
- To investigate the role and significance of satisfaction and how it influences store loyalty.

An overview of literature highlighting the importance of store image in consumer behaviour that was studied to address these objectives follows. A review of the dimensions of store image is done to better understand the concept. The relationship between store image and shoppers' satisfaction level and the store loyalty is discussed. The influence of shopper satisfaction on store loyalty is studied in the final section.

2.1. Store Image, Customer Satisfaction & Store loyalty

2.1.1. Store Image: Store image is an important marketing tool for retailers because a better image means greater customer flows, fewer walkouts and thus more customer spending each time they visit (Davies and Brooks, 1989). On the other hand, store image is crucial because consumers' decisions on where to shop depend on their perceptions of the available shopping alternatives (Oppewal and Timmermans, 1997). The importance of store image is quite high in the choice of the store because the shopper seeks the store whose image is most congruent with the image he/she has of him/herself with his/her vision of the world and lifestyle (Martineau, 1958). Thus, store image becomes a key factor determining a retailer's strategy. Past research on store image has pointed out that numerous environmental variables of a store (e.g colour, layout, etc) affect consumers' perception of store image and that specific characteristics tend to be associated with high-image and low-image (Hutcheson and Mutinho, 1998). Baker *et* a!, (1994) argued that store environment indirectly influences store image through merchandise and service quality inferences.

We found that there are differences of definitions of store image according to scholars. But we can say that store image is an overall attitude of a consumer to the store, its attributes mean various things, and each store has a relative location in the consumer's mind.

Table 1.1
Definition of Store Image

Scholars	**Definition of store image**
Kunkel & Berry (1968)	Store image is built up through experience and totally conceptualized or expected strengthening that urge consumers to purchase at the specified store.
Oxenfeldt (1974)	Store image is a complex of attributes that consumers feel about the store and it is more than a simple sum of objective individual attributes since parts of attributes interact in consumers' minds.
Zimmer & Golden (1988)	Store image means a complex in total dimensions of store attributes that consumer feel and a complex means that store image consists of various attributes.
Berman & Evans (1995)	Store image consists of functional and emotional attributes, these are organized in the perceptual structures of purchasers, and the structures are expectation on overall policies and executions of retailers.

In general, store attributes are important to consumers when they make the decision of where to shop. Consumers form impressions about stores and these impressions have a significant impact on store patronage. In general, consumers patronise stores whose image is congruent with their self-perceptions and unconscious needs. Thus, store image and general attitudes toward the store can influence shopping behaviour (Darley and Su-Lim, 1999). Consumers prefer certain attributes to be present in the stores they choose to shop in (Erdem *et al,* 1999). The preferences for certain store attributes are explained by differences in consumer values. Store attributes are presented by retailers according to their specific functional strategies. Store attributes must be offered as are desired by the targeted consumers. The challenge to retailers isto determine which store attributes are relatively more important to the targeted consumer. Providing appropriated store attributes is not enough to satisfy consumers and guarantee store loyalty. Maintaining the quality of their attributes is the hardest and most critical task to survival in the competitive nature of retailing.

2.1.2. Dimensions of Store Image: The dimensions and properties of store image are depending on the purpose and objects of studies. Consumers make store images based on advertisement, commodities, transmission of words, and shopping experience (Assael 1992). Martineau (1958) indicated that store image consists of layout and architecture, symbols and colour, advertising and sales personnel. The following major dimensions are as follows: -

- Merchandise (including the sub-dimensions of quality, selection or assortment, styling or fashion, guarantees and pricing),
- Service (including the sub-dimensions of service-general, salesclerk service, self-service, ease of return, credit, delivery and phone orders),
- Clientele (including the sub-dimensions of social class appeal, self-image congruency and store personnel),
- Physical facilities (including the sub-dimensions of physical facilities, store layout, shopping ease and architecture),
- Convenience (including the sub-dimensions of convenience, locational convenience and parking),
- Promotion (including the sub-dimensions of sales promotion, advertising or display, advertising, trading stamps and symbols and colours),
- Store atmosphere (including the sub-dimensions of atmosphere or congeniality),
- Institutional (including the sub-dimensions of conservative/modern, reputation and reliability), and
- Post-transaction satisfaction. James *et al*. (1976) reduced these to only six dimensions, namely, assortment, personnel, atmosphere, service, quality and price.

2.2. Components of Store Image and Ways of Measuring Them

A study by Silva and Giraldi (2010) reviewed and summarized the various elements and sub-elements of store image, which are as follows

Table 1.2
Components of Store Image

Components	**Subcomponents**
Product Price	Low prices, competitive or satisfactory prices, uncompetitive or high prices
Product Quality	Good or bad quality and in-stock brands
Clientele	Characteristics of the customers that shop at the store
Assortment	Range, depth, sells brands that attract customers
Physical Premises	Cleanliness, layout, ease of buying and attractiveness
Product Style	Keeping up with the latest styles
Sales Staff	Attitude of the sale staff, knowledge of the sales staff, number of salespersons, good or bad service, friendliness

Location Convenience	Location near home or work, access, good or bad location
Other Items	Parking, open hours, general convenience, layout
Services	Credit, lay-away plan, delivery and other services
Sales Promotions	Special sales, coupons, special events
Advertising	Quality and style of advertising, media used, credibility of advertising
Store Atmosphere	Layout, lighting, temperature, visual communication, colors, size of sales area, outside and inside decoration, product display, crowding within the store, prestige
Policy on Refunds and Exchanges	Policy on refunds and exchanges
Institutional Aspects	Store reputation
After-sales	Level of satisfaction

***Source**: Adapted from Kunkel and Berry (1968), Lindquis (1974), James, et al. (1976), Birtwistle, Clarke and Freathy (1999), Ghosh (1990), and Hirshman, Greenberg and Robertson (1978).*

2.1.4. Customer Satisfaction Meeting the needs of customers and to create a favorable customer experience is one of the objectives of creating a specific store image. Producing customer satisfaction can result in achieving the long-term objectives of future profits and continued business sustainability. Furthermore, customer satisfaction enhances repetitive buying behavior and the buying of other goods at the same store (Chang and Tu, 2005). Chen-Yu and Hong (2002) found that the manner in which consumers spend their money is oriented towards increasing their satisfaction, a preferred consequence of a marketing plan. Moreover, not only does satisfaction reinforce the determination or resolve to repurchase, but also loyalty to a store (Patterson and Spreng, 1997; Bloemer, Kasper, and Lemmink, 1990; Kincade, Redwine, and Hancock, 1992).

Customer satisfaction is a reaction to anticipation, product functioning after buying, experience with the product, or experience during shopping. The reaction is a response from the assessment of requirements; between pre-buying anticipations, needs or models and the actual experience with shopping- and/or product (Bloemer and De Ruyter, 1998; Howard and Sheth, 1969). As a result, the satisfaction of customers hinges upon whether or not the beliefs contemplated before a shopping event are met (Juyal, 2012).

Customer satisfaction from the retail perspective can be broken down into three elements: satisfaction with shopping systems which encompasses convenience and category of outlet; satisfaction with buying systems which consists of the choice and actual buying of products; and satisfaction of consumes which is an outcome of the use of the product (Westbrook, 1987). Disappointment with any of these elements could result in customer disloyalty, reduced sales, and loss of market share. Three stages make up customer satisfaction: pre-sales (anticipation is about goods, services, advantages, cost, and availability); sales (customer encounters the store setting, goods, service, delivery, quality, etc.); and after-sales (when the customer anticipates maintenance or information, substitution or reimbursement, overhaul or employs the grievance process) (Juyal, 2012).

2.1.5. Store Loyalty. Dick and Basu (1994) classified customer loyalty into brand loyalty, vendor loyalty, service loyalty, and store loyalty. These definitions can further be categorized into a behavioral approach, an attitudinal approach, and a combined approach.

Early studies on loyalty were performed on particular brands which could be assessed from group data and consequently brand loyalty was understood largely to be a behavioral notion. Brand loyalty was also seen as a function of the purchasing history of customers (Kuehn, 1962). Another perspective was provided by Lipstein (1959) who suggested that brand loyalty was a function of the likelihood of the

buying of the same product or a function of time for a particular brand. Jacoby and Chestnut (1978) described loyalty as the prejudiced behavioral response of consumers in the selection of one among many options in a period of time and that it could be denoted as a function of the decision-making process.

Store loyalty, from an attitudinal perspective, can be understood as store partiality or psychological loyalty. Thus, it can be described as a positive attitude to a particular store and functionally it can be evaluated as the future likelihood of purchase (Juyal, 2012).

The behavioral and attitudinal approaches were combined by Dick and Basu (1994) who then described store loyalty as positive attitude and repeated buying of consumers so that the idea can be broadly comprehended. They asserted that their idea was suitable since both elements could be assessed. Neither positive attitudes nor repeated purchases singly can be essential and adequate specifications of store loyalty and both must be viewed together from the perspective of consumers.

2.1.5. Dimensions of loyalty The most common dimension of store loyalty is repurchasing behavior (Juyal, 2012). However, this is a limited perspective. Subsequently, more dimensions have been suggested. These dimensions are:

- Favorable word-of-mouth;
- An opposition to change;
- Associating with the service; and
- A partiality for a specific service provider

Favorable word-of-mouth implies that loyal customers become advocates for the service (Payne, 1993). Four variants of the advocacy notion can be recognized:

1. Offering favorable word-of-mouth (e.g., Zeithaml, Berry, Parasuraman, 1996; Andreassen and Lindestad, 1998).

2. Suggesting the service to others (e.g., Stum and Thiry, 1991).

3. Inspiring others to use the service (e.g., Kingstrom, 1983).

4. Supporting the virtues of the service provider (e.g., Kingstrom, 1983).

2.3. Relationship between Store Image and Store Loyalty

Two perspectives exist with regard to the relationship between store image and story loyalty. The first is that the attributes of store image directly affect store loyalty. The second is that store loyalty is influenced by store image itself. Martineau (1958) associated store image and store loyalty by asserting that store image affects store loyalty. On the other hand, Singson (1975) emphasized the attributes of store image and found that price and quality, followed by assortment, were the most significant attributes that influenced store loyalty. Another perspective was provided by Lessig (1973) who found that store loyalty is associated with store image when store image is gauged using store setting, products, costs, and promotions.

2.4. Relationship between satisfaction and store loyalty behavior

Earlier studies (e.g., Hallowell, 1996; Huddleston, Whipple and VanAuken 2003; Sivadas and Baker-Prewitt, 2000) have suggested that customer satisfaction favorably influences post-buying outlooks and intent to buy. As seen earlier, customer satisfaction is a product of the buying experience. A customer's favorable opinion of store characteristics can result in improved customer satisfaction. This in turn stimulates emotions and consequently results in favorable loyalty intents. Satisfied customers have a higher likelihood of remaining customers, whereas dissatisfied customers are likely to switch to competitors' sooner or later. Customers who remain generate higher revenues and margins per customer, in the long-term, than do lost or fresh customers (Best, 2012). Sivadas and Baker-Prewitt (2000) suggested that there is a favorable association between affective and conative loyalty. Customers are likely to have favorable opinions towards a specific store if satisfied with their purchases at that store. Consequently, they may recommend the store to friends and also return to it themselves for subsequent purchases.

2.5. Relationship between store image, customer satisfaction, and

store loyalty

Bloemer and De Ruyter (1998) suggested a connection between the image of a store, store selection, customer satisfaction, and store loyalty and determined that satisfaction is the outcome of a deliberate assessment of store image. The favorable assessment of store image results in store commitment, first, and then store loyalty. They also found that store image has a direct, favorable influence on store loyalty in addition to an indirect favorable influence on store loyalty through satisfaction. Thus, they found a favorable association between the three aspects and that the influence of store image is facilitated by satisfaction. A significant direct and indirect association between store image and store loyalty facilitate by customer satisfaction was also found by Chang and Tu (2005).

2.6. Nature & Scope of the Study

This study is descriptive in nature and conducted in two phases. The first phase dealt with developing an appropriate research framework with facts and theories accessed from literature survey on factors influencing store image, satisfaction and loyalty in retail stores in general and department stores in particular. The aim is to develop the framework, which will then be used to serve meeting the research objective and sub objectives.

The second phase of the study is an empirical study of departmental stores through the shoppers. The research approach would be Survey Research, through structured questionnaire and Interviews. The standardized and validated questionnaire has been adopted after due pilot testing

This study is limited in its approach. The shopper buying behavior, store factors, satisfaction and loyalty are being examined only in the context of department stores specifically in Odisha including Bhubaneswar, Cuttack, Sambalpur & Rourkela. Selected department stores namely Vishal mega mart, Big Bazar, Pantaloons, Central, are included in the study.

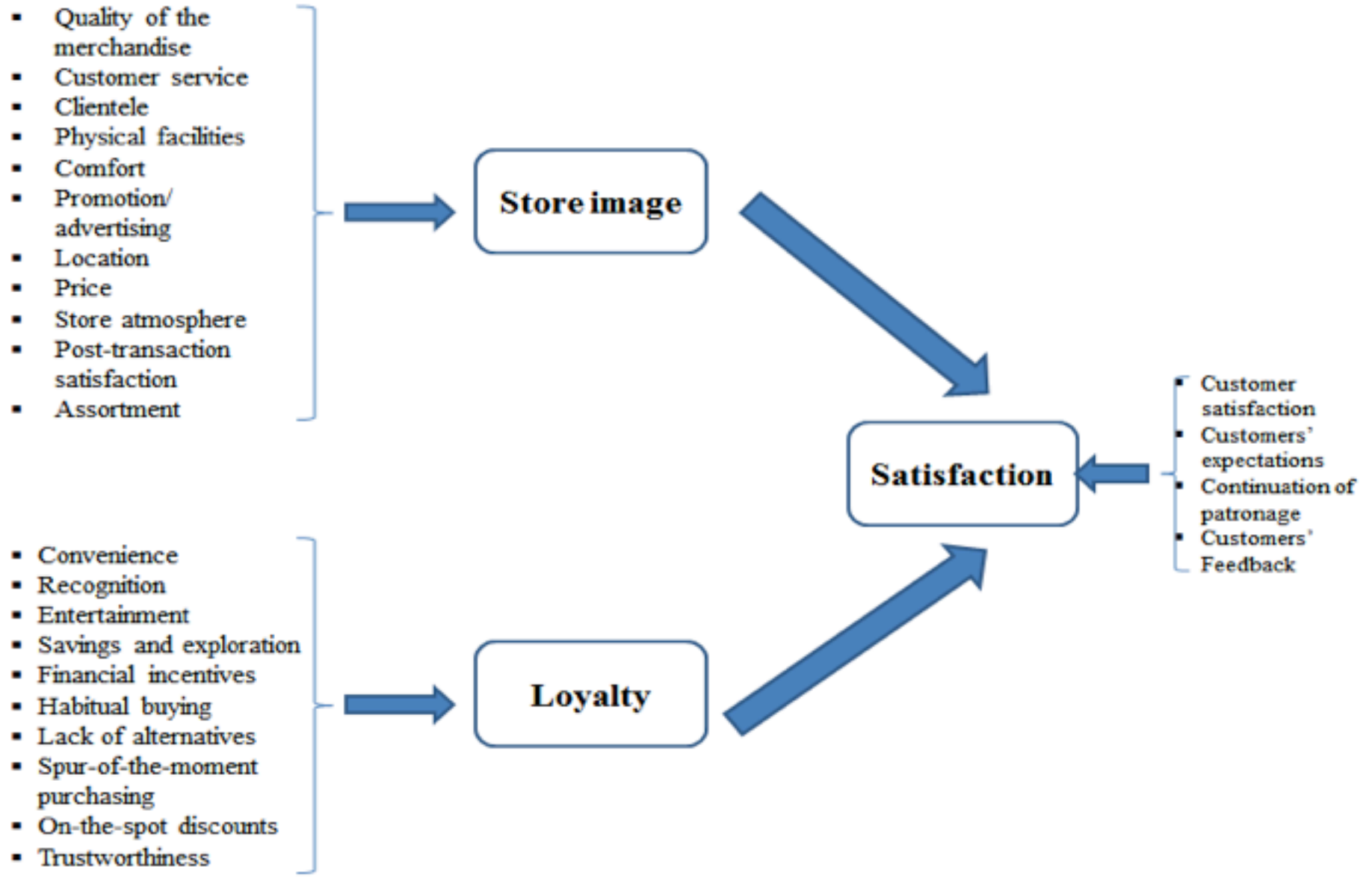
Yet the study is likely to contribute to the newly developing field of research on managing customer relationships, as issues are examined critically in the context of emerging retailing scenario. This will immensely help the retail sector in integration of right attitudes with service delivery and customer relationships endeavors so as to take more and more market shares and hence profits. The Study will evoke scope for further research in this emerging field for ultimate benefit of society at large.

2.7. Rationale of Study

During the past decades both marketing academics and practitioners have been intrigued by the relationship between satisfaction and loyalty (Dick and Basu, 1994; Fornell et. al., 1996; Hallowell, 1996; Kasper, 1988; LaBarbera and Mazursky, 1983; Newman and Werbel, 1973; Oliver, 1996). Most of these studies, however, have concentrated on products (brands) and to a somewhat lesser extent on services or channel intermediaries. Surprisingly, research on the relationship between store, shopper, and situational factors along with store image, satisfaction and store loyalty has remained limited, both in actual number as well as in scope. Yet, in the present environment of increased competition with rapid market entry of new store concepts and formats the managerial challenge of increasing store loyalty also presents the research challenge of a more in-depth understanding and an empirical estimation of this important type of consumer behavior.

There is some evidence that store loyalty may be (positively) related to store image (Mazursky and Jacoby, 1986; Osman, 1993). However, it has remained unclear what the exact relationship between store, shopper, and situational factors along with store image, satisfaction and store loyalty in a retail setting is. For instance, one question that has been left unanswered concerns the issue whether there is a direct relationship between store image and store loyalty and whether there is an indirect relationship via store satisfaction. This study is an attempt to acknowledge the shoppers' buying behaviour and perceived store image that contributes to his/ her store satisfaction and loyalty.

Figure 2.1
Theoretical Framework



2.8. Research Gap

The review of existing literature revealed certain gaps in knowledge. For instance, the relevance of the various theories with regard to retail evolution has not been studied in the context of the Indian retail sector. Similarly, studies do not appear to have been undertaken to assess the applicability and suitability of the concept and theories of consumer behaviour in the Indian context.

Furthermore, studies in the Indian context were found to chiefly focus on retail formats or the challenges in the retail sector. Also, most of the available studies associated with store image, store loyalty, or customer satisfaction have been performed in foreign contexts and the focus of these is from a generic marketing or sales perspective and not the customer perspective.

3.Objectives & research methodology

3.1. Objectives

The above section logically provides inputs for formulating objectives for the study. The following objectives could serve the purpose of this study.

- To know whether socioeconomic profile of study respondents influence study variables like price, quality, loyalty, customer care, payment preference.
- To find out whether customers are willing switch the retail store regardless of customer care
- To know about the effect of grievance handling on quality
- To know about the customer favorability and its effect on lengthy delays.

As far as hypothesis for the study is concerned; the study tries to test the study proposed model i.e. factor structure through exploratory factor analysis. In exploratory factor analysis the factor structure is assessed through statistic along with other fit parameters like R2, RMSEA etc. So it is possible for the researcher to assess if the study proposition has any evidence from the data. Here confirmatory factor analysis is used for further enhancing the findings of EFA.

3.2. Data set

The data set is 241 X 27 data matrix which means there are 241 rows and 27 columns. The study assumes that there are six factors in the study (F1 to F6) namely socioeconomic profile, customer loyalty and satisfaction, quality of service, price of the product, and promptness of service and customer care and store image. These variables (27) were given certain notation so as to make the analysis more manageable in the article. The following is the description to the study constructs and their respective variables. *F* stands for and *Q* stands for study variable. These notations were used throughout the report while interpreting the data.

Table 3.1
Description to study constructs

Study construct	Notation
F1: Consumer Profile	Q1 to Q5
F2: Customer loyalty and satisfaction	Q1.1 to Q1.5
F3: Quality of Service	Q6 to Q10
F4: Price of Product	Q11 to Q13
F5: Promptness of Service or Customer Care	Q14 to Q17
F6: Image of the Retail Store	Q18 to Q21

3.3 Confirmatory factor analysis

Confirmatory factor analysis (**CFA**) is a special form of factor analysis, most commonly used in social research (Kline, R. B. 2010). It is used to test whether measures of a construct are consistent with a researcher's understanding of the nature of that construct (or factor). As such, the objective of confirmatory factor analysis is to test whether the data fit a hypothesized measurement model. This hypothesized model is based on theory and/or previous analytic research (Preedy, V. R., & Watson, R. R. 2009). In confirmatory factor analysis, the researcher first develops a hypothesis about what factors he believes are underlying the measures he has used. and may impose constraints on the model based on these a priori hypotheses. By imposing these constraints, the researcher is forcing the model to be consistent with his theory. The following is the statistical model for confirmatory factor analysis.

$$\Sigma = \Lambda X \Lambda^{-1} + \varepsilon$$

Where; Σ is the implied covariance matrix need to be estimated by the model. X is the unobserved usually known as latent variable which depends on a set of manifest variables also known as configuration matrix. ε Is error and follows normal distribution. The estimates and other measures are obtained by maximizing the objective function shown as below.

$$F_{ml} = \ln|\Sigma| + tr(s\Sigma^{-1}) - \ln(s) - p$$

Where F_{ml} is the objective function, Σ is the implied matrix, s is the estimated covariance matrix and p is the number of parameters. As far as inference is concerned the χ^2 is calculated by using F_{ml} multiplied by (n-1) where n is sample size, the hypothesis is being "population residuals in the model are zero" so the null hypothesis is going to be H_0: $\varepsilon = 0$; some researchers computes Z statistic by $\sqrt{\chi 2}$ (Kenny, D. 2015).

R language is used for performing analysis ala reliability analysis, exploratory factor analysis and confirmatory factor analysis. Reliability analysis helps to check internal consistency through alpha (α). Exploratory factor analysis helps to find out study construct or exact factor solution. One important property of factor analysis is that the model provides the solution as a matter of heuristics. EFA is unsupervised technique. So it seems always to check factor solution without proposing any structure voluntarily. That is why, EFA always becomes a prerequisite or precursor to confirmatory factor analysis (CFA). Once knowing the default or hidden structure the researcher might be able to conceive or design his or her structure so that testing becomes rather more meaningful. Any discrepancy observed becomes the matter for the testing. That is, the difference between covariance matrix obtained by EFA and CFA becomes the residual matrix which is used to perform χ^2 test in order to test the null hypothesis that whether it is significant or not. While doing CFA it is customary to compute fit measures to assess the fitness of the model proposed. Fit measures are required in order to overcome weaknesses in χ^2 test. Some of the measures are as follows:

3.4. Comparative fit index (CFI)

A comparative measure of fit is only interpretable when comparing two different models. This term is unique to this website in that these measures are more commonly called *absolute* fit indices. However, it is helpful to distinguish absolute indices that do not require a comparison between two models. One advantage of a comparative fit index is that it can be computed for the saturated model, and so the saturated model can be compared to non-saturated models. This incremental measure of is directly based on the non-centrality measure. Let d = χ^2 - *df* where *df* are the degrees of freedom of the model. The Comparative Fit Index or CFI equals

$$\frac{\text{d(Null Model) - d(Proposed Model)}}{\text{d(Null Model)}}$$

If the index is greater than one, it is set at one and if less than zero, it is set to zero. If the CFI is less than one, then the CFI is always greater than the TLI. CFI pays a penalty of one for every parameter estimated. Because the TLI and CFI are highly correlated only one of the two should be reported.

3.5. Tucker Lewis Index or Non-Normed Fit Index (NNFI)

The Tucker-Lewis index (also called the non-normed fit index or NNFI), another incremental fit index, does have such a penalty. Let χ^2/df be the ratio of chi square to its degrees of freedom, and the TLI is computed as follows:

$$\frac{\frac{X^2}{df\,(null\ model)} - \frac{X^2}{df\,(proposed\ model)}}{\left(\frac{X^2}{df\,(null\ model)}\right) - 1}$$

If the index is greater than one, it is set at one. Note that for a given model, a lower chi square to *df* ratio (as long as it is not less than one) implies a better fitting model. Its penalty for complexity is χ^2/df. That is, if the chi square to df ratio does not change, the TLI does not change.

Note that the TLI depends on the average size of the correlations in the data. If the average correlation between variables is not high, then the TLI will not be very high. Consider a simple example. You have a 5-item scale that you think measures one latent variable.

3.6. Root Mean Square Error of Approximation (RMSEA)

This absolute measure of fit is based on the non-centrality parameter. Its computational formula is:

$$\sqrt{\frac{\chi 2 - \mathrm{df}}{df\,(n-1)}}$$

Where: *n* the sample size and *df* the degrees of freedom of the model. If χ^2 is less than df, then the RMSEA is set to zero. Like the TLI, its penalty for complexity is the chi square to df ratio. The measure is positively biased (i.e., tends to be too large) and the amount of the bias depends on smallness of sample size and *df*, primarily the latter. The RMSEA is currently the most popular measure of model fit and it now reported in virtually all papers that use CFA or SEM and some refer to the measure as the "Ramsey."

3.7. AIC, BIC & SABIC

All these measures are comparative fit indices. The expressions for these measures are as follows:

$$AIC = \chi 2 + k(k+1) - 2df$$

$$BIC = \chi 2 + \ln(\mathrm{N})\left[\frac{\mathrm{k}(\mathrm{k}-1)}{2} - 1\right]$$

$$SABIC = \chi 2 + \ln\left(\frac{\mathrm{N}+2}{24}\right)\left[\frac{\mathrm{k}(\mathrm{k}-1)}{2} - 1\right]$$

Where *k* is the number of variables in the model and *df* are the degrees of freedom of the model. These measures are meaningful only when two models are there for comparison. Lower values indicate a better fit and so the model with the lowest AIC is the best fitting model. Lesser the value betters the fit.

3.8. Hoelter Index

R doesn't give Hoelter Index as by default mechanisms. It need to be computed manually. The index states the sample size at which chi square would not be significant (alpha = .05), i.e., that is how small one's sample size would have to be for the result to be no longer significant. The index should only be computed if the chi square is statistically significant. Its formula is:

$$[(N - 1)\chi^2(crit)/\chi^2] + 1$$

where *N* is the sample size, χ^2 is the chi square for the model and $\chi^2(crit)$ is the critical value for the chi square. If the critical value is unknown, the following approximation can be used:

$$\frac{[1.645 + \sqrt{(2df - 1)}]^2 + 1}{2\chi^2/(N - 1) + 1}$$

where *df* are the degrees of freedom of the model. For both of these formulas, one rounds *down* to the nearest integer value. Hoelter recommends values of at least 200. Values of less than 75 indicate very poor model fit. The Hoelter only makes sense to interpret if N > 200 and the chi square is statistically significant.

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4. Results & its analysis

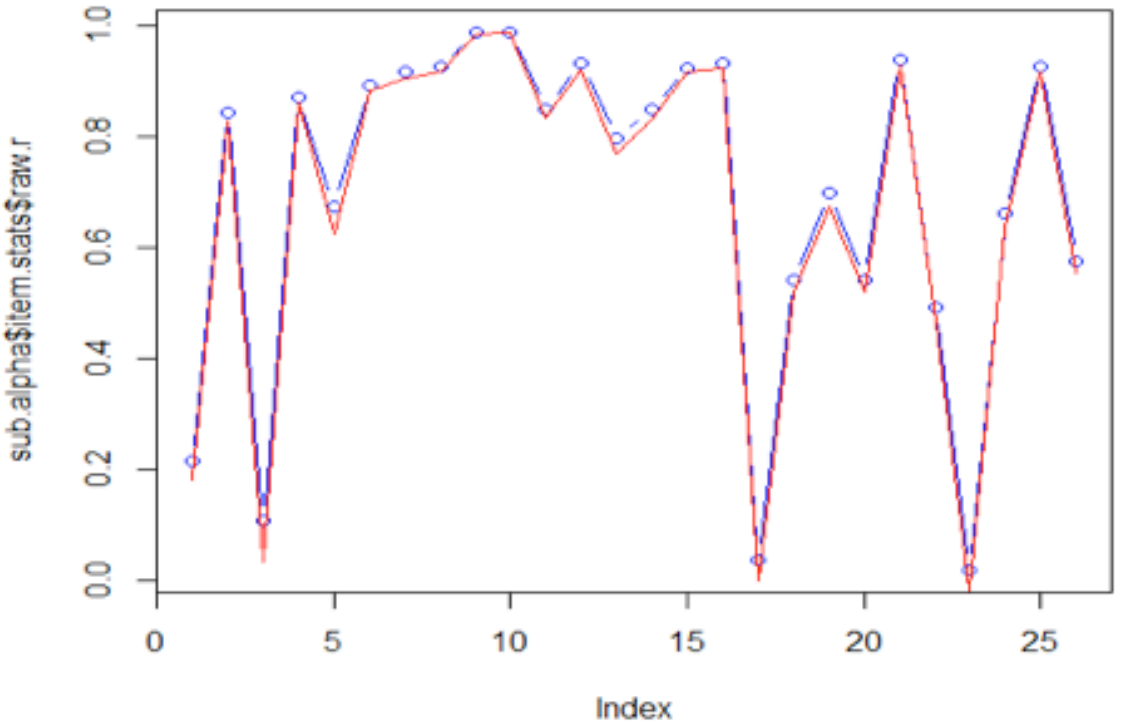
The very first part of analysis is reliability analysis. The study has 26 study variables all those variables are measured with the help of *Likart* five point scale. The study assumed as having certain constructs, which need to be verified through factor analysis. So that about the question of reliability of such items of the variables is obvious. Cronbach alpha is one of the most sought after measure used to assess reliability of the scale especially in those research that are advised for factor analysis. The following table shows the summary statistics of reliability analysis in R.

Table 4.1
Summary statistics of Reliability analysis

raw_alpha	std.alpha	G6(smc)	average_r	S/N	ase	mean	Sd
0.96	0.96	1	0.47	22.97	0.01	3.47	0.59

The alpha value is 0.96 which means the scale employed for the study is excellent. The Guttman's Lambda is one and greater than alpha which shows the evidence that there might be lumpiness in the data which is a favorable sign for factor analysis. However, the magnitude of difference is rather insignificant.

Fig.4.1. Plot of α_{raw} and α_{drop}



The above graph is the plot of α_{raw} and α_{drop} it is clear that there are sudden drops in the value for the first few and the last few variables. The alpha observed to be steady for only few intermediate variables. First and last few variables related huge effect on consistency. Variables related to consumer profile (F1) and service image (F6) has certain influence on internal consistency. For instance, variables related to gender, type of the store; price has very bad influence on the internal consistency. Alpha value falls down drastically when these variables removed. So they seem to be more important preserving scale measurement. Overall, there appears to be inconsistencies across the items of the study.

4.1. Factor analysis

The analysis was performed in R and following is the summary statistics of exploratory factor analysis.

Table 4.2
Summary statistics for factor analysis

Chi^2	P Value	Fit	RMS	CRMS	Objective Fn.	R^2	Proportion of Variance
439.9652	1.95092E-07	0.93014	0.121416	0.126585	276.2538	0.999667	0.55

The above table shows the summary statistics for common factor analysis (see more details in research methods). The value is approximately 439 with a P Value of 1.95092E-07 (approx. zero). So the structure is not a null model. There is evidence in support of alternative hypothesis that there exists certain hidden structure in the data and the structure can be explained through common factor. The following is the output for common factor analysis.

Table 4.3
Common factor analysis

Variable	F	U^2	Comm.
Q1	-0.20223	0.959104	0.040896
Q2	0.841812	0.291353	0.708647
Q3	0.067717	0.995414	0.004586
Q4	0.861006	0.258668	0.741332

Q5	-0.67037	0.550598	0.449402
Q1.1	0.896103	0.196999	0.803001
Q2.1	0.922481	0.149028	0.850972
Q3.1	0.929803	0.135466	0.864534
Q4.1	0.986417	0.026981	0.973019
Q5.1	0.987854	0.024144	0.975856
Q6	0.861997	0.256961	0.743039
Q7	0.943156	0.110458	0.889542
Q8	0.811882	0.340847	0.659153
Q9	0.844937	0.286082	0.713918
Q10	0.932432	0.130571	0.869429
Q11	0.939177	0.117947	0.882053
Q12	-0.00465	0.999978	2.16E-05
Q13	-0.53665	0.712009	0.287991
Q14	0.685213	0.530483	0.469517
Q15	-0.53411	0.71473	0.28527
Q16	0.928771	0.137384	0.862616
Q17	0.527365	0.721886	0.278114
Q18	0.033446	0.998881	0.001119
Q19	0.651467	0.575591	0.424409
Q20	0.925526	0.143401	0.856599
Q21	0.608083	0.630235	0.369765

In this case the structure might be the one which is determined through VSS and parallel analysis. It was clear from the parallel analysis that there exist two factors in the data. Gender (-0.2022), occupation (-0.670374209) are significant with quality (-0.00464965, -0.534106935) and price (-0.53664782). Rest of the variables has positive loadings to the common factor. Only education found to have positive loading to the factor along with rest of the variables related to loyalty & satisfaction, customer care and image. So the data analysis supports the following structure in the data.

$$factor = 0.84\,(education) - 0.20\,(gender) - 0.67\,(occupation) + 0.94\,(loyalty\ and\ satisfaction) + 0.40(customer\ care) + 0.55\,(image) + 0.87\,(quality) + 0.13\,(price)$$

However certain variables in quality and price observed to be significant relationships with their respective factors. For instance,

$$Quality = 0.65\,(quality\ creates\ favorability) - 0.004\,(quality\ of\ product) - 0.53\,(quality\ of\ customer\ care)$$

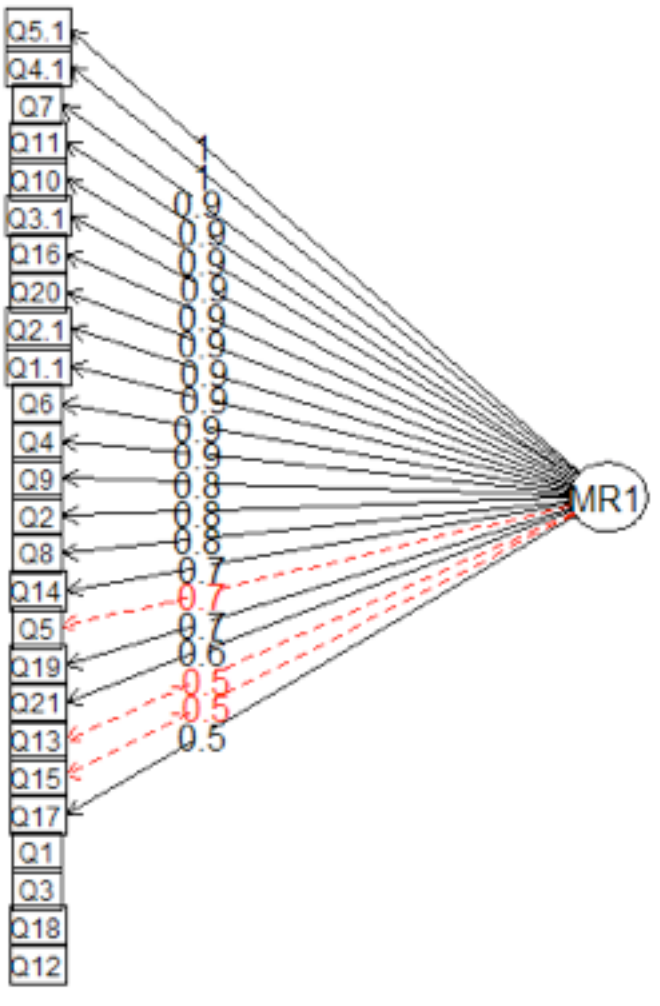
Now it is clear that quality affects image, creates favorability towards store and might not prefer to have too much quality and they also think that quality of product and customer care might not be an important retail stores. This appears to be rather more important observation. The idea that too much quality is not expected by customers and they opine that quality affects image and their favor. At the same time, they also opine that the product quality and quality of service at customer care is not so important. So it is evidently clear that service is at the pinnacle at the retail stores not the product. Customers may also not expect customer care just as membership clubs, discounts, complaints etc. The structure for price is as follows:

$$Price = 0.93\,(price) + 0.68\,(higher\ price\ makes\ customers\ switch + 0.54\,(price\ affects\ image) - 0.53\,(don't\ prefer\ to\ pay\ for\ same\ product)$$

It is clear from the above structure that price affects image, switching and variety. For instance, customers have same level of opinion on both switching and image, which means price affects image, too much price makes customer switch shows that customers rather sensitive to pricing of products. The product variety is also an important variable that affects pricing. The following diagram shows the factor structure for common factor analysis.

Fig.4.2

Structure diagram for common factor analysis



4.2. Bi-factor analysis

As it was mentioned in the research methodology, the parallel analysis shows evidence that there might

exist two factors in the data. So it was proposed a two factor structure for analysis. the following is the summary statistics for bi-factor structure.

Table 4.4
Summary Statistics for Bi-Factor Structure

Chi^2	P Value	Fit	RMS	CRMS	Obj. Fun.	R^2		Prop. Of Var.	
319.8607	0.02955	0.949211	0.1060971	0.11555	274.0437	0.9996649	0.997705	0.577	0.091

The P Value (0.02) is not as significant as in the case of common factor analysis. So, though there is certain level of evidence in support of alternative hypothesis i.e. in support of proposed structure (bi-factor structure) but it is not overwhelming. The fit is nearly one (0.94), R2 value is close to one (0.99) proportionate variance looks fair (0.577). So thought there is sufficient evidence in support of bi-factor structure but not overwhelming. The following table shows the factor scores.

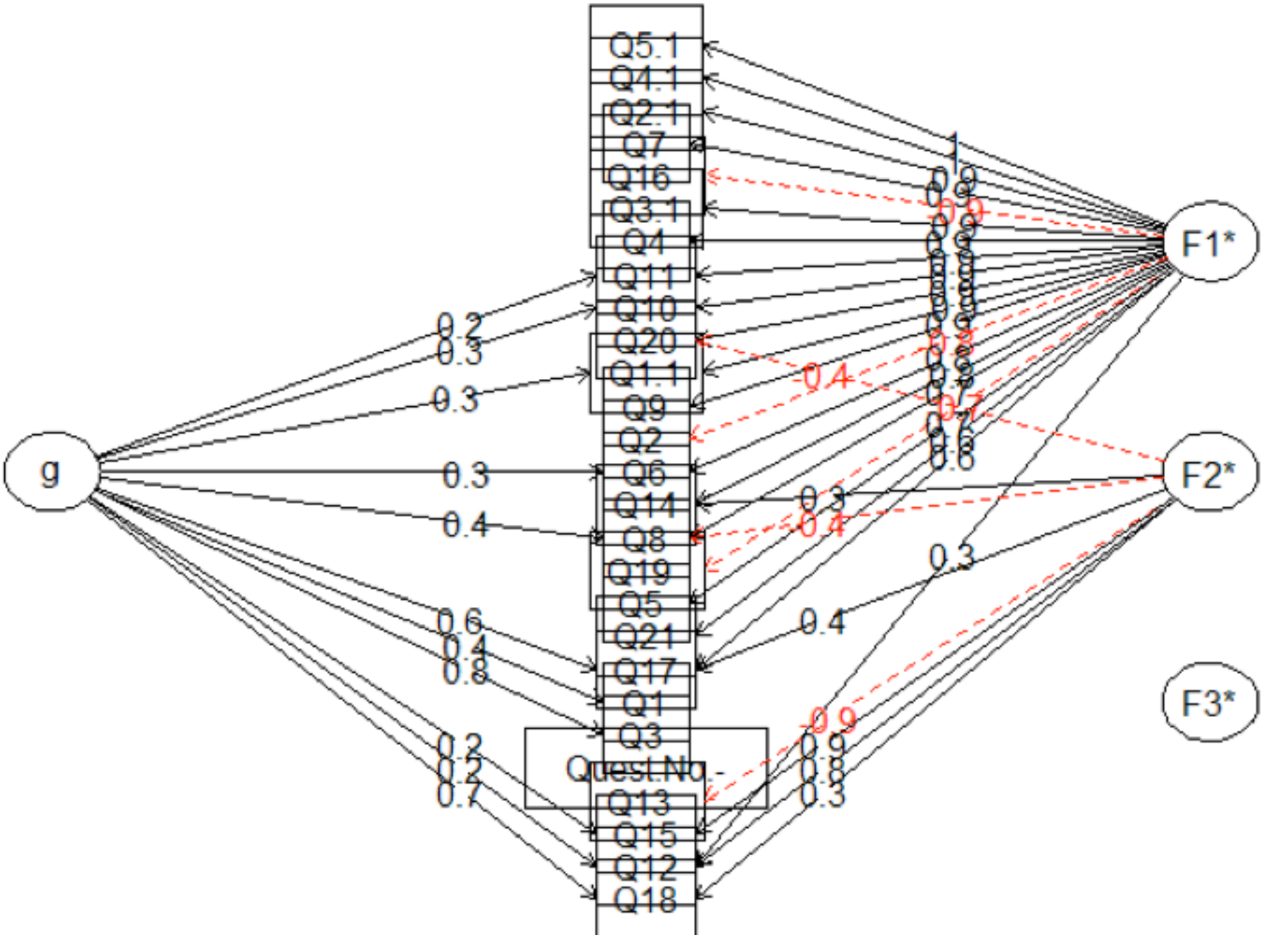
Table 4.5
Factor Loadings for Bi-Factor Structure

Variable	F1	F2	U^2	Comm.
Q1	-0.2088	-0.18911	0.911742	0.088258
Q2	0.846617	0.057501	0.262523	0.737477
Q3	0.066317	-0.05318	0.99342	0.00658
Q4	0.862292	-0.05864	0.255623	0.744377
Q5	-0.66016	0.408656	0.446127	0.553873
Q1.1	0.896818	-0.08124	0.195626	0.804374
Q2.1	0.92695	0.037201	0.123419	0.876581
Q3.1	0.931088	-0.06668	0.132307	0.867693
Q4.1	0.984497	-0.17702	0.024717	0.975283
Q5.1	0.985205	-0.20077	0.019053	0.980947
Q6	0.866831	0.05609	0.227702	0.772298
Q7	0.946425	-0.00402	0.09577	0.90423
Q8	0.810652	-0.13436	0.340078	0.659922
Q9	0.846051	-0.06232	0.283648	0.716352
Q10	0.935196	-0.01914	0.119647	0.880353
Q11	0.940095	-0.07966	0.115979	0.884021
Q12	0.023341	0.906501	0.164871	0.835129

Q13	-0.51613	0.726582	0.274167	0.725833
Q14	0.675658	-0.38906	0.439594	0.560406
Q15	-0.52642	0.310996	0.655778	0.344222
Q16	0.923446	-0.28053	0.111895	0.888105
Q17	0.539306	0.325065	0.563521	0.436479
Q18	0.042255	0.281205	0.915871	0.084129
Q19	0.651031	-0.08997	0.575573	0.424427
Q20	0.919943	-0.28848	0.11514	0.88486
Q21	0.619349	0.293808	0.488002	0.511998

Though, bi-factor model has nothing special to explain from the factor one (which is common factor in previous section) but certain variables turned interesting with respect to their contribution. For instance, in the bi-factor model education along with the way the service personnel of the store handles grievances influence the factor one. Promotion, price and billing process seems to influence factor two.

Figure
4. 3. Omega



4.3. Confirmatory factor analysis

This section provides description to confirmatory factor analysis done through R language. As we know that the data shows certain valid factors (structure). However, the structure provided by EFA is only as a matter of heuristics or unsupervised in nature. As it was clear from the analysis that there two valid factors, this means that there is hidden two factor structure in the data. This is not very cognizable for the study. The study proposes certain valid constructs such as *consumer profile, consumer loyalty, quality of service, price of products, promptness of service* and *image*. So the study obviously attempts to propose the following structure.

$$consumer\ profile + consumer\ loyalty = \sim quality + price + promptness + image \quad -struct\ 1$$

$$consumer\ loyalty \sim\sim consumer\ profile \quad -struct\ 2$$

The notations $= \sim$ and $\sim\sim$ are notations used to perform CFA in R. The LHS of the first expression are latent variables and RHS are manifest variables. The second expression deals with covariance of the structure. These expressions stand as proposed structure for testing. The study proposed two models one with very simple structure which means the model with only first expression *(struct 1)*. The second model is with both expressions *(struct 1 & 2)*. The following is the output for structure 1.

```
> sum.sub.fit <- summary(fit)
lavaan (0.5-18) converged normally after 1672 iterations

                                                  Used       Total
  Number of observations                           188         240

  Estimator                                         ML
  Minimum Function Test Statistic            20935.615
  Degrees of freedom                               284
  P-value (Chi-square)                           0.000
```

The above output shows that there is abundant of evidence in support of proposed structure. The P Value is zero with a χ^2 value of 20935. A χ^2 value of such size is almost impossible. The following output shows the fit measures for evaluation of the model.

```
Model test baseline model:

  Minimum Function Test Statistic            27706.056
  Degrees of freedom                               325
  P-value                                        0.000

User model versus baseline model:

  Comparative Fit Index (CFI)                    0.246
  Tucker-Lewis Index (TLI)                       0.137

Loglikelihood and Information Criteria:

  Loglikelihood user model (H0)              -2208.500
  Loglikelihood unrestricted model (H1)       8259.307

  Number of free parameters                         67
  Akaike (AIC)                                4551.000
  Bayesian (BIC)                              4767.842
  Sample-size adjusted Bayesian (BIC)         4555.621
```

Root Mean Square Error of Approximation:

RMSEA	0.622	
90 Percent Confidence Interval	0.615	0.629
P-value RMSEA <= 0.05		

0.000

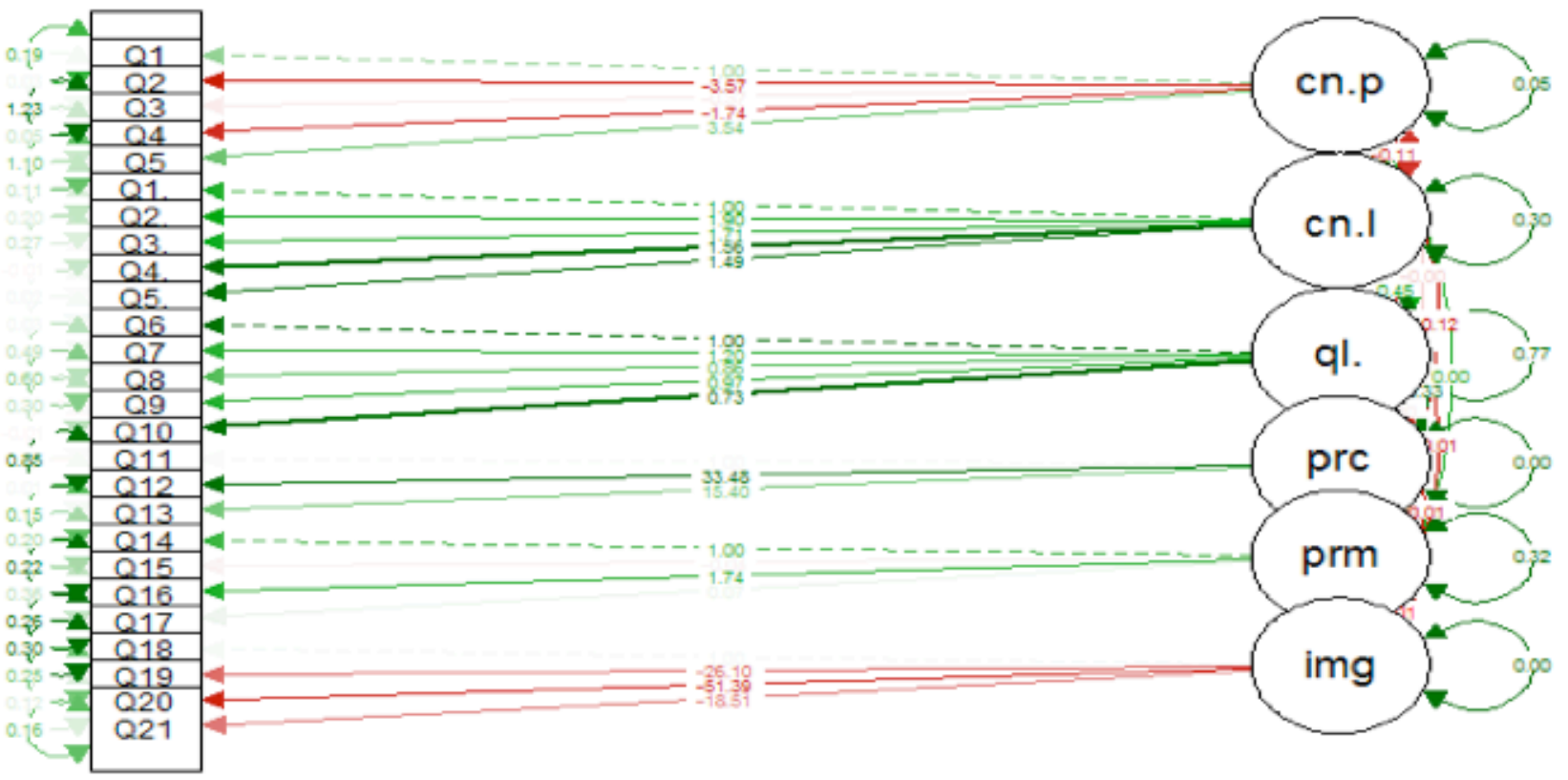
Standardized Root Mean Square Residual:

SRMR	0.275

CFI is 0.246 and TLI is 0.137. as it was mentioned in the research methodology CFI is always greater than TLI but the values are poor. The ideal values required for assessing fit should be at least 0.9. This shows that the proposed structure doesn't appears to be fit. RMSEA is 0.622 the null hypothesis that the residuals are zero is rejected. The error appears to be so influential in the model. We may not be able to accept the null hypothesis that the error in the population is zero. However, this might be due to sampling error. These observations are pretty much supported by SRMR (0.275). The last measure, of course, Hoelter Index which needs to be computed manually. The following is the Hoelter Index value computed in R.

```
> hoelter.index(20935.615, 284, 188)
[1] 4.151499
```

The value is less than 75 so there isn't enough evidence in support of study hypothesis. The following is the visualization to the CFA. The following is the visualization for the study proposition one.



Few relationships related to consumer profile and image appears to be significant. This means the service providers need to be cautious of certain important socioeconomic variables. The other factor is *image* which is significant with respect to *grievances, promotion* and *image driven by price*. So service providers need to be cautious with these variables while they think about image. The following is the output for the second model.

```
> sum.sub.fit2 <- summary(sub.fit2, fit.measure = TRUE)
lavaan (0.5-18) converged normally after 4746 iterations
```

Number of observations 188

Estimator ML
Minimum Function Test Statistic 21216.384
Degrees of freedom 290
P-value (Chi-square) 0.000

Model test baseline model:

Minimum Function Test Statistic 27706.056
Degrees of freedom 325
P-value 0.000

User model versus baseline model:

Comparative Fit Index (CFI) 0.236
Tucker-Lewis Index (TLI) 0.143

Loglikelihood and Information Criteria:

Loglikelihood user model (H0) -2348.885
Loglikelihood unrestricted model (H1) 8259.307

Number of free parameters 61
Akaike (AIC) 4819.769
Bayesian (BIC) 5017.192
Sample-size adjusted Bayesian (BIC) 4823.977

Root Mean Square Error of Approximation:

RMSEA 0.620
90 Percent Confidence Interval 0.612 0.627
P-value RMSEA <= 0.05 0.000

Standardized Root Mean Square Residual:

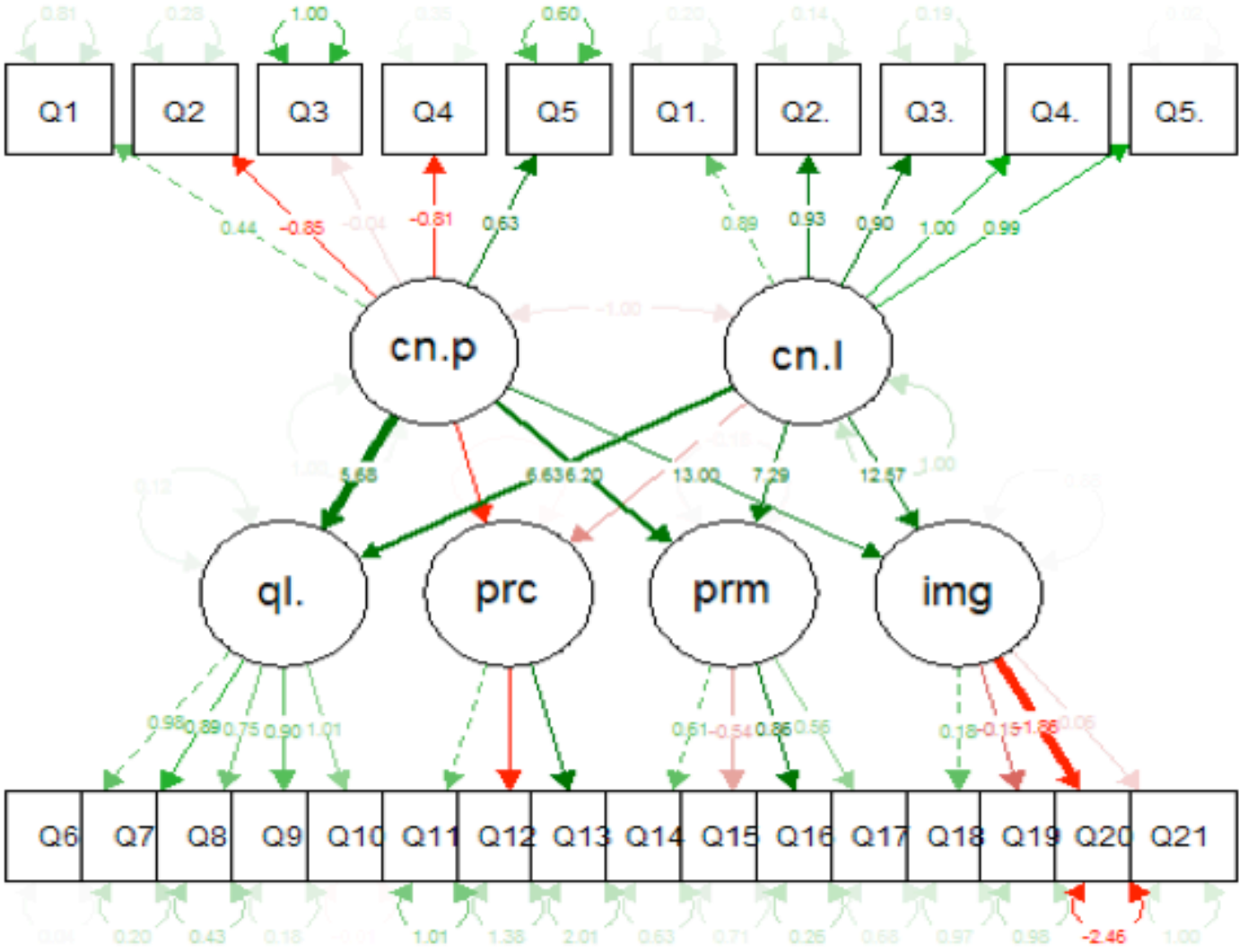
SRMR 0.294

The structure is evaluated based on fit indices. The following is the out for CFA performed in R. The fit indices appears to be more or less same to that of first model except χ^2 value which is 21216.384. So obvious AIC, BIC SABIC also different as they depend on χ^2 value. However this is only an intuitive observation. The following output for model comparison shows whether the difference is significant or not.

```
> anova(fit, sub.fit2)
Chi Square Difference Test

        Df    AIC    BIC Chisq Chisq diff Df diff Pr(>Chisq)
fit     284 4551.0 4767.8 20936
sub.fit2 290 4819.8 5017.2 21216     280.77      6  < 2.2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Though the models appears to be more or less same the difference seems to be significant. The χ^2 difference 280.77 is significant with a P Value 2.2e-16. The following is the visualization to the study model two.



Certain relationships for consumer profile, price, image appears to be significant. For consumer profile education and longevity appears to be significant. This means that, it might be possible to explain consumer profile with respect to gender and occupation, but there exist education level differences along with longevity i.e. number of years customers are purchasing in a given retail store. So, education and longevity appears to be significant while understanding consumer profile. So service providers need to be more cautious of education and longevity while think about consumer profile while studying or taking decisions for loyalty. Price seems to be significant with variable 12 which unwillingness to pay more for the same products from the same retailer. Image appears to be significant for grievances, promotion and image driven by price. The relationship between consumer profile and consumer loyalty given the expression $consumer\ loyalty = \sim consumer\ profile$ appears to be significant. The estimate (β) for this assumption is -0.154. This shows that the relationship is significant and the service providers might have to consider consumer profiles while taking decisions regarding consumer loyalty.

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5. Conclusion

Variables related to gender, type of the store; price has very bad influence on the internal consistency. Alpha value falls down drastically when these variables removed. Customers have same level of opinion on both switching and image, which means price affects image, too much price makes customer switch shows that customers rather sensitive to pricing of products. The product variety is also an important variable that affects pricing. in the bi-factor model education along with the way the service personnel of the store handles grievances influence the factor one. Promotion, price and billing process seems to

influence factor two. Few relationships related to consumer profile and image appears to be significant. This means the service providers need to be cautious of certain important socioeconomic variables. The other factor is *image* which is significant with respect to *grievances, promotion* and *image driven by price.* So service providers need to be cautious with these variables while they think about image. The following is the output for the second model. Certain relationships for consumer profile, price, image appears to be significant. For consumer profile education and longevity appears to be significant. This means that, it might be possible to explain consumer profile with respect to gender and occupation, but there exist education level differences along with longevity i.e. number of years customers are purchasing in a given retail store. So, education and longevity appears to be significant while understanding consumer profile. So service providers need to be more cautious of education and longevity while think about consumer profile while studying or taking decisions for loyalty. Price seems to be significant with variable 12 which unwillingness to pay more for the same products from the same retailer. Image appears to be significant for grievances, promotion and image driven by price. The relationship between consumer profile and consumer loyalty given the expression appears to be significant. The estimate (β) for this assumption is -0.154. This shows that the relationship is significant and the service providers might have to consider consumer profiles while taking decisions regarding consumer loyalty.

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