Chapter 20
A PLS Model to Study Brand Preference: An Application to the Mobile Phone Market

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Abstract Brands play an important role in consumers' daily life and can represent a big asset for companies owning them. Owing to the very close relationship between brands and consumers, and the specific nature of branded products as an element of consumer life style, the branded goods industry needs to extend its knowledge of the process of brand preference formation in order to enhance brand equity.

This chapter show how Partial Least Squares (PLS) modeling can be used to successfully test complex models where other approaches would fail due to the high number of relationships, constructs and indicators. Here, PLS modeling is applied to brand preference formation regarding mobile phones.

With a wider set of explanatory factors than prior studies, this one explores the factors that contribute to the formation of brand preference using a PLS model to understand the relationship between those and consumer preference for mobile phone brands.

Despite the exploratory nature of the study, the results reveal that brand identity, personality and image, together with self-image congruence have the highest impact on brand preference. Some other factors linked to the consumer and the situation also affect preference, but to a lesser degree.

20.1 Introduction

Owing to their massive presence in today's market and the huge diversity of products, brands play an important role in the consumer decision process. Brands are used to differentiate sellers' offers, and function as a sign of guarantee for consumers.

Brands are composed of many different elements, both tangible and intangible (Gardner and Levy 1955; Levy 1959a, b; Broadbent and Cooper 1987; Keller 2003). They exist in customers' minds as a sum of those elements and deliver a variety

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of benefits, which can be classified as satisfying a buyer's rational and emotional needs (De Chernatony and McDonald 2001). The importance of brand preference is emphasized by Zajonc (1980) when he points out that the affective component can continue to exist, even after the cognitive basis has been erased from a consumer's memory.

However, as pointed by Creyer and Ross (1997) and Muthukrishnan and Kardes (2001), much remains unknown about the formation of preference, especially how and according to which factors consumers develop preference for one brand. The majority of research on brand preference is partial by nature, as it is mostly confined to measuring the impact of one single factor on brand preference, which is an obvious limitation (Stafford 1966; Hawkins 1970; Ross 1971; Monroe 1976; Dunn and Murphy 1986; Bushman 1993; Schmitt and Shultz 1995; Sengupta and Fitzsimons 2000; Jamal and Goode 2001; Niedrich and Swain 2003).

This research has three main objectives. First, it attempts to identify and compile the various factors reported in the literature that can influence brand preference. Second, it develops a model to study brand preference formation to improve our understanding of the interaction of the elements involved in the emergence of preference and which potentially affect the decision choice process. Third, it show that PLS can be successfully used to test complex models with a large number of constructs and indicators.

20.2 Theoretical Background

20.2.1 Brand Preference Formation

Over the years several attempts have been made to explain the development of brand preference, some of them have been labeled as models of consumer behavior. The Howard and Sheth (1969) model is one example of those models, as it seeks to explain brand choice behavior.

The literature review of brand preference formation reveals two main theoretical perspectives, labeled as "archeological" and "architectural" (Payne et al. 1999). The first assumes that there is a well-defined preference and therefore the task of the researcher is just to uncover or reveal this. On the other hand, the second believes that preference is formed when the consumer needs to choose, and is produced using stable values associated with the object being evaluated, and a situation-specific component that represents the joint effect of the task and context contingencies. This second perspective believes that the situation-specific component is a major determinant of judgment responses (Payne et al. 1992, 1999).

However, noting that consumers do not always behave in a consistent way when choosing a brand, a probabilistic perspective of preference emerged (see, e.g., Bass 1974; Srinivasan 1975; Bass and Pilon 1980; Blin and Dodson 1980; Sharma 1981; DeSarbo and Rao 1984, 1986; Currim and Sarin 1984; Carroll et al. 1990; Russel and Kamakura 1997).

Aware of the complexity of preference, Nowlis and Simonson (1997) state that there is no single path to brand preference formation. Trying to integrate the various approaches, Shocker and Srinivasan (1979) stressed that it makes sense to treat choice as a stochastic process and relate it to a determinist measure of preference. We believe, just like various other authors (Lehmann 1972; Bettman and Jones 1972), that the two perspectives are complementary rather than substitutes.

In spite of the discussion, some general stages and elements that appear in every model can be identified. The process seems to start with stimuli which are selected, absorbed and codified by the consumer, combined with information retrieved from their memory. This package of data is then processed, a representation is formed and brand preference is developed and stored in a consumer's memory. Regardless of how we look at the process, it is essential to know what those stimuli are and how they interact with other factors to form brand preference.

To identify the major influences on brand preference an exhaustive review of the literature between 1942 and 2005 was conducted to gather information about current knowledge and, to provide the framework for the brand preference formation model proposed in this chapter.

For the literature review, the factors were divided into three groups (consumer, product/brand and situation) following Woodside and Trappey's (1992) and Belk's (1974, 1975a, b) indications that consumer behavior is conditioned by the characteristics of the consumer himself, by the situation, and the object. We assume that is also true for preference; consequently, the determinants of preference identified by the literature review were classified into one of the three groups previously mentioned.

20.2.2 Consumer-Oriented Factors

Consumer characteristics are the first main group of factors of interest for this study. This group should reflect the most important characteristics and dominant influences present in individuals and are expected to be responsible for guiding their brand preference.

For example, Schmitt and Shultz (1995) suggest the existence of an ideal consumer for every brand, based on their characteristics. Relying on this assumption, we expect to find a set of characteristics common to consumers who prefer one specific brand.

Following this same thought, several researchers have tried to identify meaningful relationships between demographic characteristics and consumer behavior (Bass and Talarzyk 1972; Fennell et al. 2003; Jamal and Goode 2001). Practically all those studies only reveal weak effects of demographic characteristics on consumer behavior (Rossi et al. 1996; Bucklin et al. 1995). Such a case is the influence of consumers' age and gender on brand perception (Elliot 1994; Sethuraman and Cole 1999). Likewise, Lin (2002) shows that consumers' values change with age, gender, education, and social class. Some other factors correlated with preference,

like satisfaction or need for cognition also seems to be linked to the demographic profile of consumers (Bryant and Cha 1996; Mittal and Kamakura 2001; Jamal and Goode 2001; Lin 2002).

We feel that demographic variables are important for this, and despite the discussion about their importance, they should be considered when modeling preference.

But it is not only the demographic characteristics that have caught the attention of researchers. Several authors have been looking for a way to predict preference and behavior from personality. Unfortunately, the conclusions of those studies are conflicting, and lack consensus about the true power of personality to predict consumer behavior (Evans 1959; Westfall 1962; Birdwell 1968; Kaponin 1960; Shank and Langmeyer 1994; Alpert 1972; Kassarjian 1971; Horton 1974; Kassarjian 1979). In any case, in the face of the evidence of the existence of an association between a consumer's personality self-concept and brand values, namely brand identity and personality, we cannot exclude the existence of a possible influence (Graeff 1996; Fournier 1998; Aaker 1997, 1999).

Other studies explore the relationship between involvement and preference, showing that involvement plays an important role in defining how consumers receive and process information (Bolfing 1988; Zhang and Markman 2001; Chernev 2001; Muthukrishnan and Kardes 2001). For instance, high levels of involvement lead to different levels of the need for cognition and motivation to search for information (Witt and Bruce 1972; Celsi and Olson 1988; Maheswaran and Mackie 1992), and the way it is used and interpreted (Bettman et al. 1975; Jain and Maheswaran 2000).

The predisposition to process information also depends on the need for cognition. This concept by Cacioppo and Petty (1982) refers to the individual's tendency to engage in and enjoy effortful cognitive endeavors. Research on the need for cognition suggests that this characteristic is predictive of the way in which people deal with tasks and social information and subsequently influences the way individuals develop their preference.

A final element is the memory and the capacity to store and recall information. The way information is stored and retrieved from memory also seems to play some part in generating preference (Costley and Brucks 1992; Haley and Case 1979; Hutchinson et al. 1994). Brands that are easily remembered seem to be preferred over brands that are difficult to memorize.

To summarize, we think that is very unlikely, if not impossible, that a single preference model based on the characteristics of consumers can fit all consumers and products, in order to be universally applicable. Instead, we feel that the appropriateness of a preference model is likely to vary across individuals and products. In our opinion, despite all the difficulties and discussions, the identification of the relevant influences of consumer-related factors on preference, either directly or through other variables, can be useful and, therefore, those effects should not be ignored.

20.2.3 Brand-Related Factors

The second group specifically addresses the factors related to the object, i.e. the product and brand attributes. As previously mentioned, products and brands have a special and personal value for consumers that exceeds the functional value and is capable of expressing social identities and symbolizing class and status (Bristow and Asquith 1999).

Prior research suggests that product and brand-related factors, such as brand name (Zinkhan and Martin 1987; Klink 2001), can affect how consumers look at brands and the inferences made about quality (Sappington and Wernerfelt 1985). Perceived quality impacts preference (Morton 1994; Dickerson 1982; Hugstad and Durr 1986; Stephen et al. 1985; Wall and Heslop 1989; Olsen 2002; Hellier et al. 2003) and is also influenced by price (Peterson 1970; Zeithaml 1988; Lichtenstein and Burton 1989; Lichtenstein et al. 1993; Chapman and Wahlers 1999), which influences preference too (Monroe 1976; Rao and Monroe 1988; Venkataraman 1981), and by country of origin (Han and Terpstra 1988; Khachaturian and Morganosky 1990; Powers and Nooh 1999; Tse and Gorn 1993; Thakor and Katsanis 1997) which additionally seems to impact perceived value (Ahmed and D'Astous 1993) and preference (Papadopoulos et al. 1990; Peris et al. 1993; Kim 1995).

Another important factor is brand identity, personality, and image. Our theoretical research reveals that this variable seems to interact with self-image congruence and the preference showed by consumers (Sirgy 1982; Phau and Lau 2001; Jamal and Goode 2001).

All those factors, together with product attributes (Urban and Hauser 1993), perceived value (Hellier et al. 2003), package (Keller 2003), and familiarity (Meyers-Levy 1989), appear in the literature on preference.

20.2.4 Situational Factors

This group of factors was the most challenging for three reasons. The first was the difficulty experienced with classifying one factor as situational. Second, the extremely high number of potential situational variables and, finally, the limited support found in the literature. However, Belk (1974) stresses that, situational factors are essential to predict consumer behavior, while Payne et al. (1999) believe that this component of situational factors has a large impact on preference.

To classify one factor as situational, we use Belk's (1974, 1975a, b) definition that situational factors are those present at a precise moment and place, which do not result from the consumer or object of choice, but which can, beyond any doubt, affect consumer behavior.

Owing to the large number of situational factors, and to the difficulty in classifying some factors as situational, as was previously mentioned, only a few were used in this study, specifically those that appeared the most important in previous studies.

As a result of those limitations, only five situational factors (communication, social environment, risk perception, pioneering advantage, and product visibility), which had proved to be related to preference, were used. For example, several authors report that a higher level of communication (namely advertising) induces high levels of preference (Paivio 1971; Shepard 1978; Mitchell and Olson 1981; Woodside and Wilson 1985; Carrol et al. 1990).

The impact of the social environment is supported by the works of Sheth (1968), Hawkins and Coney (1974) and Keillor et al. (1996). Product visibility is somehow related to this last factor. Graeff (1997), Dickson (1982) and Becherer et al. (1982) reported an association between it, the consumption context and the preference for one brand.

Another factor that emerged from the literature review was risk perception. The relationship between risk perception and preference appears in the studies of Peter and Ryan (1976), Pras and Summers (1978), Campbell and Goodstein (2001) and Hellier et al. (2003).

Finally, the pioneering advantage factor is based on the work by Carpenter and Nakamoto (1989), which suggests that the first brand in the market tends to build a standard for preference which influences the following brands. These authors' basic idea was confirmed by recent studies by Zhang and Markman (1998), Alpert et al. (2001), Rettie et al. (2002), Niedrich and Swain (2003), and Desai and Ratneshwar (2003).

Additionally, a construct which reflects the information search, acquisition and processing was included in the model due to the various references to it in the literature.

20.3 Theoretical Model

The theoretical model was developed by searching in the available literature for variables reportedly related to brand preference. The review of the literature on brand preference between 1942 and 2004 reveals a final set of 22 principal factors (constructs), and a total of 54 relationships that may be significant for the development of brand preference as modeled. The proposed model, with 23 constructs and 106 indicators, incorporates many of the factors and relations that the review indicates as directly and individually contributing to explain brand preference. Table 20.1 summarizes the most relevant studies supporting the selection of variables and relations used in the formulation of the model presented in Fig. 20.1. The inclusion of a construct or relation in the model was based on its relevance for the study, the degree of differentiation, and its effective operationalization. Nevertheless, due to the complexity of the process of brand preference formation, it is assumed that not all the factors and relations were included, which could be seen as a limitation.

Table 20.1 Studies supporting the variables and relations

Path			Studies
Demographic profile	→	Self-concept	Lin (2002)
Demographic profile	→	Satisfaction	Bryant and Cha (1996); Mittal and Kamakura (2001); Olsen (2002)
Demographic profile	→	Need for cognition	Elliot (1994)
Demographic profile	→	Communication	Ginter and Bass (1972)
Demographic profile	→	Preference	Jamal and Goode (2001); Sethuraman and Cole (1999); Bass and Talarzyk (1972)
Demographic profile	→	Information search	Mandrik (1996)
Self-concept	→	Preference	Landon (1974); Sirgy (1982, 1985); Hughes (1976)
Self-concept	→	Self-image congruence	Gardner and Levy (1955); Levy (1959); Sirgy (1982, 1985)
Satisfaction	→	Preference	Taylor and Baker (1994); Hellier et al. (2003); Jamal and Goode (2001)
Need for cognition	→	Self-concept	Malhotra (1988); Sadowski and Cogburn (1997)
Need for cognition	→	Social environment	Cacioppo et al. (1996)
Need for cognition	→	Preference	Garbarino and Edell (1997)
Need for cognition	→	Information search	Mandrik (1996); Bloch and Richins (1983); Zaichkowsky (1985); Celsi and Olson (1988)
Need for cognition	→	Self-image congruence	Sadowski and Cogburn (1997); McCrea and John (1992)
Memory	→	Preference	Hutchinson et al. (1994); Nedungadi (1990); Ettenson (1993); Fisher et al. (1999)
Involvement	→	Need for cognition	Antil (1984); Celsi and Olson (1988)
Involvement	→	Preference	Zhang and Markman (2001)
Involvement	→	Information search	Witt and Bruce (1972); Celsi and Olson (1988); Maheswaran and Mackie (1992); Bolfing (1988); Jain and Maheswaran (2000)
Communication	→	Need for cognition	Zhang and Buda (1999)
Communication	→	Memory	Rheingold (1985); Fisher et al. (1999); Macklin (1996); Alreck and Settle (1999)
Communication	→	Preference	Paivio (1971); Shepard (1978); Mitchell and Olson (1981); Woodside and Wilson (1985); Carrol et al. (1990); D'Souza and Rao (1995); Alreck and Settle (1999)
Communication	→	Familiarity	Bogart and Lehman (1973); Cobb-Walgren et al. (1995); Alreck and Settle (1999); Lin et al. (2000)
Communication	→	Information search	Harris and Monaco (1978); Gruenfeld and Wyer (1992); Creyer and Ross (1997); Garbarino and Edell (1997)
Social environment	→	Preference	Sheth (1968); Stafford (1966); Hawkins and Coney (1974); Schmitt and Shultz (1995); Keillor et al. (1996); Yang et al. (2002); Ji (2002)

(*continued*)

Table 20.1 (continued)

Path			Studies
Risk	→	Preference	Peter and Ryan (1976); Pras and Summers (1978); Campbell and Goodstein (2001); Hellier et al. (2003); Muthukrishnan and Kardes (2001)
Visibility	→	Preference	Belk (1975); Miller and Ginter (1979); Dickson (1982); Becherer et al. (1982); Graeff (1997)
Visibility	→	Information search	Mandrik (1996)
Familiarity	→	Memory	Meyer-Levy (1989a, b)
Familiarity	→	Preference	Monroe (1976); Moreland and Zajonc (1982); Rheingold (1985)
Familiarity	→	Information search	Mandrik (1996)
Brand indent/ pers/image	→	Preference	Birdwell (1968); Ross (1971); Sirgy (1982, 1985); Graeff (1997); Phau and Lau (2001)
Brand indent/ pers/image	→	Self-image congruence	Fournier (1998); Helman and De Chernatony (1999); Sheth, Newman and Gross (1991)
Brand name	→	Preference	Klink (2001); Bristow et al. (2002); Venkataraman (1981); Woodside and Wilson (1985)
Brand name	→	Quality	Zinkhan and Martin (1987); Zeithaml (1988); Zaichkowsky and Vipat (1993); Rao et al. (1999); Srinivasan and Till (2002); Sappington and Wernerfelt (1985); Jacoby et al. (1977); Rigaux Bricmont (1981); Zeithaml (1988); Dick et al. (1996)
Brand origin	→	Preference	Papadopoulos et al. (1990); Peris et al. (1993); Kim (1995); Thorelli et al. (1989)
Brand origin		Perceived value	Ahmed and D'Astous (1993)
Brand origin	→	Quality	Han and Terpstra (1988); Khachaturian and Morganosky (1990); Powers and Nooh (1999); Tse and Gorn (1993); Thakor and Katsanis (1997)
Perceived value	→	Preference	Hellier et al. (2003); Morton (1994)
Quality	→	Preference	Morton (1994); Dickerson (1982); Hugstad and Durr (1986); Stephen et al. (1985); Wall and Heslop (1989); Olsen (2002); Hellier et al. (2003)
Quality	→	Perceived value	Morton (1994); Agarwal and Teas (2001); Hellier et al. (2003); Snoj et al. (2004)
Quality		Information search	Mandrik (1996)
Price	→	Preference	Monroe (1976); Rao and Monroe (1988); Wheatley et al. (1977)
Price	→	Perceived value	Sivakumar (1996); Chapman and Wahlers (1999)
Price	→	Quality	Peterson (1970); Zeithaml (1988); Lichtenstein and Burton (1989); Lichtenstein et al. (1993); Chapman and Wahlers (1999)
Price	→	Information search	Mandrik (1996)
Product attributes	→	Preference	Urban and Hauser (1993); Fisher et al. (1999); Carpenter et al. (1994); Dhar et al. (1999); Chernev (2001); Zhang and Markman (2001)
Product attributes	→	Quality	Kirmani and Zeithaml (1993); Richardson et al. (1994); Dick et al. (1996)

(*continued*)

Table 20.1 Table 1 (continued)

Product attributes	→	Information search	Allison and Uhl (1964); Russo et al. (1998)
Package	→	Preference	Alsop (1984); Banks (1950); Krugman (1962) Keller (2003)
Package	→	Quality	Riezebos (2003); Alsop (1984); Rigaux Bricmont (1981)
Information search	→	Preference	Fisher et al. (1999)
Pioneering	→	Preference	Carpenter and Nakamoto (1989); Zhang and Markman (1998); Alpert et al. (2001); Rettie et al. (2002); Niedrich and Swain (2003); Desai and Ratneshwar (2003).
Self-image congruence	→	Satisfaction	Jamal and Goode (2001); Aaker (1997); Moutinho and Goode (1995)
Self-image congruence	→	Preference	Belk et al. (1982); Onkvisit and Shaw (1987); Belk (1988); Richins (1994a, b); Hong and Zinkhan (1995); Ericksen (1996); Aaker (1999); Jamal and Goode (2001); Sirgy (1982)

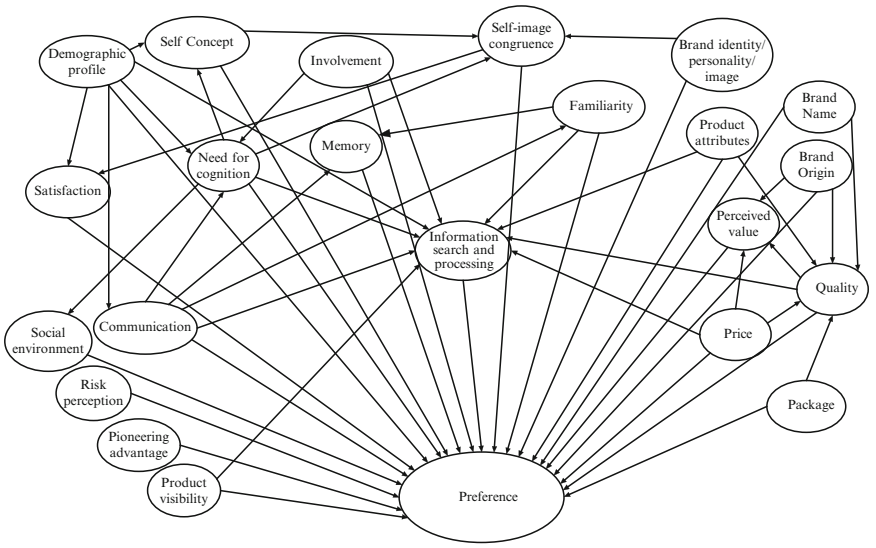

Fig. 20.1 Theoretical model of brand preference

20.4 Design and Methodology

To select the product class for the empirical research, a small questionnaire was conducted in a sample of 50 university students, using the brand dependence and brand disparity scales from Bristow et al.'s (2002) study. The data was analyzed, the results were interpreted, and mobile phones proved to be the best product class, of the ones tested, to study brand preference.

The empirical data was obtained from a sample of Portuguese students studying between the 9th grade of secondary school and the last year of university, all of whom study at state schools throughout the country. Those students were asked to

state their preference regarding the brand of mobile phone to buy, and to evaluate the various factors identified in the literature reviewed, using the multi-item Likert-type scales, previously selected, adapted and pre-tested for the current context.

A balance was sought between covering the maximum and most important indicators and the extent of the questionnaire. Where several measures were available, preference was given to those judged most easily read, and those with strong predictive power. Finally, a set of 106 indicators was selected from existing questionnaires and the handbook of marketing scales. The questions were adapted for readability prior to pre-testing.

Table 20.2 presents a summary of the studies reviewed to identify the indicators used to measure the constructs of the model (the full list of measures is available from the authors).

Table 20.2 Constructs, number of indicators and studies

Construct	Studies
Demographic profile	Sethuraman and Cole (1999); Jamal and Goode (2001)
Self-concept	Malhotra (1981); Sirgy et al. (1997); Lau and Lee (1999)
Involvement	Traylor (1981); Zaichkowsky (1985); Zinkhan and Martin (1987); Rodgers and Schneider (1993); Zaichkowsky (1994); D'Astous and Gargouri (2001)
Need for cognition	Cacioppo et al. (1984)
Memory	Lange and Dahlén (2003)
Brand name	Mandrik (1996); Kohli and LaBahn (1997)
Brand identity, personality and image	Lewis and Stubbs (1999); Del Río et al. (2001)
Price and perceived value	Petroshius and Monroe (1987); Schmitt and Shultz (1995); Agarwal and Teas (2001); D'Astous and Gargouri (2001); Del Río et al. (2001); Quester and Lim (2003)
Quality	Dodds et al. (1991); Schmitt and Shultz (1995); Burton et al. (1998); Chapman and Wahlers (1999); Agarwal and Teas (2001); Ballester and Alemán (2002)
Familiarity	Low and Lamb (2000); D'Astous and Gargouri (2001); Mackay (2001); Lange and Dahlén (2003)
Satisfaction	Lau and Lee (1999); Jamal and Goode (2001)
Self image congruence	Lau and Lee (1999)
Social environment	Lau and Lee (1999); Del Río et al. (2001)
Risk	Mitchell (1992); Agarwal and Teas (2001)
Information search and processing	Srinivasan and Ratchford (1991)
Preference	Moschis (1981); Duncan and Nelson (1985); Stayman and Aaker (1988); Petroshius and Crocker (1989); Costley and Brucks (1992); Sirgy et al. (1997); Jamal and Goode (2001); Mackay (2001); Quester and Lim (2003); Hellier et al. (2003).

Table 20.3 Sample characterization

Education level	Age				Total
	<15	15–18	19–25	≥26	
9th grade	39	97	1	0	137
10th grade	2	63	0	0	65
11th grade	1	62	3	0	66
12th grade	0	38	12	0	50
University students	1	13	132	31	177
Bachelor's degree	0	1	19	4	24
University degree	0	1	1	5	7
Total	43	275	168	40	526

Note: Gender is missing for two subjects

The following indicators were used to evaluate: demographic profile, satisfaction, self-concept, need for cognition (Cacioppo and Petty 1982), involvement, memory, self-image congruence, communication, social environment, risk perception, pioneering advantage (Carpenter and Nakamoto 1989), product visibility, information search, familiarity, brand identity/personality and image, product attributes, brand name, brand origin, price, quality, perceived value, and package. Using the guidelines proposed by Jarvis et al. (2003), two constructs (demographic profile and self-concept) were modeled as formative and the remaining as reflective.

The sample was stratified according to the number of students in each grade. A total of 700 questionnaires were mailed and 542 were received. Of those, 14 were eliminated, for various reasons, resulting in a valid sample of 528 subjects. Table 20.3 presents the participants' distribution by education level.

To evaluate the strength of brand in the consumer mind, a top-of-mind analysis (TOMA) was made. A TOMA allows the investigator to explore people's perceptions and immediate associations with a particular issue. It works by asking: what is the first brand that comes to mind when the product class is mentioned? The results of the TOMA can somehow be regarded as an indicator of brand preference. It is conceivable that consumers will automatically think of their preferred brand when a given product category is mentioned.

The TOMA performed in this study reveals that Nokia is the winner by far, followed by Siemens, as can be seen in Table 20.4.

When looking at the subjects' first brand of mobile phone and their actual brand an interesting point emerged. Alcatel was the first brand for 21.3% of the respondents, but is the actual brand for only 2.8% (see Table 20.5).

Inversely, the preference for Nokia and Siemens seems to increase as they have more actual users who had first bought another brand. These findings can be an especially interesting starting point for Alcatel to try to find why they lose so much market share and cannot retain consumer preference over time.

To assess the predictive power of our theoretical model, a structural equation modeling (SEM), specifically Partial Least Squares (PLS) (using PLS-Graph Version 3.0 by Wynne Chin), was used to evaluate the relationships between the constructs, and to estimate both the measurement and structural parameters in

Table 20.4 Top-of-mind analysis

Brand	Order of response			Total
	1st	2nd	3rd	
Alcatel	11	49	95	155
Mitsubishi	1		1	2
Motorola	14	52	97	163
Panasonic	1	2	3	6
Philips	1	2	3	6
Nokia	409	83	20	512
Samsung	11	54	91	156
Sharp		7	9	16
Siemens	61	207	115	383
Sony Ericsson	15	58	77	150
Sendo	1	2	7	10
Telit		1		1
Maxon		1		1
Sagem	1	3	4	8
Trium		4	1	5
Audiovox	2			2
Total	528	525	523	

Note: Some respondents didn't mention a second or third brand name

Table 20.5 Comparison between first and actual brand

	Actual	%	First	%
Alcatel	15	2.84	108	20.7
Mitsubishi	4	0.76	4	0.8
Motorola	24	4.55	57	10.9
Panasonic	1	0.19	6	1.1
Philips	2	0.38	15	2.9
Nokia	312	59.09	147	28.1
Samsung	21	3.98	14	2.7
Sharp	3	0.57	0	0.0
Siemens	111	21.02	87	16.6
Sony Ericsson	23	4.36	40	7.6
Sendo	2	0.38	1	0.2
Maxon	1	0.19		
Sagem	1	0.19	11	2.1
Trium	7	1.33	12	2.3
Bosh			8	1.5
Aeg	1	0.19	9	1.7
Audiovox			3	0.6
Nec			1	0.2
Total	528		523	

the proposed structural equation model. The choice of PLS is due to the nature of the study and the size and complexity of the model. Furthermore, the model has two constructs measured with formative indicators and PLS is appropriate for the analyses of measurement models with both formative and reflective items (Diamantopoulos and Winklhofer 2001).

20.5 PLS Analyses

The Partial Least Squares (PLS) was used to evaluate the proposed theoretical model. PLS is a structural equation modeling (SEM) technique that can simultaneously test the measurement model (relationships between indicators or manifest variables and their corresponding constructs or latent variables) and the structural model (relationships between constructs). Additionally, PLS has the capacity to deal with very complex models with a high number of constructs, indicators, and relationships (Garthwaite 1994; Barclay et al. 1995), what makes it ideal to our study.

The PLS algorithm generates loadings between reflective constructs and their indicators and weights between formative constructs and their indicators. It also produces standardized regression coefficients between constructs, and coefficients of multiple determination (R^2) for all endogenous constructs in the model.

In PLS, the relationship between a construct and its indicators can be modeled as either formative or reflective, which is an advantage compared to the covariance-based methods. In addition, PLS allows working with small sample sizes and makes less strict assumptions about the distribution of the data (Chin and Newsted 1999).

However, rather than being viewed as competitive models, PLS and covariance-based SEM techniques should be viewed as complementary. They differ regarding the objective (prediction for PLS and theory testing for covariance-based SEM) and the approach (variance for PLS and covariance for covariance-based SEM) (Chin and Newsted 1999).

According to Jöreskog and Wold (1982), "ML is theory-oriented, and emphasizes the transition from exploratory to confirmatory analysis. PLS is primarily intended for causal-predictive analysis in situations of high complexity but low theoretical information."

Certain conditions are required to evaluate the appropriateness of PLS compared to its covariance-based counterpart, which can be classified into four groups (Falk and Miller 1992): theoretical conditions, measurement conditions, distributional conditions, and practical conditions. According to these authors, PLS could be used when there is no strong existing theory, and hypotheses are derived from a macro-level theory in which all relevant variables are not known, relationships between constructs are conjectural, some of the manifest variables are categorical and they may have some degree of unreliability, distribution of the data may not be normal, sample size is very large or small, and a large number of manifest and

latent variables are modeled. After a systematic review of all these conditions, it was decided that PLS was the most appropriate technique for this study.

20.5.1 Measurement Model

In PLS, the relationship between a construct and its indicators can be modeled as either formative or reflective. Formative indicators are also known as cause or induced indicators, while reflective indicators are also known as effect indicators. Our study uses both kinds of indicators.

In a PLS analysis, reflective and formative indicators must be treated differently. For constructs with reflective measures (i.e., latent constructs), it's necessary to examine the loadings, which can be interpreted in the same manner as the loadings in a principal component analysis. For constructs using formative measures (i.e., emergent constructs), it's necessary to look at the weights, as they provide information about the composition and relative importance of each indicator in the creation/formation of the construct. Since the construct is viewed as an effect rather than a cause of the item responses, no interdependencies can be assumed among the formative items. As a result, traditional reliability and validity assessments have been argued as inappropriate and illogical for this type of factor, referring to its dimensions (Bollen 1989). Their interpretation is similar to the canonical correlation analysis (Sambamurthy and Chin 1994).

The measurement model for constructs with reflective measures is assessed by looking at: individual item reliability, internal consistency and discriminant validity. The individual item reliability is evaluated by examining the loadings of the measures with the construct they intend to measure.

Using the rule of thumbs of accepting items with loadings of 0.707 or more, we notice that 18 indicators of the 106 did not reach the level of acceptable reliability. However, as pointed by Chin (1998) and Barclay et al. (1995), loadings of at least 0.5 might be acceptable if other questions measuring the same construct had high reliability scores. Falk and Miller (1992) propose as a rule of thumb retaining manifest variables with loadings that exceed 0.55, i.e. 30% of the variance of the manifest variable is related to the component. Upon examination of the cross-loadings (available from the authors) of our model six indicators were eliminated as they presented loadings lower than 0.5 and some presented higher loadings in other constructs than in the one they were intended to measure. In the whole model, only two indicators present loadings between 0.5 and 0.55 (COGN1, COGN3), so we decide to keep them.

The internal consistency was examined using the composite reliability index by Fornell and Larcker (1981). In our model the composite reliability index for all constructs exceed the minimum acceptable value of 0.7 (Hair et al. 1998), with need for cognition presenting the lowest (0.736) and package the maximum (0.938).

The next step was evaluating discriminant validity. Discriminant validity indicates the extent to which a given construct is different from other latent constructs. As a means of evaluating discriminant validity, Fornell and Larcker (1981) suggest the use of the Average Variance Extracted (AVE).

A score of 0.5 for the AVE indicates an acceptable level. (Fornell and Larcker 1981). Table 20.6 shows that the average variances extracted by our measures range from 0.536 to 0.791 above the acceptable value, except for the need for cognition construct which has a value of 0.361.

This value may be an effect of tailoring the scale. However, looking at the composite reliability index, the discriminant validity of the constructs (Table 20.7), and the cross-loading, we decide to keep the construct in the model, as we believed that it actually measures the respondents' degree of need for cognition.

Table 20.7 compares the square root of the AVE (diagonal values) with the correlations among the reflective constructs. All constructs were more strongly correlated with their own measures than with any other of the constructs, suggesting good convergent and discriminant validity.

For adequate discriminant validity, this measure should be greater than the variance shared between the construct and other constructs in the model. This, according to Chin (1998), can also be accomplished by examining the loadings and cross-loadings matrix. In our model the assessment of discriminant validity does not reveal any problem, as all indicators showed higher loadings with their respective construct than with any other reflective construct.

As formative indicators are not expected to correlate with one another and therefore traditional measures of validity are not appropriate, Chin (1998) suggests the evaluation of the Variance Inflation Factor and condition index to assess multicollinearity, and the significance of the weights (Table 20.8).

Using four conservative criteria by Olmo and Jamilena (2000), we see that the measures of demographic profile and self-concept components present VIF values lower than the limit specified, indicating the absence of multicollinearity.

The condition index confirms the absence of multicollinearity, as its value for every dimension never exceeds 30.

For formative items, the magnitude and significance of the weight indicate the importance of the contribution of the associated latent variable. The education level is by far the most important variable in forming the demographic profile. For the self-concept construct, the level of formality (PERS8) seems to be the most important variable.

The significance of the weight was assessed using the bootstrap procedure. The results of 500 resamples indicate that several indicators were not significant even at the 0.1 level, but given the exploratory nature of the study and following Chin's (1998) recommendation, those items were retained in the model to assess the strength of the demographic profile.

Table 20.6 Weights, loadings, composite reliability and average variance extracted

Constructs and indicators	Type	Weight	Loading	Composite reliability ρ_c	Average variance extracted AVE
Demographic profile	F			n.a.	n.a.
Age		0.219	0.703		
Education		0.761	0.836		
Gender		0.262	0.289		
Family_DIM		−0.281	−0.394		
Marit_status		−0.389	−0.113		
Resid		0.170	−0.012		
Self-concept	F			n.a.	n.a.
PERS1		0.143	0.101		
PERS2		0.206	0.282		
PERS3		0.094	0.207		
PERS4		−0.223	−0.319		
PERS5		0.353	0.166		
PERS6		0.170	0.168		
PERS7		0.205	0.277		
PERS8		−0.800	−0.737		
PERS9		0.288	0.360		
Satisfaction	R			0.900	0.693
SATGLOB		0.220	0.707		
SAT1		0.342	0.858		
SAT2		0.303	0.875		
SAT3		0.325	0.879		
Need for cognition	R			0.736	0.361
COGN2		0.369	0.601		
COGN4		0.448	0.710		
COGN5		0.307	0.625		
COGN1		0.300	0.523		
COGN3		0.213	0.525		
Memory	R			0.780	0.546
MEM1		0.439	0.750		
MEM2		0.542	0.840		
MEM3		0.354	0.609		
Involvement	R			0.874	0.538
ENV1		0.225	0.768		
ENV2		0.203	0.768		
ENV3		0.284	0.702		
ENV4		0.210	0.593		
ENV5		0.197	0.707		
ENV6		0.249	0.840		
Communication	R			0.913	0.601
COM1		0.230	0.816		
COM2		0.213	0.836		
COM3		0.170	0.785		
COM4		0.209	0.814		

(*continued*)

Table 20.6 (continued)

COM5		0.166	0.774		
COM6		0.162	0.742		
COM7		0.126	0.643		
Social environment	R			0.859	0.607
SOC1		0.273	0.759		
SOC2		0.191	0.637		
SOC3		0.398	0.865		
SOC4		0.392	0.835		
Perceived risk	R			0.899	0.643
RSC1		0.187	0.679		
RSC2		0.251	0.818		
RSC3		0.275	0.867		
RSC4		0.263	0.842		
RSC5		0.264	0.791		
Product visibility	R			0.840	0.724
VIS1		0.513	0.811		
VIS2		0.657	0.889		
Preference	R			0.828	0.616
PREF1		0.455	0.776		
PREF2		0.420	0.825		
PREF3		0.400	0.752		
Familiar	R			0.883	0.659
FAM1		0.313	0.872		
FAM2		0.351	0.876		
FAM3		0.317	0.858		
FAM4		0.242	0.610		
Brand identity. image	R			0.908	0.587
IPI1		0.189	0.775		
IPI2		0.165	0.750		
IPI3		0.178	0.787		
IPI4		0.166	0.812		
IPI5		0.203	0.719		
IPI6		0.173	0.793		
IPI7		0.238	0.722		
Brand name	R			0.825	0.545
NOM1		0.329	0.786		
NOM2		0.365	0.834		
NOM3		0.348	0.738		
NOM6		0.318	0.568		
Brand origin	R			0.835	0.629
ORIG1		0.470	0.830		
ORIG2		0.412	0.826		
ORIG3		0.376	0.718		
Perceived value	R			0.858	0.606
VLP1		0.221	0.573		
VLP2		0.310	0.808		
VLP3		0.364	0.877		

(*continued*)

Table 20.6 (continued)

Constructs and indicators	Type	Weight	Loading	Composite reliability ρ_c	Average variance extracted AVE
Demographic profile	F			n.a.	n.a.
VLP4		0.370	0.822		
Quality	R			0.922	0.747
QLD1		0.259	0.819		
QLD2		0.303	0.882		
QLD3		0.295	0.911		
QLD4		0.300	0.842		
Price	R			0.808	0.584
PRC3		0.379	0.754		
PRC4		0.443	0.717		
PRC5		0.485	0.819		
Product attributes	R			0.852	0.536
ATB1		0.275	0.715		
ATB2		0.270	0.750		
ATB3		0.255	0.703		
ATB4		0.345	0.812		
ATB5		0.211	0.674		
Package	R			0.938	0.791
EMB1		0.248	0.865		
EMB2		0.293	0.909		
EMB3		0.311	0.916		
EMB4		0.271	0.866		
Information search	R			0.882	0.656
INF1		0.343	0.866		
INF2		0.316	0.841		
INF3		0.327	0.883		
INF4		0.239	0.623		
Pioneering advantage	R			n.a.	n.a.
PRIMMC		1.000	1.000		
Self-image congruence	R			0.857	0.667
CNS1		0.456	0.830		
CNS3		0.393	0.824		
CNS5		0.375	0.796		

Notes: Type: *R* reflective, *F* formative, *n.a.* not applicable

20.5.2 Structural Model

The structural model represents the relationships between constructs or latent variables that were hypothesized in the research model. Since the primary objective of PLS is prediction, the goodness of a theoretical model is established by the strength of each structural path and the combined predictiveness (R^2) of its exogenous constructs (Chin 1998). Falk and Miller (1992) suggest that the variance explained, or

Table 20.7 Discriminant validity coefficients

	Satis	Need	Mem	Invol	Comm	Soc En	Risk	Visibi
Satis	0.832							
Need	−0.120	0.601						
Mem	0.292	−0.273	0.739					
Invol	0.239	−0.286	0.214	0.733				
Comm	0.344	−0.258	0.455	0.487	0.775			
Soc Env	0.365	−0.377	0.252	0.378	0.433	0.779		
Risk	0.537	−0.301	0.319	0.398	0.562	0.452	0.802	
Visibi	0.177	−0.401	0.204	0.398	0.343	0.547	0.359	0.851
Prefer	0.302	−0.312	0.235	0.463	0.443	0.544	0.489	0.458
Famil	0.273	−0.270	0.330	0.252	0.341	0.247	0.335	0.224
Br.Iden	0.433	−0.364	0.338	0.388	0.526	0.593	0.499	0.356
Br.Name	0.532	−0.273	0.327	0.445	0.580	0.532	0.557	0.360
Br.Orig	0.184	−0.416	0.155	0.373	0.327	0.361	0.370	0.449
Value	0.642	−0.347	0.273	0.346	0.444	0.467	0.687	0.346
Quality	0.792	−0.223	0.351	0.338	0.454	0.498	0.705	0.285
Price	−0.253	0.329	−0.232	−0.361	−0.421	−0.445	−0.525	−0.390
Prod At	0.276	−0.268	0.389	0.435	0.502	0.337	0.431	0.307
Package	0.076	−0.326	0.150	0.437	0.333	0.356	0.282	0.404
Inform	0.214	−0.338	0.288	0.439	0.382	0.296	0.363	0.299
Pion.	−0.007	−0.039	−0.015	0.000	0.002	0.031	−0.003	0.062
Congr.	0.221	−0.391	0.254	0.412	0.436	0.462	0.380	0.450

	Prefer	Famil	Br.Iden	Br.Name	Br.Orig	Value	Quality	Price
Prefer	0.785							
Famil	0.300	0.812						
Br.Iden	0.648	0.460	0.766					
Br.Name	0.564	0.412	0.655	0.738				
Br.Orig	0.425	0.317	0.420	0.426	0.793			
Value	0.423	0.294	0.504	0.549	0.280	0.778		
Quality	0.432	0.312	0.513	0.587	0.274	0.755	0.864	
Price	−0.406	−0.253	−0.434	−0.398	−0.341	−0.420	−0.395	0.764
Prod At	0.427	0.528	0.481	0.488	0.470	0.346	0.355	−0.347
Package	0.415	0.171	0.349	0.401	0.502	0.168	0.161	−0.271
Inform	0.429	0.649	0.494	0.435	0.432	0.315	0.304	−0.329
Pion.	0.033	0.003	0.024	−0.002	0.020	−0.009	−0.004	−0.068
Congr.	0.590	0.270	0.563	0.538	0.530	0.322	0.331	−0.352

	Prod At	Package	Inform	Pion.	Congruence
Prod At	0.732				
Package	0.376	0.889			
Inform	0.560	0.331	0.810		
Pion.	0.056	−0.013	0.073	1.000	
Congr.	0.453	0.515	0.434	0.045	0.817

Notes: Diagonal elements are the square root of average variance extracted (AVE) between the constructs and their measures. Off-diagonal elements are correlations between constructs. For discriminant validity, diagonal elements should be larger than off-diagonal elements in the same row and column

Table 20.8 Multicollinearity statistics

Component	Indicator	Tolerance	VIF	*t*-Statistic
Demographic profile	Age	0.378	2.648	1.232
	Education	0.376	2.656	4.082***
	Gender	0.929	1.076	1.391
	Family_dim	0.952	1.050	2.053*
	Marit_status	0.906	1.104	4.254***
	Residence	0.887	1.127	1.302
Self-concept	PERS1	0.862	1.160	0.763
	PERS2	0.943	1.061	1.538
	PERS3	0.859	1.165	0.658
	PERS4	0.850	1.176	1.423
	PERS5	0.916	1.091	1.633
	PERS6	0.953	1.049	0.864
	PERS7	0.878	1.139	1.667
	PERS8	0.938	1.066	4.439***
	PERS9	0.898	1.113	2.031*

Notes: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$ (based on $t_{(499)}$, two-tailed test)

Table 20.9 Variance explained

Dependent construct	R^2
Satisfaction	0.059
Communication	0.049
Need for cognition	0.138
Self-concept	0.096
Social environment	0.143
Memory	0.242
Self-image congruence	0.358
Information search	0.539
Familiarity	0.116
Perceived value	0.589
Quality	0.392
Preference	0.574

R^2s, for endogenous variables should be greater than 0.1. The variance explained for each dependent construct is showed in Table 20.9.

As can be seen, three of the 12 endogenous constructs do not meet Falk and Miller's (1992) rule of 0.1. In this study, the final dependent construct (preference) has an R^2 value of 0.574, which can be considered satisfactory, taking into account the complexity of the model. Other constructs in the model also present acceptable levels of explained variance above the 0.1 level.

After computing the path estimates in the structural model, a bootstrap analysis was performed to assess the statistical significance of the path coefficients. From the initial set of paths, five were revealed as significant at 0.95, six at the 0.99 level, and the remaining 18 were significant at the 0.999 level, as shown in Table 20.10.

Table 20.10 Path coefficient

Path			Path coefficient	T statistic	Sign
Demographic profile	→	Satisfaction	−0.104	2.052	*
Demographic profile	→	Need for cognition	0.205	3.447	***
Demographic profile	→	Communication	−0.221	4.345	***
Demographic profile	→	Preference	0.099	2.667	**
Need for cognition	→	Self-concept	−0.169	2.103	*
Need for cognition	→	Social environment	−0.377	9.187	***
Need for cognition	→	Information search	−0.088	2.406	*
Need for cognition	→	Self-image congruence	−0.211	4.624	***
Involvement	→	Need for cognition	−0.163	3.148	**
Involvement	→	Preference	0.119	2.821	**
Involvement	→	Information search	0.201	5.380	***
Communication	→	Need for cognition	−0.133	2.853	**
Communication	→	Memory	0.388	9.957	***
Communication	→	Familiarity	0.341	7.491	***
Social environment	→	Preference	0.099	1.991	*
Risk	→	Preference	0.129	2.169	*
Visibility	→	Preference	0.118	2.901	**
Familiarity	→	Memory	0.198	4.412	***
Familiarity	→	Information search	0.463	11.951	***
Brand indent/pers/image	→	Preference	0.331	6.190	***
Brand indent/pers/image	→	Self-image congruence	0.480	12.971	***
Brand name	→	Quality	0.521	10.568	***
Quality	→	Perceived value	0.690	23.289	***
Price	→	Perceived value	−0.131	3.822	***
Price	→	Quality	−0.192	4.101	***
Product attributes	→	Information search	0.194	4.890	***
Package	→	Quality	−0.139	3.265	**
Self-image congruence	→	Satisfaction	0.201	4.247	***
Self-image congruence	→	Preference	0.195	4.532	***

Notes: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$; (based on $t_{(499)}$, two-tailed test)

Figure 20.2 shows the significant paths (at the minimum level of 0.05) for our model. As can be seen, of the initial 22 constructs, only 7 seem to have a direct and statistical significant impact on brand preference, with brand identity, personality and image and self image congruence constructs having the strongest influence.

In PLS, no global criterion is optimized and, consequently, there is no that allows us to evaluate the overall model. Trying to surpass this problem, Tenenhaus et al. (2004) propose a global criterion of goodness-of-fit (*GoF*) that represents an operational solution for this gap, and can be seen as an index for validating the PLS model globally. This *GoF* measure is the geometric mean of the average communality and the average R^2. The average communality is computed as a weight average of the different communalities with the number of manifest variables or indicators of every construct as weights. It is worth noting that single indicator constructs should not be used for the computation of the average communality, because they lead to communalities equal to 1 (Tenenhaus et al. 2005).

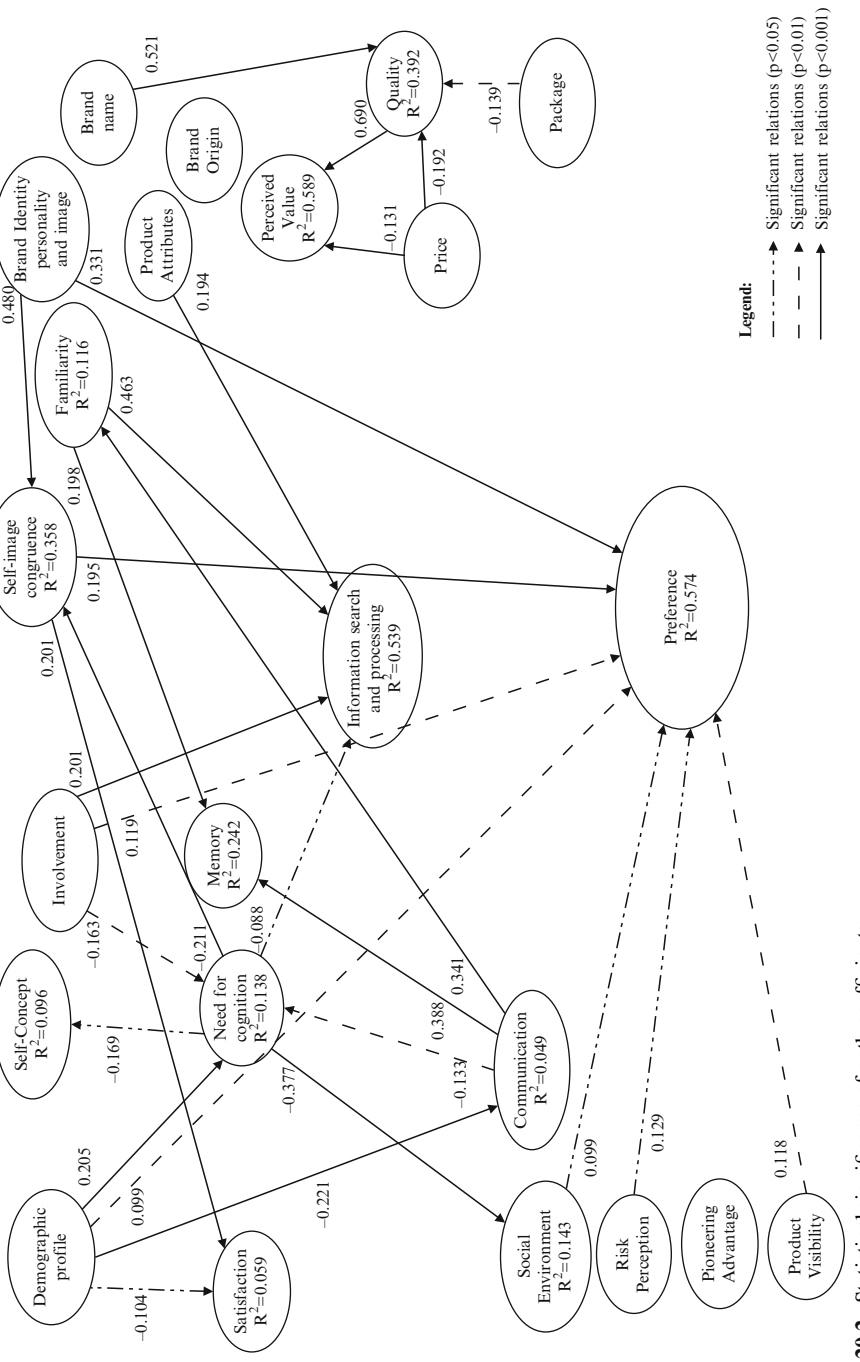

Fig. 20.2 Statistical significance of path coefficients

Table 20.11 Communality, redundancy and *GoF*

Block	R^2	Average communality	Average redundancy	Manifest variables (MV)	AvComm. × MV
Demog. profile (*)		0.2411		6.0000	0.930
Self-concept (*)	0.0957	0.1178	0.0113	9.0000	1.026
Satisfaction	0.0593	0.6941	0.0412	4.0000	2.773
Need for cognition	0.1369	0.3610	0.0494	5.0000	1.804
Memory	0.2421	0.5458	0.1321	3.0000	1.637
Involvement		0.5379		6.0000	3.229
Communication	0.0489	0.6012	0.0294	7.0000	4.206
Social environment	0.1402	0.6102	0.0856	4.0000	2.428
Risk perception		0.6427		5.0000	3.216
Visibility		0.7248		2.0000	1.449
Preference	0.6159	0.4997	0.3077	3.0000	1.847
Familiar	0.1159	0.6588	0.0763	4.0000	2.636
Brand iden/ier/imag		0.5879		7.0000	4.107
Brand name		0.5442		4.0000	2.182
Brand origin		0.6288		3.0000	1.886
Perceived value	0.5892	0.6064	0.3573	4.0000	2.425
Quality	0.3960	0.7466	0.2957	4.0000	2.986
Price		0.5844		3.0000	1.753
Product		0.5360		5.0000	2.680
Package		0.7911		4.0000	3.165
Information search	0.5393	0.6559	0.3537	4.0000	2.624
Pioneering advant.		1.0000		1.0000	
Self-image congru.	0.3543	0.6665	0.2361	3.0000	2.001
Average	0.2778			100.00	0.529887
				GoF	*0.3814*

Note: (*) For latent variables (LVs) measured with formative indicators the communalities were replaced with the R^2 obtained through the multiple regression of the LVs scores from internal estimation, over its own formative manifest variables (MVs)

For our model, the Amato et al. (2004) *GoF* was 0.3814, as can be seen in Table 20.11.

Another test applied in PLS models is the Stone-Geisser test of predictive relevance. This test can be used as an additional assessment of model fit in PLS analysis (Stone 1974; Geisser 1975). The Q^2 statistic is a jackknife version of the R^2 statistic. According to Chin (1998), the "Q^2 represents a measure of how well observed values are reconstructed by the model and its parameter estimates." Models with Q^2 greater than zero are considered to have predictive relevance. Models with higher positive Q^2 values are considered to have more predictive relevance.

The procedure to calculate the Q^2 involves omitting or "blindfolding" one case at a time and reestimating the model parameters based on the remaining cases, and predicting the omitted case values on the basis of the remaining parameters (Sellin 1989). The procedure results in the Q^2 test statistic.

The Stone-Geisser Q^2 can be obtained through the underlying latent variable score case from which the cross-validated communality is obtained, or through those latent variables that predict the block in question from which the cross-validated redundancy is obtained.

The cv-communality measures the capacity of the path model to predict the manifest variables or data points from their own latent variable score, and serves as an indicator of the quality of the measurement model. The cv-redundancy measures the capacity of the model to predict the endogenous manifest variables using the latent variables that predict the block in question, and serve as a sign of the quality of the structural model (Tenenhaus et al. 2005).

We compute measures of cross-validation to evaluate both the measurement model (cv-communality H^2) and the structural model (cv-redundancy F^2). For our model, blindfolding has been carried out using $G = 30$. According to Wold (1982), the omission distance should be an integer between the number of indicators and cases. Chin (1998) indicates that values between 5 and 10 are feasible but, considering the complexity of the model, we believe that a larger number is preferable. The results are in Table 20.12.

As can be seen, several blocks do not present an acceptable cross-validated redundancy index. More, due to blindfolding procedure, the cv-communality and

Table 20.12 Blindfolding results: cv-communality and cv-redundancy

Block	Cv-communality H^2	Cv-redundancy F^2
Demographic profile	0.0049	
Self-concept	−0.0768	−0.0532
Satisfaction	0.4862	−0.3575
Need for cognition	0.0660	−0.1023
Memory	0.1460	−0.0123
Involvement	0.3579	
Communication	0.4708	−0.3451
Social environment	0.3628	−0.1539
Risk perception	0.4657	
Visibility	0.2037	
Preference	0.2474	0.2884
Familiar	0.4416	−0.2067
Brand iden/per/imag	0.4462	
Brand name	0.2624	
Brand origin	0.2750	
Perceived value	0.3650	0.3194
Quality	0.5613	0.1861
Price	0.1962	
Product	0.3124	
Package	0.6289	
Information search	0.4376	0.3017
Pioneering advantage		
Self-image congruence	0.3358	0.1244

the cv-redundancy measures may be negative, which happens in this study and, according to Tenenhaus et al. (2005), implies that the corresponding latent variable has been badly estimated. These results may be attributed to the size and complexity of the theoretical model proposed.

20.6 Discussion

In keeping with the evidences retrieved from the literature review (Rossi et al. 1996; Bucklin et al. 1995), the demographic profile in this study shows a small, but statistical significant, impact on brand preference. This impact can be even higher, as this construct represents several other effects on other components of the model, and consequently, we think that demographic variables should not be ignored in brand preference studies.

The need for cognition construct presents a rich set of significant relations with other elements, but these results should be carefully considered given the AVE value obtained in the measurement model evaluation. Nevertheless, it can be observed that all the paths, starting with the need for cognition, have negative signs, suggesting that consumers with a high level of need for cognition, i.e. who appreciate the effort of thinking over things, tend to pay little attention and assign little importance to, and rely less on other factors. In line with the indications by Zhang and Buda (1999) and Sadowski and Cogburn (1997), these results show that the level of need for cognition has the capability of influencing the way consumers look at the environment and the stimulus received.

The need for cognition is also influenced by the importance placed on communication, suggesting that consumers who place higher importance on communication are less likely to engage in complex mental processes. On the other hand, communication shows a positive impact on memory and familiarity, which is consistent with previous studies. The absence of a direct impact on the preference confirms Hawkins (1970) and Higie and Sewall's (1991) doubts about the existence of a direct link between communication and preference and reinforces the indication by D'Souza and Rao (1995) that communication itself is not sufficient to increase brand preference. Nevertheless, communication has a significant impact on memory, as pointed out by Ettenson (1993), on familiarity according to Bogart and Lehman (1973), Cobb-Walgren et al. (1995), Alreck and Settle (1999), Lin et al. (2000) and Riezebos (2003), and on the need for cognition, but none of those links directly to preference, only through other constructs.

Our findings also suggest that familiarity enhances memory, but contrary to the observations by Haley and Case (1979) and Hutchinson et al. (1994), memory has a negative impact (non significant) on brand preference, suggesting that preference can be negatively affected by memory capacity, perhaps because consumers with better memories are able to retain more data and produce more complex comparisons.

More consistent with the evidence from the literature reviewed, namely Witt and Bruce (1972), Celsi and Olson (1988) and Maheswaran and Mackie (1992), is the effect of involvement, which exhibits a positive impact on information search, thus pointing to a high level of involvement inducing a more extensive information search. Also, the degree of familiarity and the importance placed on product attributes display a positive influence on information search, suggesting that consumers more familiar with the class and those who weighted product attributes more heavily, tend to place more importance on information search and processing. Conversely, consumers with a high need for cognition are less willing to engage in information search, which could be explained by the confidence they have in on their own mental skills.

Looking at the attributes related to the brand, we notice that only brand identity, personality, and image components exhibit a significant relation with preference, suggesting that most consumers use brands as a way of expressing themselves or their lifestyle and, consequently, they tend to prefer brands whose identity, personality, and image are closer to them, pointing out that a consumer's relationship with brands becomes increasingly symbiotic.

Companies have long stimulated consumers to identify with products or brands and their identity/personality. Brands becomes extremely attractive to consumers, and so become new friends, who over time become old friends. Consumers prefer brands with a strong identity, personality and image (Sirgy 1982; Phau and Lau 2001), especially those that reinforce their self-concept. Fournier (1998) has even identified a total of 15 types of consumer/brand relationships.

Consequently, the congruence between brand identity, personality and image, and consumer self-image, called self-image congruence seems to be very important for brand preference. Many studies (Belk et al. 1982; Onkvisit and Shaw 1987; Belk 1988; Richins 1994a,b; Hong and Zinkhan 1995; Ericksen 1996; Aaker 1999; Jamal and Goode 2001) have confirmed the importance of self-image congruence, which our study now confirms. If we look at the path coefficients we notice that brand identity, personality and image, and self-image congruence have the strongest relations with preference, stressing the importance of those constructs in the development of brand preference.

Other constructs related to the brand show strong and significant relations, especially brand name/quality and quality/perceived value, but none have a significant impact on preference.

Finally, of the situational factors, only social environment and product visibility exhibit a significant positive influence on preference. These findings suggest that consumers try to match the brand of their mobile phone with the brands of their friends and family. A product with social visibility also seems to have a positive impact on preference, which was previously noted by Graeff (1997).

Several other constructs also show strong relations, namely: communication, familiarity, brand name, quality, need for cognition, product attributes and demographic profile, but, as was anticipated, a large number does not exhibit a statistical significant relation with preference. The explanation for this contradiction, in our opinion, may result from two conditions. First, the product class used in this

investigation has different characteristics from the products used in the studies reviewed, most of which were consumer goods. Second, as was anticipated in the introduction, we think that the interaction between factors plays a crucial role in the development of preference. This is, perhaps, an issue that could explain the results found, because previous studies focus only on the impact of one or a very limited set of factors on preference.

Consequently, we cannot say that our results are contrary to those found in the literature; rather, they should serve as a new starting point for investigators to consider, revise, and extend upon.

In conclusion, these results show that the social environment and the context in which the product will be used influence the brand preference for mobile phones. Further, the results stress the importance of brand identity and its relationship with the self-image of the consumer for the formation of brand preference and, therefore, reinforce the conviction of several authors that consumers tend to prefer brands that are closer to their self-image.

20.7 Summary, Conclusions, and Limitations

The goal of our research was to uncover factors that lead to the formation of brand preference and improve our understanding of the interaction of those factors. At the same time, we hope to show that PLS can be successfully used to test big and complex models, where other statistical techniques would fail.

From the analysis, we were be able to show that several factors contribute to brand preference, specially those related to brand identity, personality and image and their congruence with consumer self-image. The findings of this study are partially supported by the literature, and the estimation model validates 29 of the 54 relationships hypothesized in our conceptual model at the 0.05 significance level. The R-square for the model was 0.574, which we think can be considered very satisfactory, taking into account its complexity.

In the light of the controversy about the nature of brand preference and consumer behavior, the results of this investigation support Best's (1978) vision of a pattern of preference, which can result in a buying pattern or a pattern of choice behavior. Nevertheless, we cannot ignore or underestimate the power of situational factors in determining consumer preference. Consequently, in our opinion, the results of this research reinforce the conciliatory perspective by Lehmann (1972), Bettman and Jones (1972), and Shocker and Srinivasan (1979), which points to the integration of the deterministic and probabilistic approaches.

The main direct effects on brand preference are the self-image congruence and the identity/personality and image of the brand. In addition to those, the level of involvement, social environment, risk perception, demographic profile, and product visibility also show a positive influence on brand preference. Several other constructs present indirect, but significant and robust, contributions to explain the development of brand preference.

On the other side, 15 constructs in this research do not exhibit a direct influence on brand preference. Of those, the pioneering advantage and brand origin are the only ones that do not show a single significant relationship with any other construct in the model.

The results of the demographic variables, as previously noted, follow the evidence from previous studies (e.g., Jamal and Goode 2001); that is to say, present a small but significant relation with preference construct and, consequently, should not be ignored in future investigations.

In conclusion, our findings suggest that brand preference formation is a complex process, in which factors should not be considered independently because interaction plays a determinant role.

These findings must, of course, be interpreted with extreme caution; moreover, the model needs to be tested with improved and more objective measures for some constructs to solve methodological problems associated with the statistical significance of those measures. In addition, the model clearly does not include all the relevant variables. The possible inclusion of more situational, brand-related or other consumer-related variables to further extend the proposed model should be actively pursued by future research. Additionally, other relationships currently not supported by other studies, may be included in the model, for example, the relationship between brand identity, personality, and image and the perceived value or perceived quality.

Finally, we believe that this study is important to show how PLS path modeling can be used to successfully assess complex models and, in our case, provide some explanation of the relationships between the selected factors and brand preference formation. Furthermore, it shows that factors that are individually significant, can lose their power when assessed together with other factors due to the interaction effect. In our opinion, the new insight into the interaction effect provides important and usable information to managers. Nevertheless, this study needs to be replicated with new samples of consumers and different products and be improved with the introduction of new and relevant variables and perhaps the refinement of the scales used to measure some of the constructs.

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