İSTANBUL TECHNICAL UNIVERSITY ★ INSTITUTE OF SCIENCE AND TECHNOLOGY

SEEKING BRAND RECOGNITION THROUGH FRAGMENTS OF PRODUCT

M.Sc. Thesis by
Koray GELMEZ

Department : Industrial Product Design

Programme : Industrial Product Design

JANUARY 2011

İSTANBUL TECHNICAL UNIVERSITY ★ INSTITUTE OF SCIENCE AND TECHNOLOGY

SEEKING BRAND RECOGNITION THROUGH FRAGMENTS OF PRODUCT

M.Sc. Thesis by
Koray GELMEZ
(502081909)

Date of submission : 20 December 2010
Date of defence examination: 28 January 2011

Supervisor (Chairman) : Inst.Dr. H. Hümanur BAĞLI (ITU)
Members of the Examining Committee : Prof.Dr. Özlem ER (ITU)
Assoc.Prof.Dr. Mine ÖZKAR (ITU)

JANUARY 2011

İSTANBUL TEKNİK ÜNİVERSİTESİ ★ FEN BİLİMLERİ ENSTİTÜSÜ

ÜRÜN BÖLÜMLENDİRMESİ YOLUYLA MARKA TANINIRLIĞININ ARANMASI

YÜKSEK LİSANS TEZİ
Koray GELMEZ
(502081909)

Tezin Enstitüye Verildiği Tarih : 20 Aralık 2010
Tezin Savunulduğu Tarih : 28 Ocak 2011

Tez Danışmanı : Öğr.Gör.Dr. H. Hümanur BAĞLI (İTÜ)
Diğer Jüri Üyeleri : Prof.Dr. Özlem ER (İTÜ)
Doç.Dr. Mine ÖZKAR (İTÜ)

OCAK 2011

FOREWORD

I would like to point out my appreciation to those I got motivation and help throughout this study.

First of all, I would like to state my deepest appreciation and thanks to my advisor, Inst.Dr. H. Hümanur BAĞLI. Her guidance and motivation throughout this study not only enlarge my point of view but also enrich the structure of this thesis.

I would also express my special thanks to my friends, İrem ÇELİK and Ahmet BEKTEŞ for all their endless support. I am grateful to my colleague Özge ÇELİKOĞLU for her encouragement.

I would like to thank all participants in my empirical study for their contribution.

Finally, I am highly encouraged by my parents making never-ending sacrifice and support. For his patient assistantship during this thesis, I am so thankful to my brother Gökhan GELMEZ.

December 2010 Koray GELMEZ

TABLE OF CONTENTS

Page

ABBREVIATIONS

AMA	**:** The American Marketing Association
APA	**:** The American Psychological Association
GSD	**:** Geon-Structural-Description
RBC	**:** Recognition-by-Components
SEMPO	**:** Search Engine Marketing Glossary of Terms
SUV	**:** Sports Utility Vehicle
T-scopes	**:** Tachistoscopes
2-D	: Two-dimensional
3-D	: Three-dimensional

LIST OF TABLES

Page

LIST OF FIGURES

Page

SEEKING BRAND RECOGNITION THROUGH FRAGMENTS OF PRODUCT

SUMMARY

Product features are prominent elements in reflecting and maintaining brand identity. People are able to recognize a certain brand through its attributions on specific parts of products. While in modern societies variety and quantity of products are increasing incrementally, it is becoming difficult to be distinctive for companies. In this context, this study aims to reveal brand recognition through fragments of product.

Founded on literature review and empirical study, it is endeavored to elicit the relationship between brand identity and design features. Related basic terms, definitions and methods were explored in the extent of object recognition in cognitive sciences. Regarding marketing research, the related marketing terms are presented. In the part of design research literature, the related discussions particularly on the relationship between brand identity and product design were also revealed. In literature review, In the literature review, it is tried to be benefited from the prosperity at the intersection of these three domains.

Recognition is investigated profoundly as a process of perception in cognitive sciences. It has been carried out experiments so as to find out how recognition is performed, which variables affect it and how objects are categorized in perceptual process. In marketing research, for customers it is seen that recognition is not as effective mean as recall to measure brand awareness. Recognition is usually assessed by asking if people know the name of brand. In design research, however, recognition is discussed where relationship between product and brand occurs.

Depending on this review, an empirical study was carried out. It was examined over three most common models of mobile phones as stimuli. In the empirical study, a recognition test was conducted to 30 participants and a semi-structured interview was carried out to 6 participants who were actively mobile phone’s users. This empirical study is aimed to reveal which fragments in most common three mobile phones involve more clues about their brands. Fragments of mobile phones in recognition test, which were prepared as 3x8, 2x5, 1x3, 1x2 and 1x1 division types, were asked to participants in order to identify the degree of recognizability. It was generated distribution maps of responses according to recognized, misrecognized and unrecognized fragments in those division types. Furthermore, a semi-structured interview was carried out aiming at providing crosscheck for quantitative data. The results were first discussed separately for each test products and then cross-comparison was presented according to division types. The results and analysis offer an adequate and efficient feedback leading to further studies.

ÜRÜN BÖLÜMLENDİRMESİ YOLUYLA MARKA TANINIRLIĞININ ARANMASI

ÖZET

Ürün özellikleri marka kimliğini yansıtma ve sürdürme konusundaki belirgin unsurlardır. İnsanlar belirli bir markayı, o markanın ürünlerinin belirli parçaları üzerinde yapılmış atıfları yoluyla tanıyabilmektedir. Günümüz toplumlarında ürünlerin çeşidi ve miktarı katlanarak artarken, firmalar için ayırt edici olmak giderek zor hale gelmektedir. Bu bağlamda, bu çalışma ürün bölümlendirmesi yoluyla marka tanınırlığını ortaya çıkarmayı amaçlamaktadır.

Literatür taraması ve deneysel çalışma üzerine kurulu olan bu çalışmada, marka kimliği ve tasarım özellikleri arasındaki ilişki ortaya çıkarılmaya çalışılmaktadır. İlgili temel terimler, tanımlar ve metotlar bilişsel bilimdeki nesne tanıma ekseninde araştırılmıştır. Pazarlama araştırmalarına ilişkin olarak, ilgili terimler sunulmuştur. Tasarım araştırmaları literatürü kısmında, özellikle marka kimliği ve ürün tasarımı arasındaki ilişki üzerine olan ilgili tartışmalar ortaya çıkarılmıştır. Literatür taramasında, bu üç alanın kesişimindeki zenginlikten yararlanılmaya çalışılmıştır.

Tanıma bilişsel bilimde algının bir süreci olarak derin bir şekilde araştırılmaktadır. Tanımanın nasıl gerçekleştiği, hangi değişkenlerin buna etki ettiği ve nesnelerin algılama sürecinde nasıl sınıflandırıldığını ortaya çıkarmak için deneyler yürütülmektedir. Pazarlama araştırmalarında, müşteriler için tanımanın marka tanınırlığı ölçmek için hatırlama kadar etkili bir araç olmadığı görülmektedir. Tanıma genellikle insanlara markanın ismini bilip bilmediği sorularak değerlendirilmektedir. Tasarım araştırmalarında ise, tanıma ürünle marka ilişkisinin ortaya çıktığı yerde tartışılmaktadır.

Bu incelemeye dayanarak, deneysel bir çalışma uygulanmıştır. Çalışma, uyarıcı olarak en yaygın üç cep telefonu modeli üzerinden yürütülmüştür. Deneysel çalışmada, aktif cep telefonu kullanıcılarından 30 katılımcıya tanıma testi uygulanmış ve 6 katılımcıyla yarı yapılandırılmış görüşme yapılmıştır. Bu deneysel çalışma, en yaygın üç cep telefonu modelinin hangi bölümlerinin markaları hakkında daha çok ipucu içerdiğini ortaya çıkarmayı açıklamaktadır. Tanınırlık derecelerini belirlemek için 3x8, 2x5, 1x3, 1x2 ve 1x1 bölünme türlerinde hazırlanan tanıma testinde kullanılan parçalar katılımcılara sorulmuştur. Tanınan, yanlış tanınan ve tanınmayan bölümlere göre yanıtların dağılım haritaları oluşturulmuştur. Ayrıca, nicel veriye karşılaştırma sağlamak amacıyla yarı yapılandırılmış görüşme yapılmıştır. Sonuçlar öncelikle her bir test ürünü için ayrı ayrı tartışılıp daha sonra bölünme çeşidine göre çapraz karşılaştırma sunulmuştur. Sonuçlar ve analizler, ilerideki çalışmalara yön veren yeterli ve verimli geri dönüş sunmaktadır.

1. INTRODUCTION

1.1 Problem Statement

Today's societies are surrounded by excessive types and numbers of products. Even if most of the products share the same functions, they are differentiated in details. A typical car is basically composed of a body and four wheels. If it has characteristic shoulders on its body, it might be associated with Volvo. Similarly, almost each notebook is rectangular prism. Yet, when edges of its pure shape reach a certain fillet, it is called MacBook. When features of products are considered, brands can be identifiable through their silhouettes, colors, materials, buttons, textures or handles of products etc. Even if a product is not seen totally, it can be recognizable via these physical attributions.

Several experiments on object recognition indicate that people do not have to see entire object in order to recognize it. However, all parts of an object do not have the same degree of recognizability. In other words, there are specific parts that are more recognizable. In order to reveal the characteristics of these parts, there are various types of recognition tests in experimental human psychology.

Products as brand image are visible parts of iceberg for company (see Figure 1.1). Therefore, they have to serve as the faces of brands to users. For instance, when a car is seen, it is not designated only as a car. It is a product of Volkswagen, Mercedes or BMW etc.

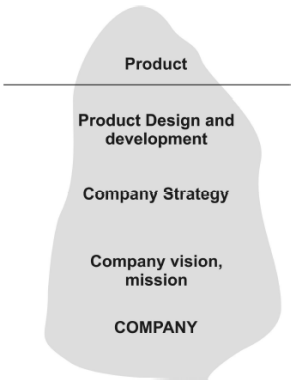


Figure 1.1 : Visualization of the iceberg analogy of a company (Çekceoğlu, 2006)

There is an extensive research on object recognition in cognitive sciences, on the relationship between brand identity and product in marketing research and on how product features are related to its brand in design research. Nevertheless, the discussions and findings in different literatures do not seem connected in a cohesive manner sharing the same terminology. Therefore, it becomes necessary to have a wider investigation covering the data of each area in an interdisciplinary study. Methods used in object recognition tests as a road map for this study would have significant contributions while examining the effects of the fragments of products on brand recognition.

1.2 Purpose of the Thesis

The purpose of this study is to seek relationship between fragments of products and brand recognition. Mostly leaning on the literature of cognitive sciences, it will be investigated how brands are being recognized through fragments of products.

This study is expected to contribute to the literature where there seems to be lack in using richness in the intersection of different literature such as cognitive sciences, marketing and design research. While transferring the brand identity through industrial design, how product is affected in a fragmental manner is one of the key points for this study. This brings about another issue if these decisions are obviously seen by the targeted user group. People can be exposed to products visually both in two-dimensional or three-dimensional way. That is, one can experience a product by using it and seeing it physically or can perceive it from its images e.g. from advertisements. How these features are perceived through different media by users in terms of recognition is another concern in the context of this study.

The research questions of this study are in the following:

> What is the relationship between fragments of products and brand recognition?
>
> What are the related theories and discussions on this issue?
>
> How is recognition handled in cognitive sciences? Are there any counterparts of this issue in design research and marketing literature?
>
> How do product features affect the brand recognition?

On which fragments of the product is the brand recognition intensified?

1.3 Structure of the Thesis

This study consists of five main chapters. Figure 1.2 shows the diagram of the thesis structure.

Chapter 1 introduces the topic of the thesis, the purpose of the thesis and the research questions to be answered throughout this study.

Chapter 2 is a review of related literature. It is based on three main literature; namely, cognitive sciences, marketing and design research. In the first part, the related definitions, terms, theories and methods will be introduced regarding cognitive sciences. In the second part, related marketing terms will be presented. In the third part, studies in design research literature addressing this issue are going to be revealed. In the last part, the relationship of these three areas will be discussed.

As Chapter 3 emphasizes the design and conduct of the empirical study of this thesis, Chapter 4 points out the results and analysis of it.

Chapter 5 evaluates and concludes what has been done throughout the study. It also covers the limitations of this study and subjects for further studies.

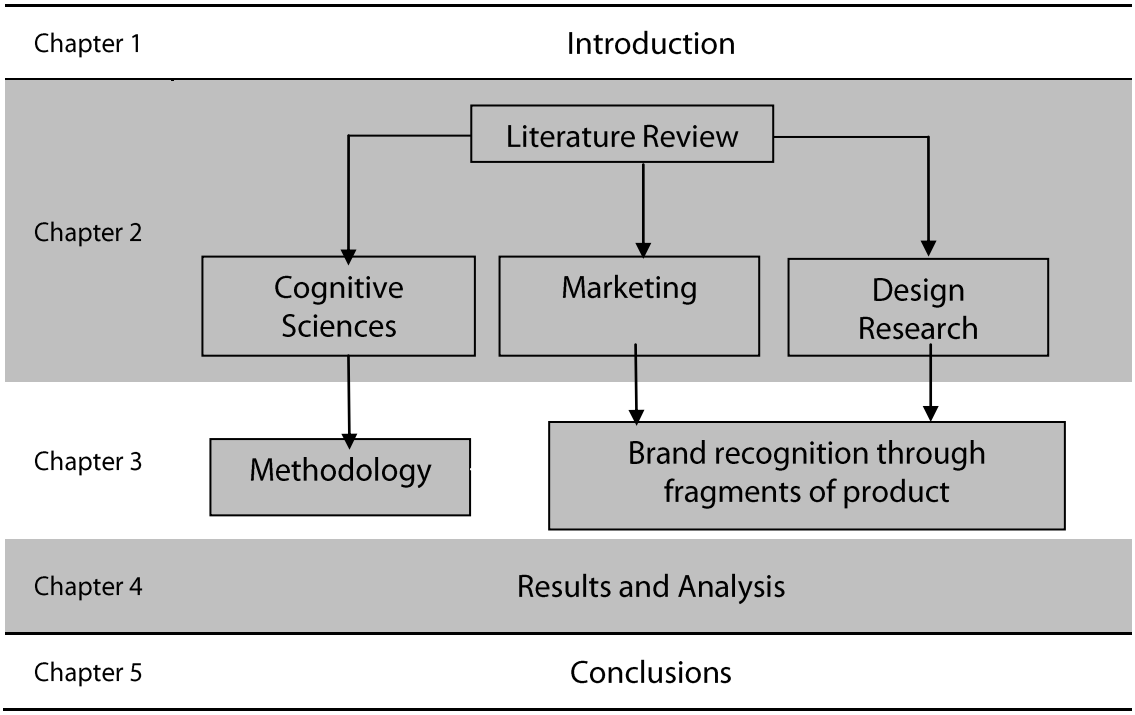


Figure 1.2 : Diagram of the thesis structure

2. LITERATURE REVIEW

In this chapter, literature on recognition is investigated. Basically, this chapter is established on three major aspects: cognitive sciences, marketing research and design research domains. In the first part, how recognition is defined and discussed among cognitive scientists is revealed. Second part mainly emphasizes on brand recognition studies in marketing literature. Third part is about studies and analysis of product recognition from design research perspective. Chapter discussion is a summary of these three parts and their relationships.

Cognitive scientists make research and conduct tests on how human recognizes several objects or faces under certain conditions. Even though they do not make research particularly on brands and product design, they have comprehensive studies on this issue, which provide a noteworthy base for this subject.

Marketing research has undeniable contribution on perception of brand towards consumers. While dealing with recognition of brand, studies on perception of brand enrich the essence of the topic.

Design research, on which this study mostly contributes, is another source especially with its studies on product recognition.

2.1 Studies on Recognition from the Domain of Cognitive Sciences

Interaction with surroundings demands the capability to swiftly "detect, recognize and respond" to numerous things (Spetch and Friedman, 2006). One of these significant and ordinary actions assisting in contact with the world is recognition. While seeking brand recognition from the fragments of the product, it is noteworthy to start from cognitive sciences domain in terms of recognition. Owing to the advance in computational approach, there has been an extensive research on human object recognition system. Following parts of this study focus on the definitions, process, levels and variables of recognition, theories and recent discussions on recognition and tests that are being implemented to measure recognition.

2.1.1 Definitions of recognition

Recognition in the context of this study is defined as “in memory, the capacity to know that a particular stimulus has been previously learned when encountering something previously encountered” or similarly “in general, a sense of familiarity upon encountering something that has been previously encountered” (Matsumoto, 2009, p.428). At this point, it seems crucial to emphasize on the idea that recognition happens when something is experienced prior to time of recognition. Dudai (2002) indicates that the word “recognition” means both “the judgment of previous occurrence” and “the brain process(es) by which this is achieved”. As inferred from above, it denotes mode of memory and cerebral activity.

In cognitive sciences, this issue is handled specifically on object recognition, face recognition and pattern recognition etc. Since this study is relatively closer to the object recognition, following parts mainly depend on its literature. Specifically, object recognition is defined as the perception of the physical properties of an object, e.g. its shape, texture and color, and application semantic attributes of it, covering the perception of its use, earlier experience and its relation (Enns, 2004).

2.1.2 Process of recognition

Although it seems effortless and usual, the process of recognition is fairly complex as human has to build three-dimensional (3-D) world from two dimensional (2-D) input. While humankind looks through his surroundings, 3-D objects are captured on the retinas at backside of eyes in 2-D forms. These 2-D forms are united to represent 3-D objects (Spetch and Friedman, 2006).

More specifically, Marr (1982) reveals that local contours and surfaces that can be considered as meaningful parts of the object are deduced from different formations of visual input. This initiates the process of object recognition. These local elements constitute perceptual organization of the object that generates mental representations. Then, most probable representations are tried to associate with the visual input (Tarr, 2002). In recognition process, people are endeavoring to decide whether certain input matches to an object they have seen before, or mental representations (Ullman, 1998).

Evans (2010) positions recognition as the final stage of perception. (Table 2.1)

Table 2.1 : Three stages in perception

Sensation	**external energy stimuli are detected and converted into neural codes**
perceptual organization	integration of neural codes by the brain to form a percept
identification and recognition	the percept is categorized, which involves matching with stored experiences

2.1.3 Theories and discussions on recognition

Approximately for 30 years, understanding how mankind recognizes his surroundings has been one of the major concerns among scientists. Even though there is a consensus on the basics of this act, dissidence takes place in some aspects. Tarr (2002) points out that disagreement is on how information from visual input is organized into high-level object representations. There are two different theories for object recognition in the literature; namely, structural description-based and image-based (or view-based). In the following sections, these theories will be disclosed and exemplified specifically in the light of the literature on cognition.

2.1.3.1 Structural description-based theory

This theory posits that mental representations from objects are based on structural description of the object and thus it is viewpoint invariant as an object-centered approach to recognition process (e.g. Marr & Nishihara, 1978 and Biederman, 1987).

Marr & Nishihara (1978) introduce the object-centered description that is unaffected by viewpoint for recognition process. They clarify that this is involved in modular and hierarchical system that provide generalization and discrimination by identifying different levels of details in the object. Their approach is based on hierarchical decomposition of the object into articulated parts.

Marr & Nishihara (1978) suggest that the primal elements describing objects should be cylinders that have a major axis. These elements are hierarchically organized with high-level units giving information about object shape and low-level units giving more detailed clues. This approach is illustrated as seen in Figure 2.1.

The human body can be divided into a succession of cylinders at different levels of generality. They assert that this entire three-dimensional description is gathered in memory, and makes people to recognize appropriate visual stimuli not considering viewpoint. They also declare that concavities in the object are recognized at first range.

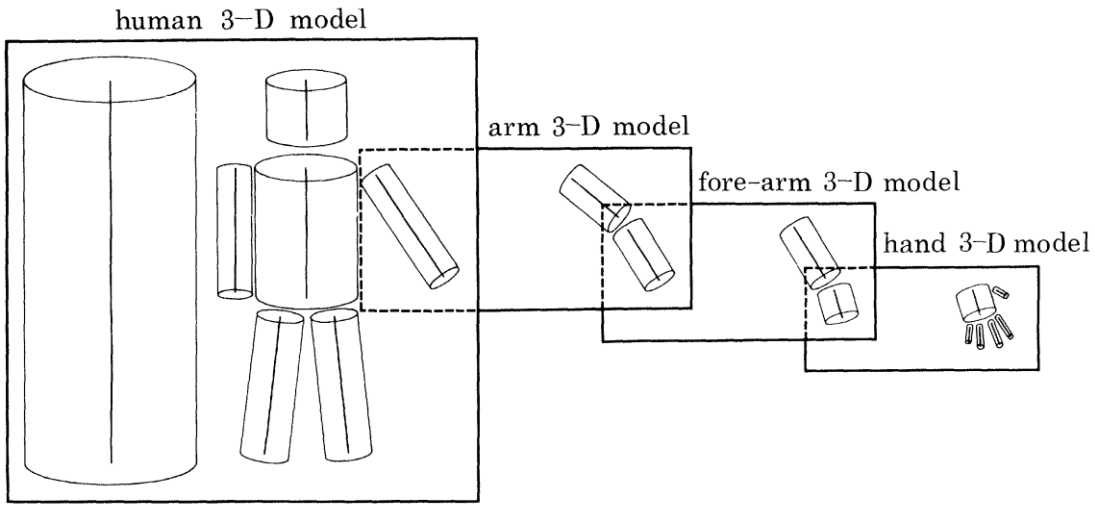


Figure 2.1 : The hierarchical organization of the human figure (Marr & Nishihara, 1978)

In a similar manner, recognition-by-components (RBC) theory (Biederman, 1987) and recent model of it, geon-structural-description (GSD) theory (Biederman & Gerhardstein, 1993) generate the basis of this structural description-based theory. This theory posits that representations of objects are formed from simple, geometric components and their interrelations. Biederman (1987) assigns these components as geons (geometrical ions), which are simple three-dimensional features such as blocks, cylinders, wedges and cones. These are obtained from five detectable properties of the edges of the objects; namely, curvature, collinearity, symmetry, parallelism and cotermination. These terms are defined in the following (Eysenck & Keane, 2005):

Curvature : points on a curve
Collinearity : points sharing a common line
Symmetry : versus asymmetry
Parallel : sets of points in parallel
Cotermination : edges sharing a common point

These properties are non-accidental that do not depend on viewpoint change. According to this theory, human vision analyzes three-dimensional object by dividing it into its constituent geons. Afterwards, the relations among geons are established, including properties like location and size. There occurs a match between stored structural descriptions and perceived object that is formed by constituent geons. If a rational and sufficient match happens, object recognition is then completed. This is primal type of recognition, or basic level, which does not require higher-level cognitive processes. In higher-level processing, shade, texture or color may be employed to discriminate objects adequately.

Biederman (1987) makes an estimation that as few as 36 geons could generate millions of unique objects. This resembles the idea that limited number of phonemes in a certain language has capacity to produce numerous words. Figure 2.2 shows an example that different arrangements of the same parts can form different objects.

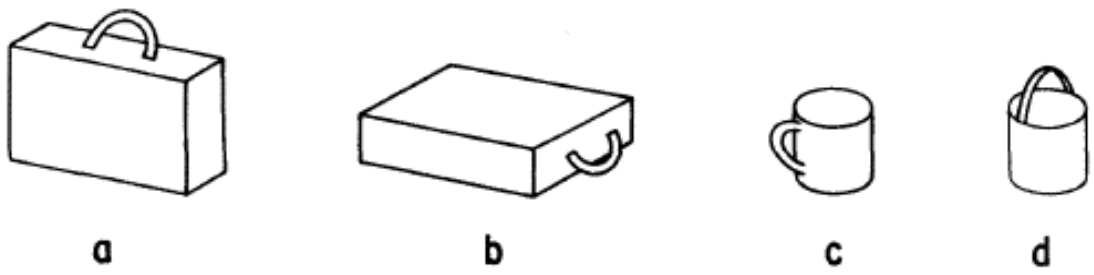


Figure 2.2 : Different arrangements of the same components (Biederman, 1987)

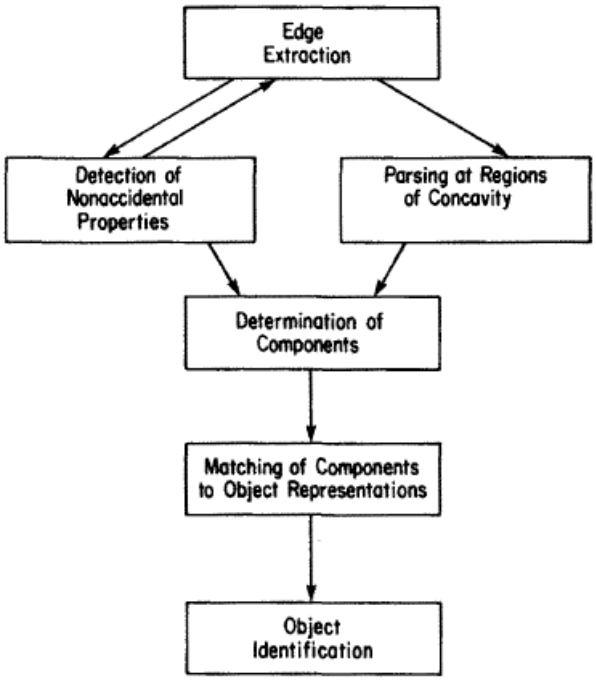


Figure 2.3 : Presumed processing stages in object recognition (Biederman, 1987)

According to recognition-by-components, "[There is] an early edge extraction stage, responsive to differences in surface characteristics namely, luminance, texture, or color, provides a line drawing description of the object" (p.117). Afterwards, non-accidental properties of the edges of image such as curvature, collinearity, symmetry, parallelism and cotermination are detected. "Parsing at regions of concavity" as it is seen in Figure 2.3 is carried out concurrently with this detection. This will lead to determination of components and match of components to mental representations. In general sense, the material and surface have secondary importance on object recognition (Biederman, 1987). Finally, object identification occurs as illustrated in Figure 2.3.

Biederman's (1987) theory also explains how one can usually recognize objects under inadequate viewing conditions. The following factors are responsible for this detection:

- Non-accidental edge properties can be detected even if the objects are visible only partly.
- Even if some of the geons are invisible from the viewpoint, there is still a large amount of visual clues to recognize an object.
- As long as the concavities of contour are able to be seen, missing parts of the contour can be recovered.

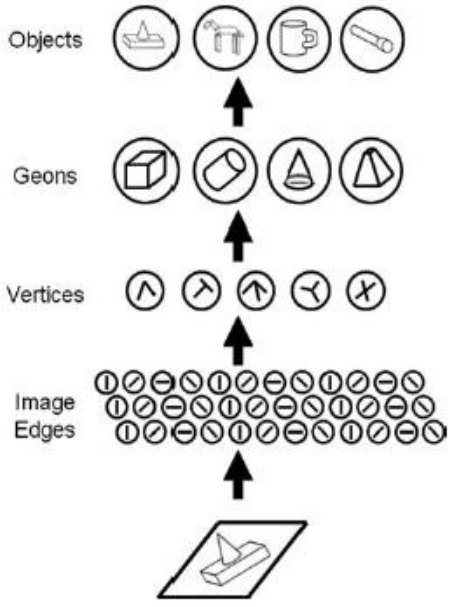


Figure 2.4 : Diagram for recognition-by-components (Biederman, 1987; Hummel & Biederman, 1992)

Figure 2.4 summarizes the core idea of recognition-by-components theory. Extracted image edges from the object are transformed into the vertices. Afterwards, their combination generates geons. Hence, this leads to specific object.

2.1.3.2 Image-based (view-based) theory

This approach proposes that mental representations from objects are captured in the position where they are observed. Since it is a viewpoint dependent approach and depends on the idea of taking images from visual input, it is named as image-based, or view-based, approach (e.g., Bülthoff & Edelman, 1992; Tarr, 2002; Tarr & Bülthoff, 1998). It is also considered as viewer-centered approach to recognition process.

Spetch and Friedman (2006) explain this theory in two versions. They say that in earliest version of this theory, normalization approach, mental representations are accumulation of different views of object. Apart from the objects that have been distinguished with diagnostic features, there has to be a mechanism that provides correspondence with mental representation to identify object from the novel view. They illustrate this notion in the following way:

> If one can see the trunk of an elephant, it is probably not necessary to see much else in order to identify the elephant as such. In the absence of such a diagnostic feature, however, the view-based theory predicts that speed or accuracy in recognizing an object will decrease as a function of the rotational distance between a given novel view and the nearest stored view. (p. 14)

According to this theory, solitary view of an object may not be sufficient to represent it; consequently, multiple appearances should be learned for objects to recognize them from diverse point of views (Tarr & Pinker, 1989). As mentioned, if the existing mental representations are not enough to recognize the object, mental transformation and generalization mechanisms have to be put into use to assist to identify (Jolicoeur, 1987; Tarr & Pinker, 1989).

Latest findings support a new approach in image-based theory, called view-combination approach. The difference between these two view-based approaches is on the predictions for the condition where people learn an object with more than one view of it.

Bülthoff & Edelman (1992) reveals that people who are involved in the experiment testing this phenomenon recognize interpolated novel views more precisely than extrapolated novel views. Simply, Spetch and Friedman (2006) exemplify this idea that participants that are learned a given object in two views (e.g. 0^0 and 30^0 views of the same object) are more successful to detect interpolated novel view (e.g. 15^0) than extrapolated view (e.g. 45^0). Normalization approach; however, assumes that recognition of both interpolated and extrapolated views are equal. Although both approaches belong to the image-based idea, they differ in comparing trained views with novel views.

Viewpoint dependency is the prominent factor that is mostly debated on between structural description-based theory and image-based theory. While structural description-based theory claims that essential elements consisting of three-dimensional volumes are viewpoint-independent, image-based approach suggests that viewpoint dependent surfaces and contours form the fundamental features of object representation and recognition. Both of them posit sufficient explanation on human-object recognition.

Apart from two leading theories mentioned above, especially Ullman (2006) contributes to literature on recognition by fragments with the help of computational advance.

2.1.4 Levels of recognition

What makes object-perception capabilities of human being remarkable is not only its pace and precision but also its flexibility towards different conditions (Tarr & Cheng, 2003). That is, people are able to recognize objects in various specific levels.

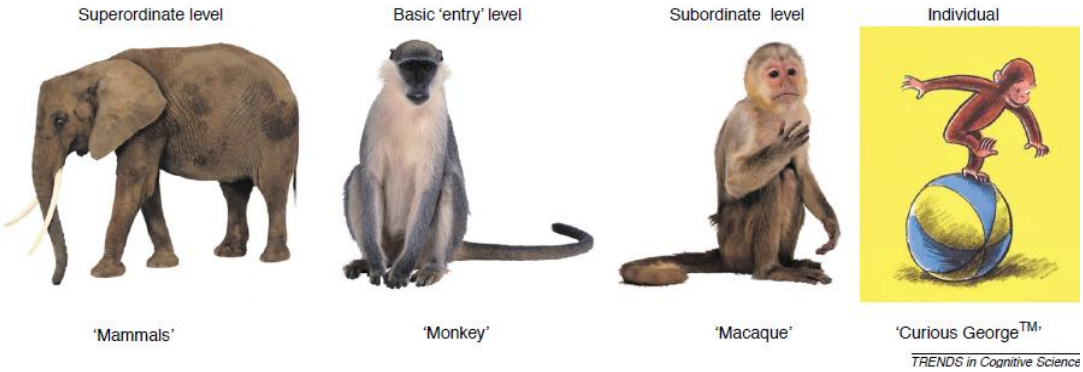


Figure 2.5 : Multiple levels of description conditions (Tarr & Cheng, 2003)

People can identify objects at superordinate, basic 'entry', subordinate and individual levels. Different recognition levels of specificity rely on the experience and task demands. In other words, while an ordinary man might call macaque as a monkey, an expert on zoology would name it as macaque since he is expert on this domain.

It is thought that common objects are first recognized at the entry level such as dog or car; (Rosch et al., 1976), then superordinate level (such as mammal or vehicle) and subordinate level (such as Golden Retriever or Audi) recognition are performed. On the other hand, this may not be true when atypical object belongs to a category (Jolicoeur, Gluck, & Kosslyn, 1984). More specifically, Tarr (2000) implies that entry-level recognition is certainly a crucial part of daily recognition; however, it is not the barely level at which objects are identified. One recognizes objects at a more detailed degree, from time to time called them as the *subordinate level*, e.g., a "McIntosh Apple" or a "white-breasted nuthatch." These types of recognition need more perceptual breakdown and hence normally last longer than entry level. Moreover, people are able to recognize objects at individual level such as "the McIntosh Apple I brought for lunch" (Tarr, 2000).

In addition, similarities between two objects share decreases from superordinate level to individual level. To illustrate, macaques and vervet monkeys would have analogous visual properties at the basic (entry) level, but dissimilar descriptions at the species or subordinate level (Tarr & Cheng, 2003).

2.1.5 Variables of recognition

Several studies focus on which factors affect recognition specifically. This part briefly explains on which variables recognition depends. Tarr & Vuong (2002) indicate that "Transformations in size, position, and mean illumination also alter the image of an object, although somewhat less severely as compared to viewpoint/orientation changes."

2.1.5.1 Size as variable

This is a variable that is frequently measured if the size of the objects has an importance on the identification of an object. Biederman & Cooper (1992) assert that there are two independent object memory systems; the first one is to represent the features whereas the second one is responsible for its size, position and orientation.

Differences in the size of the object make a delay in recognizing it (Jolicoeur, 1987). Therefore, the notion may be questioned if objects are saved at a certain scale in human mind. Kirkpatrick (2001) infers from the Biederman's recognition-by-component theory that since the size of an object, such as the sailboat, does not change the structural description of an object (the geons and their spatial organization), recognition should be size invariant.

2.1.5.2 Viewpoint as variable

The most controversial issue regarding factors that affect recognizability of an object is viewpoint dependence of it. It is the core reason that two leading theories on object recognition, the structural description-based and image-based theories, have a confliction. In general, while structural description-based theory posits that recognition is viewpoint-invariant, image-based theory asserts that object recognition is viewpoint dependent. These discussions were reported in Section 2.1.3 in more detail.

2.1.5.3 Partial representation as variable

Recognition-by-components theory explains that only two or three geons would be enough for swift recognition and identification of most objects as long as there is adequate time provided to identify the geons and their relations (Figure 2.6) (Biederman, 1987).

When this variable is tested, participants correctly recognize objects even if two or three components are visible, however they do not manage to recognize when only one component is seen. For example, it is easy to identify the sailboat when only one of the sails is missing. Empirical part of this study shares a similar point of view questioning the partial representation of stimuli that will be handled in next chapters.

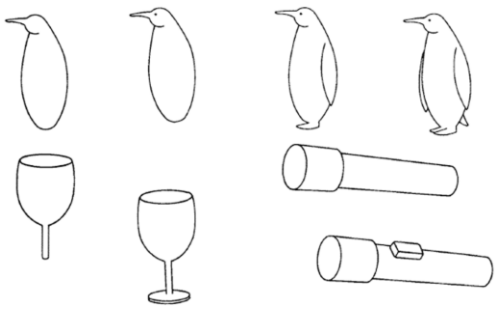


Figure 2.6 : Illustration of the partial and complete versions of 2 three-component objects and 1 nine-component object (Biederman, 1987)

Besides the variables above, luminance, context, position and exposure time are the factors on which several researches have done.

2.1.6 Visual categorization

Categorization is divided into three approaches in a historical perspective (Booch, 1994). The term categorization was first introduced by Plato, which is called classical approach. Basically, this approach regards related properties as the criteria for similarity among objects. Since it has some drawbacks to explain, other approaches have been developed.

The second one is conceptual clustering that tries to explain how knowledge is represented. In this approach, firstly members' conceptual descriptions are identified, then classes are produced. The task of categorization covers recognizing inherent structure and grouping objects together by similarity into classes. That is, it is a process of generating a structure of categorization.

The last one is the prototype theory proposing that basic level categorization is about establishing balance between expanding the similarity of objects in the same category and decreasing the similarities of those in the different categories (Rosch et al., 1976). They hypothesize that when people are categorizing a common object or experience, they are more unlikely to depend on abstract definitions. They most probably give importance on what they think to be the object and choose the most suitable candidate category by experiencing. Even though prototypes of specific categories may be changeable, people have inclination to experience similarity of prototypes to decide on the category. Krippendorff (2006) uses the term "ideal type" instead of prototype theory, by explaining that human recognizes objects via their resemblance to ideal type of a certain category.

Visual categorization (or visual classification, visual grouping) can be defined as the perception of an object that fits in a certain general category (Ullman, 2006) e.g. naming a car, a pencil or a bird. How this process occurs in vision is one of the concerns that scientists go through. Gestalt researchers are the first who study on visual grouping in perception. They propose principles how human mind understands whole in relation to its parts. Each principle addresses different type of grouping in an image. These principles are listed as principle of proximity, similarity, prägnanz, continuity, closure and symmetry (Ellis, 1969).

2.1.7 Experimental studies on object recognition

There are several types of studies on recognition based on experimental human psychology. Different methods and techniques are used according to the intention of different researchers. Below are some highlights that research concentrate on the problem of measuring recognition.

Object priming (Bar and Biederman, 1998): These studies include a simple task, such as naming or categorization. When naming or categorizing of objects is sufficient for the intended measuring, these types of test are usually implemented. It can be used in both on novel object or common object recognition. Naming an object is considered as the strongest signifier of recognition explicitly even though it is not necessary for recognition process.

Training: In this type of recognition experiments, exposure stage is employed as the training phase for participants. According to the context of experiment, they practice to learn intended information. In the test section, what participants are exposed to is tested. Relative capacity between exposure section and test section is a technique for result analysis.

Matching: As the name implies, it is about matching elements in experiments. Typically, in exposure stage, a stimulus is shown to the participants. In the following stage, it is asked which stimulus matches with previous stimuli.

Object categorization: This includes perceptual categorization of the object in basic entry level.

Object detection: It refers to detect any visual input to include any object or not. It is an activity of seeking the presence of the object and it is closely related to segregation of figure-ground. Researchers have studied on the process of the object detection. Some of them propose that detection of an object occurs before the recognition of it (Driver and Baylis, 1996). In contrast, some studies show that object recognition affects detection or might happen before it (Peterson & Gibson, 1994; Peterson & Kim, 2001). Grill-Spector & Kanwisher's (2005) experiments on this issue reveal that detection and categorization of objects are linked. Furthermore, detection is not performed before categorization of object.

Within-category identification: It refers to the identification of objects in subordinate levels. Several experimental test results show that participants deliver lower performance in within-category identification than object detection or object categorization in terms of accuracy and time (Grill-Spector & Kanwisher, 2005).

An example for recognition test:

For the empirical part of this study, a recognition test is carried out. Therefore, it seems beneficial to explain it by giving an example from the previous studies.

As illustrated in Figure 2.7, the procedure of the experiment is arranged according to the purpose of the study. That is, participants make judgment whether the new object they see is the same with the previous stimulus or not. It is aimed to examine how various unique parts in an object affect recognition according to changes in viewpoint. Different stimuli are asked in different views to test the effect of viewpoint variations (Tarr et al., 1997).

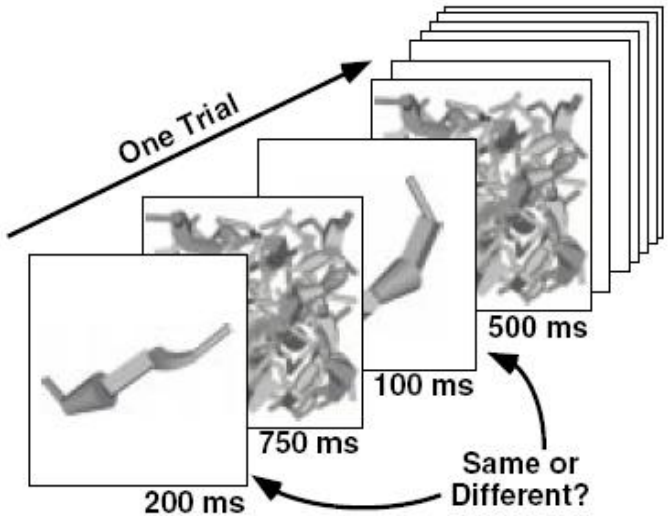


Figure 2.7 : The procedure used in the sequential matching task (Tarr et al., 1997)

Although the experiment is set up in accordance with the purpose of the study as mentioned in this section, Figure 2.7 is presented here in order to give an idea how it is conducted among participants.

2.2 Brand Recognition from the Domain of Marketing Research

This part focuses on brand recognition from marketing research point of view. It is first defined related basic concepts such as brand, brand recognition and visual brand identity. Afterwards, it is revealed how brand recognition is measured in literature of marketing research.

Brand recognition is significant for a brand since it is one of most obvious signifier and proof for existence of it for customers. That is, basically if a brand is recognized, it means that at least there is potential to build brand on the intended group. Therefore, brand recognition is an initial necessity for brand creation and management.

2.2.1 Brand

There are different definitions and descriptions of brand related to its context or alternating business understanding. Brand is more than just a sign or a name unlike it is generally perceived. According to The American Marketing Association (AMA), brand is defined as "a name, term, sign, symbol or design, or a combination of them which is intended to identify the goods or services of one seller or group of sellers and to differentiate them from those of competitors" (Kotler, 1999).

Simply, brand is the basic mean to differentiate in the market. Mozota (2003) argues that brand is more than this definition by explaining that brand is all concrete and abstract features that provide the offer distinctive. It is "a set of perceptions that driven both by communications and experiences." (Mozota, 2003).

Aaker (1991) describes brand as a node in the memory that makes other related information to be revealed. In a similar manner, Kapfarer (1997) regards brand as a "living memory", whose products and advertising build the strength of a brand. It can be inferred that brand is a general concept in the consumer's minds that embody all its potential created through its products and advertising. Therefore, it seems important for the existence and survival of a brand to stay in the memory perpetually.

Brands provide consumers to give responsibility to the company, which they find out via their experiences with the related product and company's marketing program. Moreover, brands have numerous advantages to the firms such as having loyalty, being protected legally, easing product handling or following, differentiating among competitors (Kotler and Keller, 2007).

2.2.2 Brand recognition

Brand recognition is often discussed under the topic of *brand awareness,* which Aaker (1991) defines as "the ability of the potential buyer to recognize and recall that a brand is a member of a certain product category".

It is about how efficient the brand elements are able to describe the product under various conditions (Keller, 1998). Brand awareness is the one of most crucial sources of the brand equity (Figure 2.8). There are two dimensions for brand awareness: Depth of brand awareness describes the easiness of consumer's recalling or recognizing the brand, breadth of brand awareness describes the condition of consumer's thinking of the brand while buying or consuming.

In marketing literature, there is a consensus on the issue that brand recognition and brand recall have positive effects on consumer's buying process. The more consumers are aware of a certain brand, the more inclination to purchase product belonging to this brand.

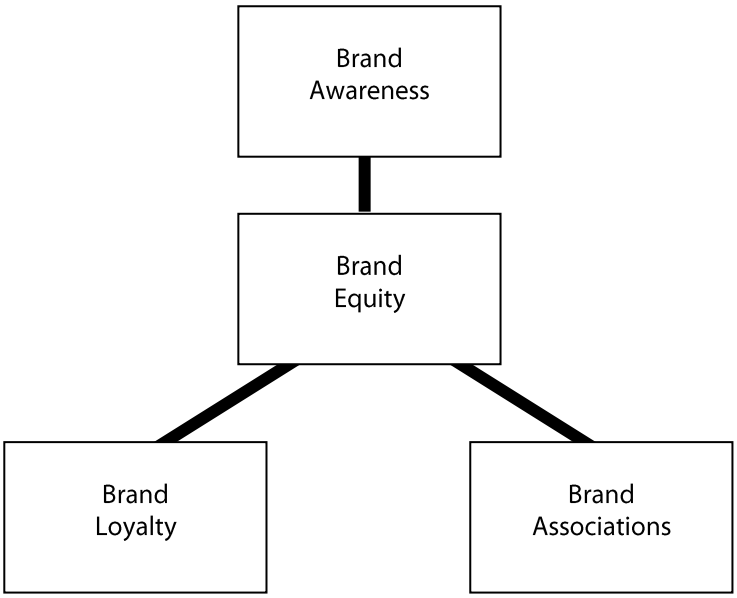


Figure 2.8 : Brand equity (Aaker, 2007)

Lynch & Srull (1982) posit that there are different types of customer's choice situations such as stimulus-based, memory-based and mixed-choice. Stimulus-based choice is the one of those situations in which pertinent information regarding brand is provided. This is highly related to the brand recognition. In memory-based choice, related to brand recall, consumer has to recall relevant information about brand. Mixed-choice is the combination of these two situations and requires both types of brand awareness. Recognizing brand seems usually simpler than recalling brand. Therefore, brands that are highly recognized and lowly recalled are considered as "graveyard brands" (Aaker, 2007).

However, Kapferer (1997) points out that every awareness type has its distinct aims depending on the related market. He divides brand awareness into three types:

> "Top of mind" awareness gauges if the brand is thought at first stage by the consumer to whom given product category.
>
> "Unaided" awareness seeks the influence of the brand. This type can be considered as brand recall. It is regarded as "a reference and a key player" on the market.
>
> "Aided" awareness measures whether the consumer have already heard about brand. This type can be considered as brand recognition. The aim of this type is to restore confidence about brand knowledge.

According to Search Engine Marketing Glossary of Terms (SEMPO), collection of prior experiences on certain product or service derived from its usage or advertising generates brand recognition. Keller (1998) states that if consumers distinguish a certain brand that is previously experienced, the brand recognition occurs. This uncovers the fact that brand recognition becomes relatively important, if brand is tangibly present during purchasing.

Perreault et al. (2008) posits five levels of brand familiarity, which is mentioned in some popular articles as five levels of brand recognition. These can be briefly explained above:

Brand rejection is described as making associations with something negative; thus, brand is deliberately avoided from.

Brand non-recognition is the case in which consumers do not recognize the brand. It might be due to the lack in the differentiation from the competitors.

Brand recognition is a stage that brand is being recognized and assists consumers to choose recognized brand with compared to non-recognized one.

Brand preference is the level where consumers have tendency to choose the brand due to their habit or positive experiences.

Brand insistence is the final stage where consumers insist on the brand and eager to look for it. This level is sometimes called as "brand loyalty".

Even if it is not entirely accurate, information that is stored in the memory might be the most trustable input for the purchase choice. The importance of brand recognition regarding decision-making processes in purchasing is exemplified by a brief story (Cowley, 2004):

> While on a protracted shopping trip, Susan was standing in the fifth camera shop of the day, trying to remember if the Pentax camera she was looking at was the same model she had seen in another shop in the morning. She was also trying to remember whether the price was the same. It was late, the other shop was in another shopping mall, she felt pretty sure that the camera model was the same, and that the price was higher in the other store. She bought the camera, which was actually a different model with fewer features (p.641).

2.2.3 Visual brand identity

Brand identity refers to a group of brand associations that company aims to generate or sustain. These associations try to compose a promise to consumers (Aaker, 2007). Keller (1998) proposes that brand elements, which are brand names, logos, symbols, characters, slogans, jingles, and packages, constitutes brand identity. Those elements should be memorable, meaningful, transferable, adaptable and protectable.

According to Allen & Simmons (2004), brand identity is discussed under visual and verbal identity. Whereas logotypes, symbols, colors and typefaces generate the visual identity, verbal identity is composed of the brand name, naming system for products or sun-brands, strapline, tone of voice principles and the use of stories. Visual brand identity is a part of branding, referring to the part that consumers see apparently. It is accepted as one of the most crucial component since what people see is more influential than what they are told. Besides all these elements, the product serves as the first source for the brand identity (Kapferer, 1997). Products, or services, make the brand to uncover its plan and its distinctiveness. According to Kapferer (1997), brand identity is defined apparently if these questions are answered:

- What is the brand’s particular vision and aim?
- What makes it different?
- What need is the brand fulfilling?
- What is its permanent nature?
- What are its value or values?

- What are the signs which make it recognizable? (p.92)

As seen, brand identity is not only related to internal descriptions of brand, but it is also about perception and more specifically about the ability to be memorized easily. Similarly, Keller (1998) posits memorability as one of the brand elements that of brand is crucial to assist recalling and/or recognizing the brand while buying and/or consuming. This can be achieved robustly via visual identity. It can be inferred that visual identity influences the recognition and recall of a certain brand.

2.2.4 Measuring brand recognition

As mentioned before, brand recognition is an input to measure brand awareness. Brand awareness is measured in three classical ways: aided, spontaneous and top-of-mind. Aided awareness is measured by calculating the percentage of participants that name certain brand. In this type of tests, participants are informed the brand names first. In spontaneous awareness, people are expected to name the brands they have known without any cue. This is the percentage of participants revealing they know certain brand. Top-of-mind awareness is measured by asking the same question. However, this is the percentage of participants who name the certain brand first (Laurent et al., 1995).

Keller (1998) posits that measuring brand recognition needs to make the stimulus distinguish which can be a word, an object or an image. It is related to capability of the consumers' identification of brand under different conditions. Simply, while measuring brand recognition, people are given a visual or oral stimulus and asked whether they have seen it previously. It is beneficial to use traps that participants might not have seen before in order to make more precise test. Besides "yes/no" questions, there can be scales that participants mark their confidence while they are recognizing the stimulus. While measuring brand recognition, interviews and questionnaires are used commonly. Participants are often asked whether they know about certain brand or not.

Online questionnaires are generally used since it has widespread and easy accessibility. Marketing researchers often search responds for brand recognition by asking "Do you recognize/hear about/know Brand X?".

In some brand recognition tests, “perceptually degraded” stimuli might be used, e.g. masking visually, distorting or pacing exposure speed. These measures are used when high level of recognition is tested. Testing brand names with missing letters is one of the examples that measure this level recognition: D _ _ NE _, KO _ _ K, DU_ AC_ _ _ - DISNEY, KODAK, DURACELL (Keller, 1998).

Since it is thought that brand recognition has positive effect on giving rapid decision of purchasing, researchers often concentrate on packaging that is highly related to this. They make evaluation of the visibility of package in the store. Tachistoscopes (T-scopes) and eye-tracking techniques are the research methods that measure the efficiency of different packaging designs (Keller, 1998).

2.3 Recognition from the Domain of Design Research

The last part of literature review focuses on the domain of design research to which this study is supposed to contribute mostly. In this part, most related issues in this literature are discussed under following topics; recognition and relationship between product and brand identity.

The subject of recognition becomes an issue in design research when product is examined as the representation of brand. Since products are the references for their brands, they are one of the most effective media to see identity of brands apparently. Hence, measuring the recognition of brand is carried out through product features.

2.3.1 Concept of recognition in design

Regarding semantic approach, products are the signs that create meanings and convey messages to users. Design elements work to fulfill these tasks such as brand name does.

Krippendorff (2006) describes recognition as a mode of attention, which can be defined as “correctly identifying what something is, what it can be used for” (p. 89). Starting with recognition, it is suggested that modes of attention is followed by *exploration* and *reliance*.

Recognition can be resulted in “approaching”, “ignoring”, or “avoiding”. As soon as it is recognized, people begin to explore it concerning their body in order to attain reliance (Krippendorff and Butter, 2008).

Moreover, Karjalainen (2004) defines recognition as "the watchword in our contemporary product environment, which is saturated by a constant flow of signs and messages to our minds." He explains that process of evaluation and act or selection of a certain product happens as soon as recognition occurs. In order to differentiate from rivals in the market, "distinctive products with recognizable identities are needed". In this context, brand works as central position of recognition and makes its products to distinguish for customers in the market in the direction of strategic decisions. There are several means that represent brand in recognition (Karjalainen, 2004). Among those representations, products are the most physical objects that reflect and sustain brand identity. Recognition of brand and product joins together when customers come into contact with the crucial features of them (Montague, 1999).

It might contribute to this study to mention about principles that Norman (1990) posits since his studies extensively focus on usability stemming from cognitive sciences. These principles are briefly explained:

Visibility: It is crucial to make functions of an object visible. If it is hidden, it becomes difficult to recognize and use.

Feedback: Giving feedback about its action makes a product more usable.

Constraints: This refers to restrict some actions assisting user not to perform unintended reactions.

Mapping: It is about relationship on controls and their effects.

Consistency: This refers to use similar features for similar tasks to ease perception.

Affordance: It is about giving clues on how to use it apparently e.g. door handle invites to grab and pull it.

These principles ease users not only to recognize surroundings but they also facilitate to understand how to use it.

2.3.2 Relationship between product design and brand identity

Recognition of their brands is very crucial for companies. Karjalainen (2004) posits "… a product is often the strongest manifestation of brand identity, while it is usually the prior source through which a brand is evaluated". He also agrees that brand and product are in correlation. Existence of a brand is substantiated solely by recognition. Unless people recognize the brand, it does not mean anything. After being recognized, the key issue becomes how to be distinguished in the market (Karjalainen, 2004).

The term *design cues* is defined as sum of elements which the firm applies deliberately and has connection with the strategy of it (Karjalainen, 2004). These elements are classified into six groups in a similar manner (Chen and Owen, 1997):

1. Form elements - including the number of different form elements used, the shape(s) of the form elements used and the symbolic associations;
2. Joining relationships - including the number of different spatial relationships used, spatial relationships, number of different joining types used and joining type(s);
3. Detail treatments - including the number of different treatments used on faces, edges and comers, and the treatments used on faces, edges and comers;
4. Materials - including the number of different materials used, type(s) of materials used and the finishing of the materials;
5. Colour treatments - including the number of different colours used, colours used and tone groups (colour images); and
6. Textures - including the number of textures used, type(s) of textural patterns, characteristics of textures and tactility of textures. (p. 262)

According to this type of grouping, whereas the first three groups are about the geometric modeling of the object; the second three groups refer to the surface mapping. The empirical part of this study mostly focuses on design cues that are classified under second three groups. These cues can be sought in elemental manner, which Warell (2004) puts forward as *design syntactics*. Focusing on generating neutral visual analysis, design syntactics theory endeavors to develop *visuo-spatial structure* of the product by clarifying how product appearance affects visually in functional and perceptual ways (Warell, 2001).

According to Karjalainen & Warell (2005), there are two different levels that product form can indicate brand identity; namely, syntactic level and semantic level. *Syntactic level* is about recognition of product identity that is seen before. They exemplify this level as recognizing Volvo car via its shoulders or diagonal piece in front. *Semantic level* is about generating interpretation of meaning that product form owns. In this type of recognition, it is highly related to produce sign and interpret its meanings. It is illustrated again on Volvo car by indicating that "the wide shoulders of a Volvo may be interpreted as denoting thick and heavy doors; a connotation of rigidity and strength, which is associated with "safety", one of Volvo's core values".

These design cues, founded on *syntactic* and *semantic levels*, are classified into three different titles; *specific/explicit design cues*, *non-specific/implicit design cues* and *qualitative characteristics*. Specific/explicit design cues, mostly linked with syntactic level, are able to be defined accurately and apparently. These elements can include product forms, color choice and materials that are used. It is exemplified on Volvo car, where specific/explicit design cues are used in various models to generate cohesion among product family. Non-specific/implicit design cues are also highly connected with syntactic level. These types of cues are not as obvious as the previous one. Rather than using apparent elements such as wide shoulders in Volvo cars, it is more about *stylistic* decisions and *form language*. Qualitative characteristics are chiefly associated with semantic level. It can be seen on again Volvo cars from the attributions of safety and Scandinavian values. Yet, this is the most subjective point of view since this type relies on how to decipher the signs and can change according to social and cultural framework (Karjalainen & Warell, 2005).

Based on the theory of signs introduced by Peirce (1955), it is developed the concept named semantic transformation by Karjalainen (2004). The theory is established on the relationships among terms in triangle. In Figure 2.9, *R* refers to a *Representamen* as a perceptible object, *O* refers to *Object* as of reference and *I* refers to *Interpretant* as the effect of sign. In regard to design perspective, it is exemplified as following (Karjalainen & Snelders, 2010, p. 9):

…specific design features of Nike running shoes (R) can be a manifestation of the dynamic orientation of the Nike brand (O). The context of interpretation (I) comprises the subjective realm of the interpreter and the environment in which the interpretation is made. Three dimensions of the semantic transformation process play a role in this.

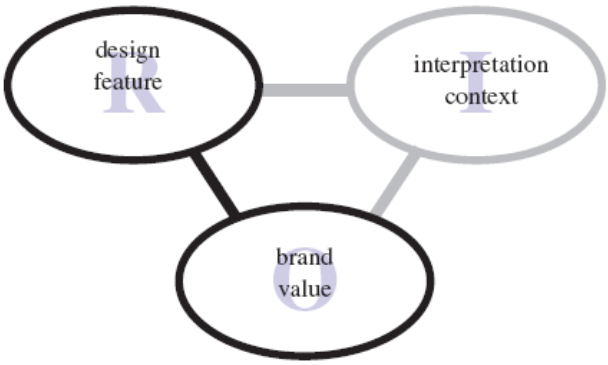


Figure 2.9 : The R-O-I framework for the analysis of brand references in design (Karjalainen & Snelders, 2010)

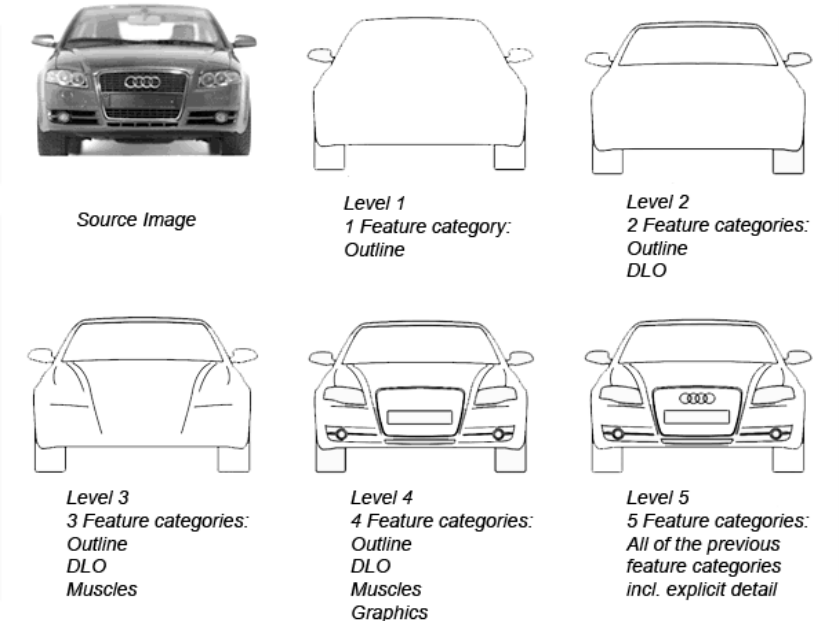


Figure 2.10 : Decomposition strategy (Ranscombe et al., 2010)

Ranscombe et al. (2010) conduct a study for brand perception by decomposing product forms. By using the technique of 'de-layering' products are decomposed in order to detect identification. In this process, sketches of students and designers are gathered. As seen in Figure 2.10, step by step certain features are added to outline in order of daylight opening (DLO), muscles, graphics etc. Afterwards, web-based survey is conducted by asking the segment of the vehicle image, emotions to define character of vehicle and the manufacturer of the vehicle.

A conclusion is drawn from the correct identifications of the responses according to vehicle segment, character and brand. As a result of their study, brand identification seems more identifiable than others and 'graphics' that are added in level 4 have the most crucial contribution on brand recognition.

Kreuzbauer & Malter (2007) suggest four ways of brand where product design affects brand categorization:

Product affordances (see Gibson, 1979) is the first categorization in which user identifies product via direct interaction. It can be exemplified such as handle of a product affords grasping for user. These affordances might become connected with a certain brand. Moreover, it is explained specifically on mobile phones which is related empirical part of this study (Kreuzbauer & Malter, 2007):

> …a consumer can directly perceive that a mobile phone handset affords grasping and carrying but would need additional input in order to understand its function as a communication tool, portable music player or camera (p. 243).

According to *product–brand categorization*, any product of a certain brand gives clue on both its brand and generic category. For instance, Apple Iphone includes information on identity of brand and the concept of mobile phone.

Thirdly, *brand-sign categorization* is proposed. It is about giving information about characteristics of a certain brand. This approach is examined under *brand-symbolic* categorization and *brand-iconic categorization*. Former one is exemplified with brand logos such as HP logo does not refer to any core meaning of its concept. It is merely a representation of HP. Latter categorization refers to non-brand specific concepts, which is exemplified as BMW car style having attribution to predator bringing about aggressiveness, dominance and pace to its brand concept.

Brand-style categorization is about attributions of special qualities to brand. For instance, shiny features might make a brand luxurious.

2.4 Chapter Discussion

Throughout this chapter, related issues are undertaken separately and specifically addressing the literature of cognitive sciences, marketing research and design research. In this study, it is tried to be benefited from the prosperity at the intersection of these three domains. In this part of this study, all these discussions that are mentioned in this chapter are handled together.

When three main parts of this chapter are examined, it is observed that the subject, topic, sub-topic and keywords regarding three domains of literature of each part are changeable accordingly. Table 2.2 summarizes how basic terms or concepts are used in these three domains.

As cognitive sciences use more broad term as *human*, marketing and design research uses more specified terms consumer, *customer*, *buyer*, *purchaser* or *user*. Regarding topic, each domain approaches in different manners. While discussing recognition one of the most related topics is *object.* In marketing research, it can become as *brand* or *product*. As might be expected, *product* often takes place in design research. In literature of cognitive sciences, one can find related studies on recognition as a sub-topic of *object recognition*. As it is revealed in Section 2.2, *brand awareness/recall/recognition* might be the sub-topic focusing on specifically this issue. In design research, *semantic transformation* and *design syntactics* might be considered as the counterpart. As seen in Section 2.1, *diagnostic features* are the elements involved in a certain object, which are responsible for being recognized it easily. In similar manner, the term *design cues* and *recognizable identities* are often used for features that give visual information.

Figure 2.11 : Levels of recognition – adaptation to mobile phones

Table 2.2 : Comparison of the terms in literature review

	Cognitive Sciences	Marketing Research	Design Research
Subject	Human	Consumer, customer, buyer, purchaser	User
Topic	Object	Brand, product	Product
Sub-topic	Object recognition	Brand awareness/recall/ recognition	Semantic transformation, Design syntactics, Product semantics
Keyword	Diagnostic features	-	Design cues, Recognizable identities

Levels of recognition proposed in cognitive sciences literature (Figure 2.5) are transferred specifically to mobile phones, which are concentrated on empirical part of this study. Regarding Figure 2.11, in superordinate level for mobile phone can be identified as electronic/digital device, in subordinate level it can be recognized as Nokia, Samsung or Motorola etc. and in individual level, it can be categorized as "my phone". According to literature review on cognitive sciences, common objects are first recognized at the basic entry level (mobile phone); then superordinate level (electronic/digital device) and subordinate level (Nokia) recognition are completed. (See Rosch et al., 1976, Jolicoeur, Gluck, and Kosslyn, 1984)

Recognition is investigated profoundly as a process of perception in cognitive sciences. There is an extensive study specifically on object and face recognition. It is conducted experiments in order to find out and formulize how recognition is performed, which variables affect it and how objects are categorized in perceptual process. In marketing research, recognition is considered as a weaker indicator than recall for customers. It is seen that recognition is not as effective mean as recall to measure brand awareness. Recognition is generally assessed by asking whether or not people know the name of brand. In design research, however, recognition takes place where relationship between product and brand occurs.

Hence, basic terms related to recognition were concentrated in literature of cognitive sciences, relationship between brand identity and product design was mentioned in the light of marketing and design research. These three types of literature provide a extensive background for following chapters.

3. DESIGN AND CONDUCT OF THE STUDY

This chapter reveals the empirical study on brand recognition from fragments of mobile phones. Starting with an explanation of objective of the empirical study, then it is presented the details of methodology, which are selection of product, brands and their models, selection of participants, apparatus and materials, stimuli and data collection methodology.

Recognizing objects partially (e.g. Biederman, 1987) or fragmental analysis in object recognition (e.g. Ullman, 2006) are the motives for the basis of this empirical study. In partial recognition, it is sought that objects are identified even if some elements of them are missing. Determining the informative fragments in an object is the concern in fragment-based recognition. This empirical study is aimed to reveal which fragments in most common three mobile phones involve more clues about their brands.

3.1 Objective of the Empirical Study

Brand recognition is handled basically in marketing research as revealed in the literature review of this study. However, studies on the term recognition, specifically object recognition, have already saturated and discussed in perceptual and experimental level in cognitive sciences. On the other hand, design researchers have some studies focusing on the relationship between product design and brand identity, borrowing methodology mainly from semantics. There seems to be lack in discussing brand recognition and its relation with product by getting support from the basic methodology and concepts. It is thought that combining related issues from different points of view can bring new, rich and fresh perspective to current literature. It is aimed to meet this insufficiency.

The objective of the study is to reveal the effects of product fragments on brand recognition. In other words, seeking how the fragments of products affect brand recognition is the initial point of the study. Borrowing test methodology from cognitive sciences, empirical study is carried out to reveal whether there is a degree of recognizability on product fragments. If so, how it is distributed on these fragments is questioned.

After discussing current literature on cognitive sciences, marketing research and design research, it is assumed that empirical study contributes to disclose research questions.

3.2 Methodology

Levitin (2002) in the chapter named as "Experimental Design in Psychological Research" explains that "A good experiment is one in which variables are carefully controlled or accounted for so that one can draw reasonable conclusions from the experiment's outcome." Moreover, Harris (2008) suggests a keyword for the method of experimental research: thoroughness. In other words, experimenter should be thorough and clear in methodology since the process has to be replicable.

On the other hand, regarding ethical concerns in using human participants, The American Psychological Association (APA) (1992) posits basic four principles of ethics in human subject research:

1. Informed consent: Participants should be informed about the description of the task. They have rights to reject or give up the experiment.
2. Debriefing: The participants should be given an explanation of the theory that is tested and methods that is used. The participants should be informed beforehand that the data are not used to assess them personally; it is only to collect information in general.
3. Privacy and confidentiality: The data gathered from the experiment should be private and confidential.
4. Fraud: This principle is not only related to human subjects research. Researchers should not fabricate data and they should never knowingly intentionally or through carelessness allow false data, analyses and conclusions to be published.

Since empirical part is relatively closer to the methodology in cognitive sciences, these important points above are taken into consideration while carrying out the study. This part indicates how methodology is held during empirical study.

Pilot test: A pilot study was carried out in order to form a well-planned empirical study. Since it provided quite effective feedback, the pilot test is continued as the empirical part for this study.

3.2.1 Selection of product

A product type that seems more suitable for the aim of the study is chosen for the empirical part of this study. Below are the criteria to choose intended type.

A. Perception: Product type should be perceivable to the public.

B. User profile: The user of product type should cover wide age range and both genders. It should be common for the different user segments.

C. Branding: The product should be produced by more than one company in order to make comparison.

D. Familiarity: Turkish users should be familiar with the product. It should not be novel.

E. Interaction: The product should be interacted with its all dimensions. In other words, it should be small enough to interact with its all views. It should be handheld product

Table 3.1 is created to see which product type can cover these criteria. Small home appliances, sport shoes and automobiles are eliminated since they are not used from all their dimensions. Moreover, small home appliances and automobiles may be limited in terms of potential gender type. Computers, mp3 players, cameras, notebooks and netbooks are not selected because the range of user ages is relatively restricted. Mobile phones and beverage bottles seem to meet all criteria. Yet, mobile phones offer more interactive usage than beverage bottles. Therefore, mobile phones are going to be examined in this empirical study.

Table 3.1: Product types for empirical study

Product Types	Brands	Corresponding Criteria
Small Home Appliances	Braun, Tefal, Arzum, Arçelik, King, Sinbo, Beko, Moulinex	A, B, C, D
Computers	Apple, HP, Sony, Asus, Toshiba, Dell, Casper, Exper, Beko,	A, C, D
Notebooks and Netbooks	Apple, HP, Sony, Asus, Toshiba, Dell, Casper, Exper, Beko,	A, C, D
Mp3 Players	Samsung, Philips, Apple, Kingston, Sony	A, C, D, E
Mobile Phones	Nokia, Samsung, Sony-Ericsson, Apple, LG, Motorola, GM	A, B, C, D, E
Cameras	Nikon, Canon, Samsung, Olympus, Sony, Kodak	A, C, D, E
Sport Shoes	Nike, Adidas, Converse, New Balance, Reebok, Jump, Kinetix	A, B, C, D
Beverage Bottles	Coca Cola, Pepsi, Pınar, Erikli, Absolut, Yeni Rakı, Efe Rakı	A, B, C, D, E
Automobiles	Audi, BMW, Ford, Mercedes, Renault, Toyota, Volkswagen, Volvo	A, B, C, D

3.2.2 Selection of brands and models

In the press release of a research company GfK Turkey (2010), it is announced that in 2009 top ten best selling mobile phones' brands and models are listed below.

Top three models of mobile phones are chosen for the empirical part of this study since this data is an indicator for spreading widely. As first two mobile phones are Nokia's models, third one belongs to Samsung. This provides not only to compare the same brand's models but also different brand's models. Since this study focuses on visual analysis, marketing segmentation is suggested for further studies. Therefore, selection of the brands and models are limited within the top three best selling models.

Table 3.2 : Best selling brands and models of mobile phones in 2009, GfK Turkey 2010 press release

No.	Brand	Model	Percentage
1.	**Nokia**	**6300**	**11,4**
2.	**Nokia**	**1203**	**8,3**
3.	**Samsung**	**SGH-E 250**	**5,2**
4.	Nokia	1200	5,2
5.	Samsung	SGH-M 620	3,6
6.	Samsung	SGH-L 700	3,0
7.	Nokia	2630	2,9
8.	Nokia	3120 CLASSIC	2,5
9.	Samsung	SGH-C 260	2,0
10.	Nokia	3600 SLIDE	1,7

3.2.3 Selection of participants

According to Harris (2008), describing participants is crucial since it has importance on the generalizability of the results. Furthermore, the number of participants depends on the homogeneity and heterogeneity in the population on which is studied. As homogeneous population needs fewer participants, heterogeneous one requires more. According to "rough-and-ready" rule, if a descriptive perceptual experiment is done and the issue studied on is independent for the people, few subjects will be enough. If the issue is expected to be dependent on individuals, then it is needed to be studied with between 30 and 100 participants (Levitin, 2002).

The study was conducted in participants' native language, Turkish. They were chosen from the age of 16 to 24 with mean age of 20,73 for recognition test (SD = 2,36), since this age group has one of the highest percentages of mobile phone possession (as cited in Mestçi, 2005). They were mostly students due to this selected age group. It was held on 30 participants individually (16 male, 14 female) for recognition test. 6 participants (3 male, 3 female) took place in semi-structured interview session. They were active mobile phone users and declared that they had no vision problems.

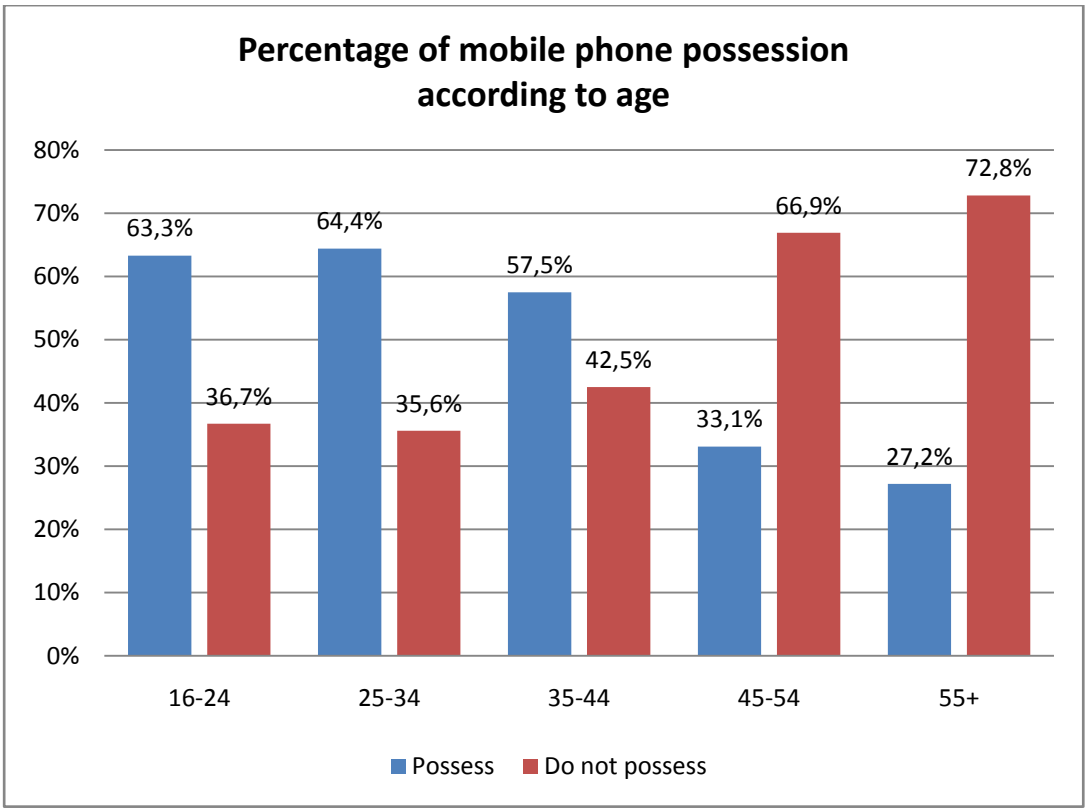


Figure 3.1 : Percentage of mobile phone possession according to age (Mestçi, 2005)

Furthermore, this group is anticipated to be most acquainted with mobile phones and less likely to have optical and perceptional problems. Deliberately, designers or design-related people did not involve as participants since Hsu et al. (2000) explains that there are differences between designers and users in terms of their perceptions of the same objects and their comments of the same image-words.

3.2.4 Apparatus and materials

The experiment was run in a dimly lit room in order to decrease visual distractions. Stimuli were presented on the laptop (HP Pavilion 1242) running Windows 7 and Microsoft Office PowerPoint 2007. The display was set on 15.4" monitor at 1366x768 pixels. There were 10 different products in the experiment. Duration of experiment per each participant was approximately 20-30 minutes. Participants viewed stimuli on the monitor from a distance of approximately 60 cm from the computer. Adobe Photoshop CS3 was used to obtain fragments from the images of products and to erase logos and screens of the phones. Screens of all images of phones were filled with middle-grey. A separate list was used to collect responses from the participants by experimenter.

Image dimensions were changeable accordingly to the number of fragments and types of mobile phones. They were prepared in actual sizes and in 300 dpi resolution.

3.2.5 Stimuli

Best selling three brands (Nokia 6300, Nokia 1203 and Samsung SGH-E 250) introduced in Table 3.2 were used to test their fragments. In total 190 visuals of mobile phones were presented to participants by asking them to indicate brand related to visual.

Besides those best selling three brands, seven different mobile phones' fragments were spread among these as visual distractors; namely, *Blackberry, General Mobile, Apple Iphone, LG, Motorola, Philips and Sony-Ericsson.* Merely front views of products were prepared since most of interaction is taken place in this view.

Stimuli were clustered mainly under four types; 3x8 division type, 2x5 division type, 1x3 or 1x2 division types and 1x1 division type (Figure 3.2, Figure 3.3, Figure 3.4 and Figure 3.5).

In 3x8 division type, images of each product were divided into 24 fragments; three in vertical direction and eight in horizontal direction. In 2x5 division type, images were divided into 10 fragments; two in vertical direction and five in horizontal direction. These two types were considered as geometrical divisions. Therefore, they might be regarded as an objective approach since the functional parts were ignored while being divided. The reason why 3x8 and 2x5 were chosen is to generate different relationships between pieces. Mutually, 3-2 and 8-5 are the numbers that are relatively prime. They provide different types of spatial relations for each fragment. For example, when participants are asked to response for the first fragment of Nokia 6300 in 3x8 division type, the limits of the fragment lose its relation with near parts. Asking the same fragment in 2x5 alters and enlarges its relationship.

The logic behind 1x3 or 1x2 division types is the functional and visual characteristics of mobile phones. For instance, screen, middle part and keypad compose different parts in themselves. These parts are grouped because of their functional similarities. Moreover, these parts are grouped visually. For example, keypad part is composed of buttons that are perceived as group according to Gestalt principles of proximity and similarity. This type might be considered as subjective approach to be asked for the participants.

It was aimed to make a crosscheck with previous ones. While Nokia products were divided into three parts, Samsung was divided into two since its keypad was hidden under its body. Finally, mobile phones were asked entirely to gather information if they were able to be recognized at all.

Figure 3.2 : Test products that were divided into 3x8

Figure 3.3 : Test products that were divided into 2x5

Figure 3.4 : Test products that were divided into 1x3 or 1x2

Figure 3.5 : Test products that were divided into 1x1

3.2.6 Data collection methodology

Through data collection procedure, it was conducted to the participants whose profile is explained in Section 3.2.3. There were three types of methods while gathering data: recognition test, semi-structured interview and questionnaire. Whereas recognition test provided quantitative data, semi-structured interview was carried out to support these data. Questionnaire was distributed to get demographic information of participants and familiarity of selected brands.

In data collection methodology, there are three major concerns:

Understanding the relationship between brand recognition and product fragments

Distributing degree of recognizability on product fragments

Making comparison among product itself and different types of brands regarding brand recognition

3.2.6.1 Study procedure of recognition test

Procedure of recognition test stems from topic of object recognition of cognitive sciences. Each session was implemented separately to the participants individually. It was tried to be used standardized instructions for all participants since it is important to implement instructions as consistent as possible in style, content and delivery and not to cause any variations among these elements (Harris, 2008).

After introducing the procedure of experiment on a separate sheet (Appendix C), the main issues about experiment were repeated orally again. When it was ensured that there were not any other problems, the pretest images were presented on the computer. In this experiment, performance was measured using brand-naming task rooted from object-naming task that are used in object recognition tests. It might be considered as an application of object priming as mentioned in Section 2.1.7. This recognition test is close to within identification, which is in the same section.

Participants had to declare the brand name after they saw the fragment of the product. Their responses were recorded by the researcher.

Prior to the experiment, the participants read a list of the brand names that were used in the experiment. The list covered more numbers of brands than it would be used in the experiment since only three different brands were aimed in the experiment. The participants were told that the visuals in the experiment might include more than one type of brands and it did not mean that all types would be tested.

This procedure for name familiarization yields no effect for recognition. When participants are not familiar with the name of the experimental brands, results would be the same when it was available. More specifically, in categorization tasks Grill-Spector & Kanwisher (2005) emphasize that results of the test remain the same even if participants are told the object categories beforehand by the experimenter.

First, a fixation marker was shown before fragment of products in order to reduce spatial and temporal uncertainty. After shown 0,7 sec. fixation marker, the fragment of mobile phone was presented for 1 sec. Following this, immediately a jumbled scene mask appeared for 0,5 sec. to interrupt perceptual processing and to limit target availability to the exposure duration. Visual mask is consisted of jumbled fragments of mobile phones. Stimuli were presented on a white background. Figure 3.6 illustrates the procedure of the study.

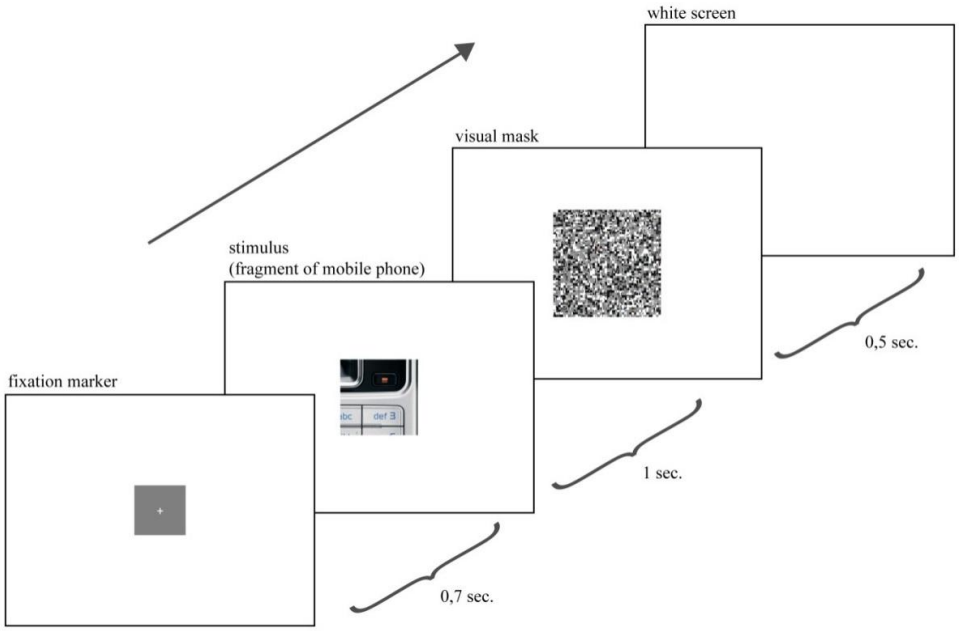


Figure 3.6 : Procedure of empirical study

There was a deliberate categorization of visuals while presenting them. First section, in which 114 fragments were asked, consisted of 3x8 fragments of each product. In second section, each product was divided into 2x5 (vertical x horizontal). In third section, products were divided according to their schematic placement of parts e.g. screens, keypads, control panels… Final section was composed of the entire product without their logos. Within each section, the order of the visuals was randomized in order to lessen order effect. Because, order where the stimuli are presented may intervene with the outcomes of the experiment. One solution to decrease the order effect is to make random order for the stimuli (Levitin, 2002).

After experimental process finished, participants were debriefed and asked anything to ask about the experiment.

Table 3.3 : Distribution of visuals used in study

No.	Division type (vertical x horizontal)	Number of fragments of the test products	Number of distractors	Total number
1.	3x8	3x(3x8) = 72	42	114
2.	2x5	3x(2x5) = 30	21	51
3.	1x3 or 1x2	2x(1x3) + 1x(1x2) = 8	7	15
4.	1x1	3x(1x1) = 3	7	10
Total number		113	77	190

3.2.6.2 Semi-structured interview

A semi-structured interview was carried out on six participants to provide crosscheck the recognition test. Recognition test, where personal judgments of participants are ignored, is the source of quantitative data in this study. In order to make crosscheck, a semi-structured interview was formulated. After giving general outline of interview to participants (Appendix D), they were asked to make comments on test mobile phones in the frame of interview questions. (Appendix F) The questions were prepared to get comments specifically on the distinctive features of product and its relation with brand identity.

Questions were asked for each mobile phone separately in random order of products. Images of mobile phones were presented on both computer screen and A4 paper. Participants were asked to mark distinctive pieces of the phones on the paper. At the end of the interview, three of the test products were shown and requested to make comparison in terms of design features. Then the questionnaire was distributed.

3.2.6.3 Questionnaire

A questionnaire was distributed to participants after the recognition test and semi-structured interview. The aim of this questionnaire is to get the participants' demographic information including their age, gender and occupation and to gather data about the degree of their familiarity and experience on mobile phones that they have used so far. According to this questionnaire distributed after recognition test, most of participants consist of students (22) since this age group mostly refers to them. Other occupations of participants in recognition test are engineer (5), officer (1), research assistant (1) and secretary (1).

Only two participants have not used a mobile phone branded as Nokia. 28 participants have chosen Nokia mobile phones once or more than once, which means that most of participants are familiar with Nokia actively by experiencing them three-dimensionally. On the other hand, 14 participants have used Samsung mobile phones actively, which is the half of Nokia users. 42 mobile phone models seem to be remembered among 54 Nokia branded mobile phones whereas 13 mobile phone models of 18 Samsung phones are remembered. 43 models of mobile phones are not remembered among 108 different mobile phones (See Appendix B).

According to questionnaire distributed after interviews, the general participant profile fits to previous profile. Four of them consist of students, one of them is officer and one of them is engineer (See Appendix E).

4. RESULTS AND ANALYSIS

In this part, results and analysis of this study are revealed. The results are first discussed separately for each test products and then cross-comparison is presented according to division types. Finally, thematic implications on study are grouped and discussed that are inferred from the analysis.

4.1 Distribution and Analysis of Responses

Responses from the participants are gathered and categorized mainly into three sections; recognized fragments, misrecognized fragments and unrecognized fragments. Each of these is presented in a different colored scale, which is ranged from 0 to 30. While scale from white to green shows the degree of recognized fragments, scale from white to red refers to the degree of misrecognized fragments and scale from white to black indicates the degree of being unknown of the fragments. In this part, responses are analyzed in a descriptive manner. In order to support recognition test analysis, opinions from semi-structured interview are highlighted in following sections.

4.1.1 Nokia 6300

In this part, responses from participants on Nokia 6300 are revealed and analyzed. They are categorized as recognized fragments, misrecognized fragments and unrecognized fragments below.

4.1.1.1 Recognized fragments of Nokia 6300

Below are the distributions of recognized fragments from participants on Nokia 6300 (Figure 4.1). The green scale shows the degree of recognized fragments. The fragment goes greener if it is answered accurately. In general terms, most of the participants give correct answers on Nokia 6300. When all division types are considered, the frequency of recognized fragments is fairly higher than unknown and wrong answers.

As it is seen in all fragments type, green fragments intensify in middle and lower part of Nokia 6300. It covers middle control button and keypad. When 3x8 division type is considered, first row is known accurately by 11 or 13 people among 30 participants. It decreases in next three rows and vanishes normally in the screen parts. In fifth and sixth rows, the correct answers reach to its maximum. In following rows, it declines slowly again. The fragment with 25 recognized fragments that contains right side of middle control panel is the maximum green part regarding 3x8 division type.

In 2x5 division type, it shows almost the same distribution with the previous division type. Maximum number of true fragments is placed in lower parts. Green fragment with 28 answers is the utmost correct concerning this division type among other test products.

1x3 division type supports the other division types of Nokia 6300. When entire phone is asked to participants, 29 people of 30 indicate that it is Nokia.

According to semi-structured interview, *Participant B* and *Participant F* indicate that lower parts carry more clues about Nokia, which verifies the distribution of responses.

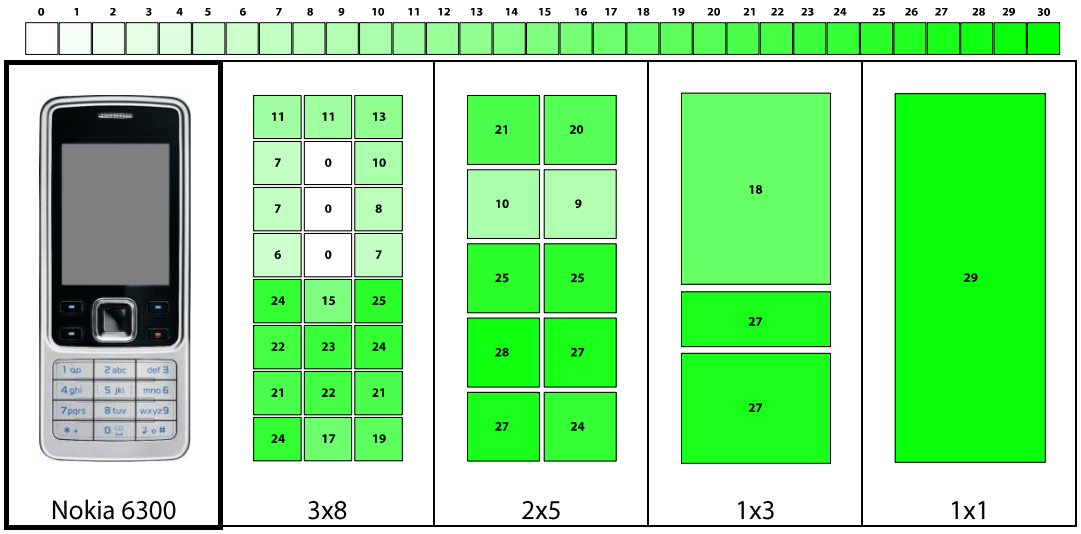


Figure 4.1 : Distribution of recognized fragments of Nokia 6300

4.1.1.2 Misrecognized fragments of Nokia 6300

Figure 4.2 shows the distributions of misrecognized fragments in 3x8, 2x5,1x3 and 1x1 division types. In order to get detailed information on misrecognized fragments in empirical study, refer to Appendix G.

First row and lower rows include most of mistakes regarding 3x8 division. Especially in the first row, the first fragment has the maximum misrecognized fragments, where there seems no symmetrical distribution as expected. Last fragment in 3x8 division type follows first fragment with number of 7 misrecognized fragments. Around last fragment, remaining maximum red fragments seem to intensify.

In 2x5 division, the total number of wrong associations hits its peak in the right side of the screen. Supporting this inference, second and last row in 2x5 indicates no symmetrical distribution. Lower numbers of participants suppose remaining fragments as another brand. When compared to 3x8 division type, the maximum and minimum wrong responses display different scattering.

In 1x3 one, as three participants declare other brand name for screen part, only one participant makes wrong attribution for the controller part and two people give a brand name except for Nokia for the keypad part.

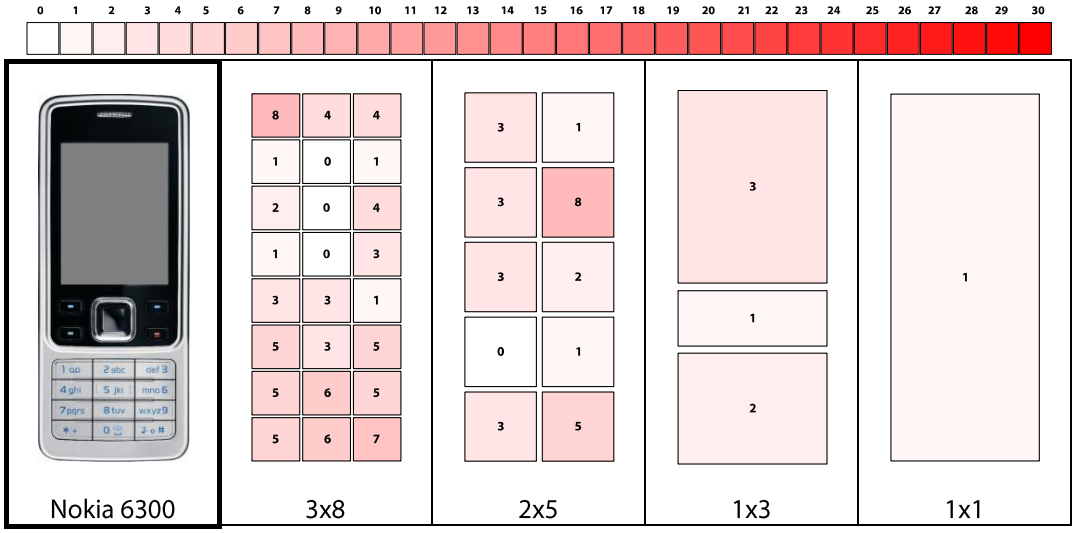


Figure 4.2 : Distribution of misrecognized fragments of Nokia 6300

4.1.1.3 Unrecognized fragments of Nokia 6300

In this part, unrecognized fragments are categorized visually in Figure 4.3. This shows the distribution of how many participants response that “I do not know”. While black fragments refer to unrecognized parts, white shows that the fragments are answered by the participants.

Unrecognized fragments become intense on and around screen part. All division types support this result. This shows that most of participants have difficulty in guessing upper screen part.

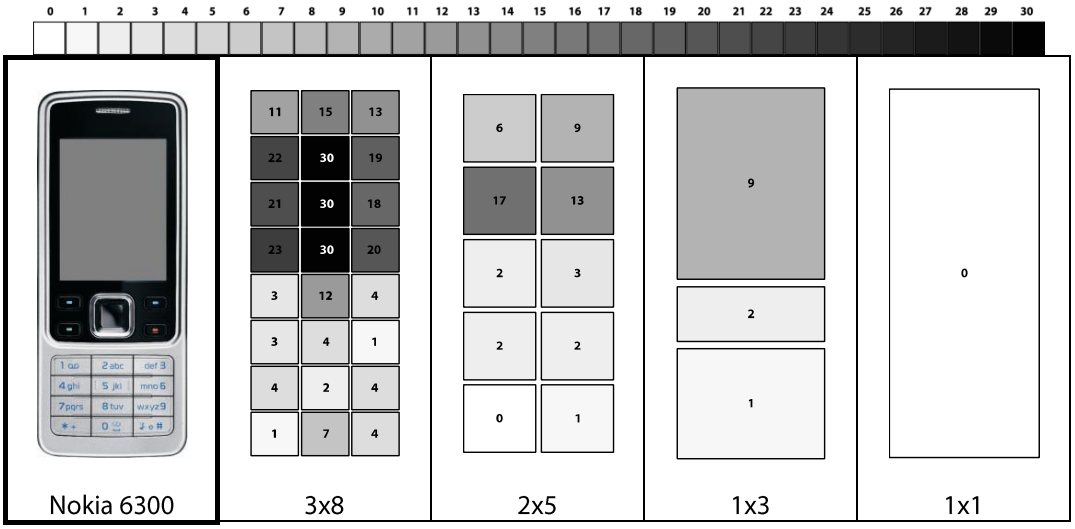


Figure 4.3 : Distribution of unrecognized fragments of Nokia 6300

4.1.2 Nokia 1203

In the following sections, responses on Nokia 1203 are shown and analyzed. They are clustered as recognized fragments, misrecognized fragments and unrecognized fragments below.

4.1.2.1 Recognized fragments of Nokia 1203

In this part, the recognized fragments of Nokia 1203 are distributed in Figure 4.4. The greener it is, the more accurate the fragment is. Regarding all division types, the number of recognized fragments is higher than unknown and wrong replies.

In 3x8 division type, upper corners and keypad parts seem greener than other parts. In controller part and keypad part, there seems to be equal distribution of recognized fragments. The greenest part in 3x8 division type is placed in the left lowest corner.

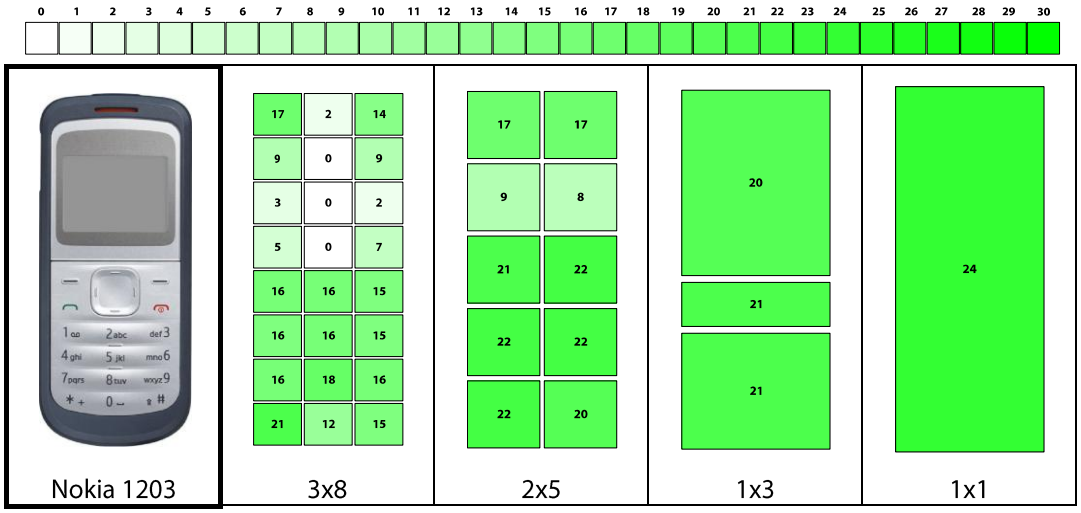


Figure 4.4 : Distribution of recognized fragments of Nokia 1203

The 2x5 division type also supports this distribution. Last three rows include maximum and equal distribution of correct answers.

In 1x3 division type, there is almost an equal distribution among all fragments. When participants see Nokia 1203 completely, 24 of them recognize it.

4.1.2.2 Misrecognized fragments of Nokia 1203

Figure 4.5 illustrates the mapping of misrecognized fragments of Nokia 1203. Number of misrecognized fragments ranges from 0 to 8 in Nokia 1203. To get further information on which brands are attributed to Nokia 1203, please refer to Appendix G.

Wrong answers are clustered on two sides when top part is considered in 3x8 division type. Middle column contains slightly fewer misrecognized fragments. According to photograph direction, right side of it is more likely to be made more misrecognized fragments than left side considering this type.

However, 2x5 division type contradicts with this inference. In this one, left side includes slightly more false answers than right one.

Middle and lower part are known as different brand when 1x3 is considered. When participants were exposed to entire photograph of Nokia 1203, 4 of them declared different brand other than Nokia.

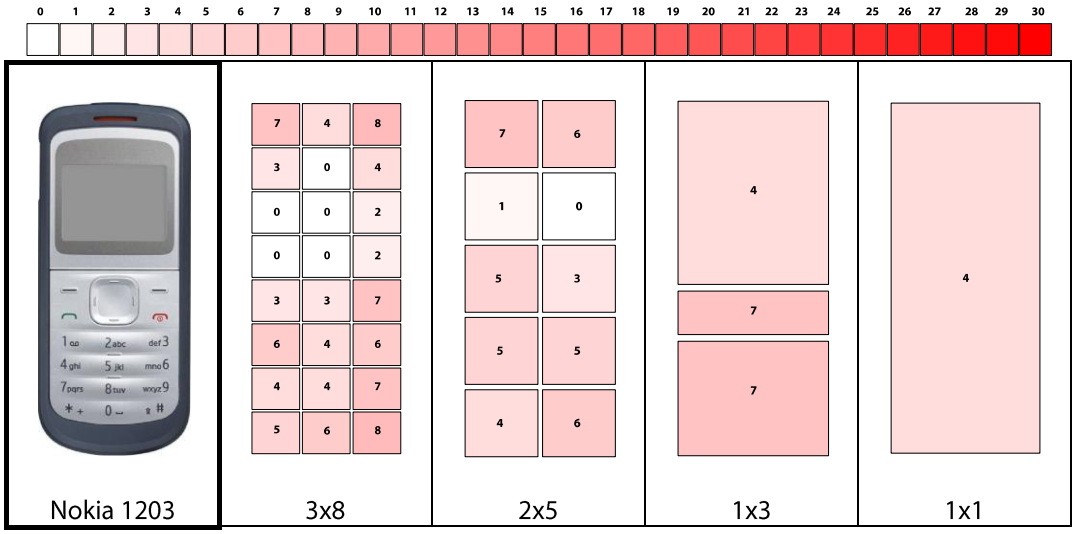


Figure 4.5 : Distribution of misrecognized fragments of Nokia 1203

4.1.2.3 Unrecognized fragments of Nokia 1203

This part reveals the fragments about which participants have no idea on Nokia 1203 regarding 3x8, 2x5, 1x3 and 1x1 division types.

Participants have less idea on middle section of the upper part in 3x8 division type. In this type, the four edges of phone are more likely to have an answer. In second, third and fourth rows unfamiliarity becomes maximum where screen is situated.

2x5 division type supports this inference with its second row. Lower parts are more or less in similar colors. Top row follows lower fragments in number of unrecognized parts.

In 1x3 division type, upper fragment has highest unknown answers with the number of 6. When Nokia 1203 is asked wholly, only two participants have no opinion about it.

In semi-structured interview, *Participant B* and *Participant D* state that earpiece of Nokia 1203 seems one of the most unidentifiable parts.

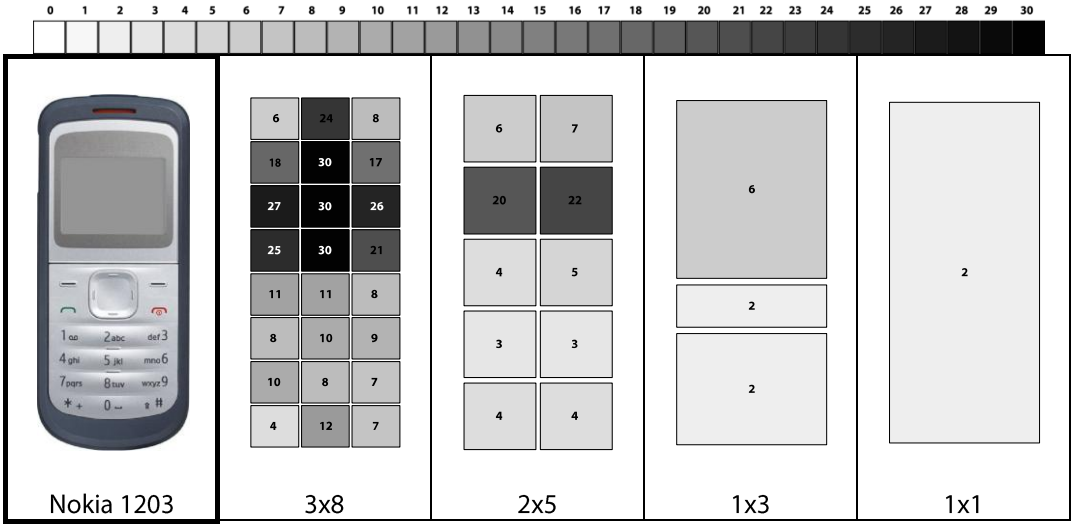


Figure 4.6 : Distribution of unrecognized fragments of Nokia 1203

In conclusion, in article titled *"Designing Visual Recognition for the Brand"*, Karjalainen & Snelders (2010) propound that since Nokia has larger product range and address to various segments, design decisions are taken in more flexible manner when compared to Volvo car. Therefore, it is thought that brand references on Nokia are more implicit and product portfolio of Nokia seems more flexible among its models if its entire product portfolio is considered. Design cues do not take place merely in one product.

In other words, they can be copied to other products that are under the same brand or product line with some modifications. This can be changeable from brand to brand according to its strategy. Whereas some brands like BMW, Jaguar, Apple and Braun have obviously “recognizable design features” which are used among all its products, brands like Toyota, Ford, Sony and Samsung use more adaptable strategy regarding individual products (Karjalainen & Snelders, 2010)

According to Karjalainen & Snelders’ study (2010):

> The consistency of a product portfolio with varying designs was managed through subtle references, and some of these were even held to function at a subconscious level. Nokia designers claimed that their products, even those with very different designs, were recognized as Nokia products, because they incorporated specific design features in a more subtle, ‘‘qualitative’’ way.

4.1.3 Samsung SGH-E 250

The third mobile phone in best selling brands and models of mobile phones in 2009 is Samsung SGH-E 250. This part of study focuses on the distribution of answers of this phone as recognized fragments, misrecognized fragments and unrecognized fragments.

4.1.3.1 Recognized fragments of Samsung SGH-E 250

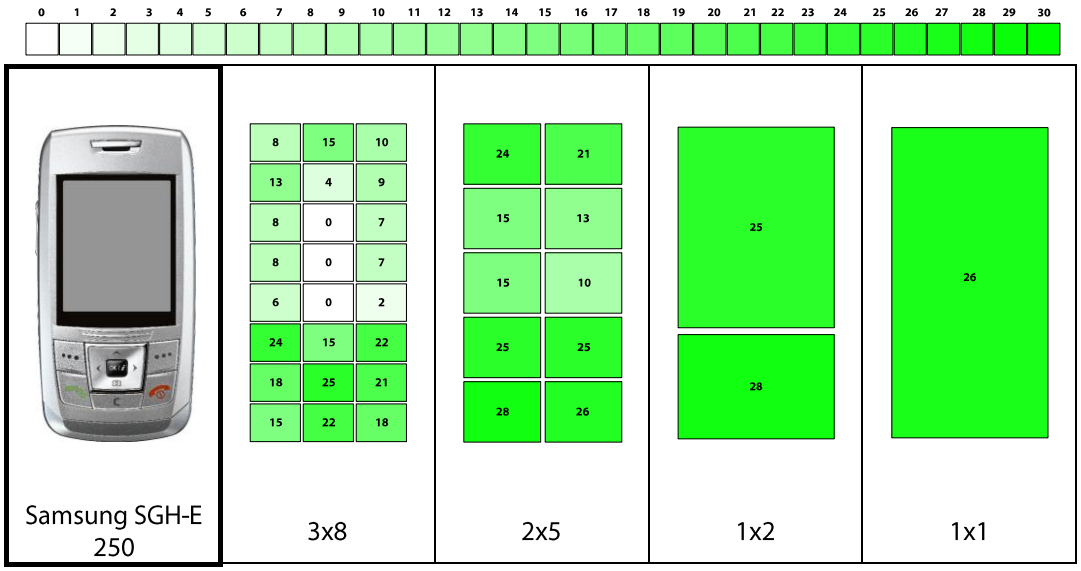


Figure 4.7 : Distribution of recognized fragments of Samsung SGH-E 250

Recognized fragments scaled between the number of 0 and 26. When 3x8 division type is considered, middle of the first row has the maximum correct answer where it includes earpiece. Recognized fragments are grouped in lower parts; especially lower middle parts. This is approved in all division types. Lower parts have the maximum number of recognized fragments even if it is slightly more than top fragments.

According to semi-structured interview, *Participant A* and *Participant F* point out that "C" button and middle button seem distinctive and recognizable parts.

4.1.3.2 Misrecognized fragments of Samsung SGH-E 250

Figure 4.8 shows the distribution of wrong responses in all division types. Detailed wrong attribution is placed in Appendix G.

Right column involves more misrecognized fragments than left one in 3x8 division type. Except for screen part, there are misrecognized fragments ranged from 1 to 6. Right bottom corner of screen has the maximum number of misrecognized piece.

Right top edge in 2x5 division type is recognized wrongly by 4 participants, which is the utmost number. Following this, 3 participants identify fourth row as different brand.

While one for each person knows fragments in 1x2 division type as another brand, 3 participants make misrecognized fragments on entire image of Samsung SGH-E 250.

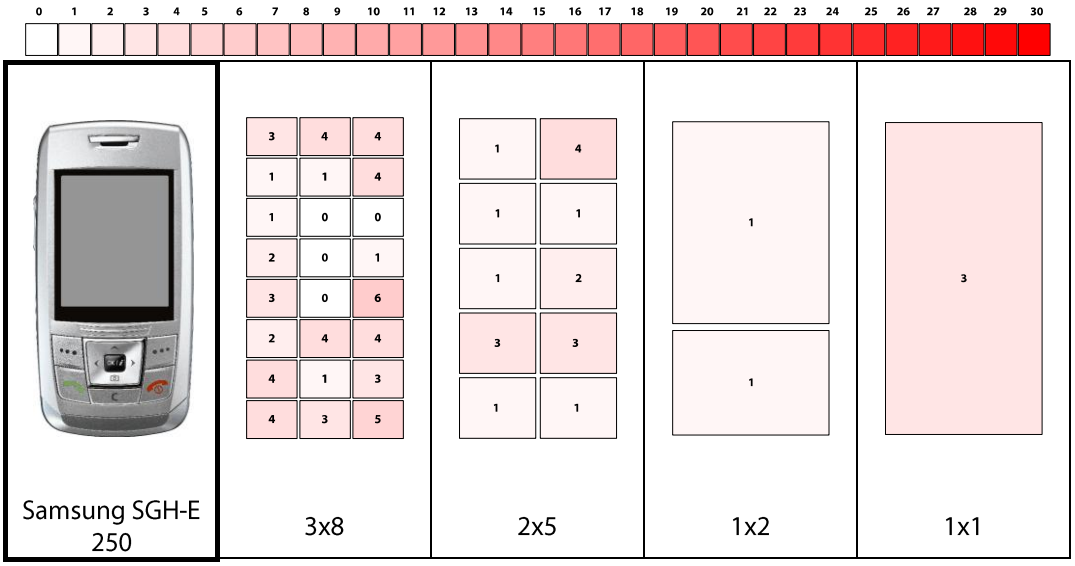


Figure 4.8 : Distribution of misrecognized fragments of Samsung SGH-E 250

4.1.3.3 Unrecognized fragments of Samsung SGH-E 250

In Figure 4.9, it is shown the distribution of responses of participants who have no idea on Samsung SGH-E 250.

In 3x8 division type, unrecognized fragments are gathered in top parts and around screen. In lower part where controller buttons are placed, there seems to be almost symmetrical distribution of unrecognized fragments.

Screen parts include maximum unknown pieces ranging from 14 to 18 in 2x5 division type. There is a huge difference between these parts and lower parts.

Regarding 1x2 division type, while 4 participants do not know the top part of Samsung SGH-E 250, only 1 person does not recognize bottom part. When total image is seen, one person declares "I do not know this fragment".

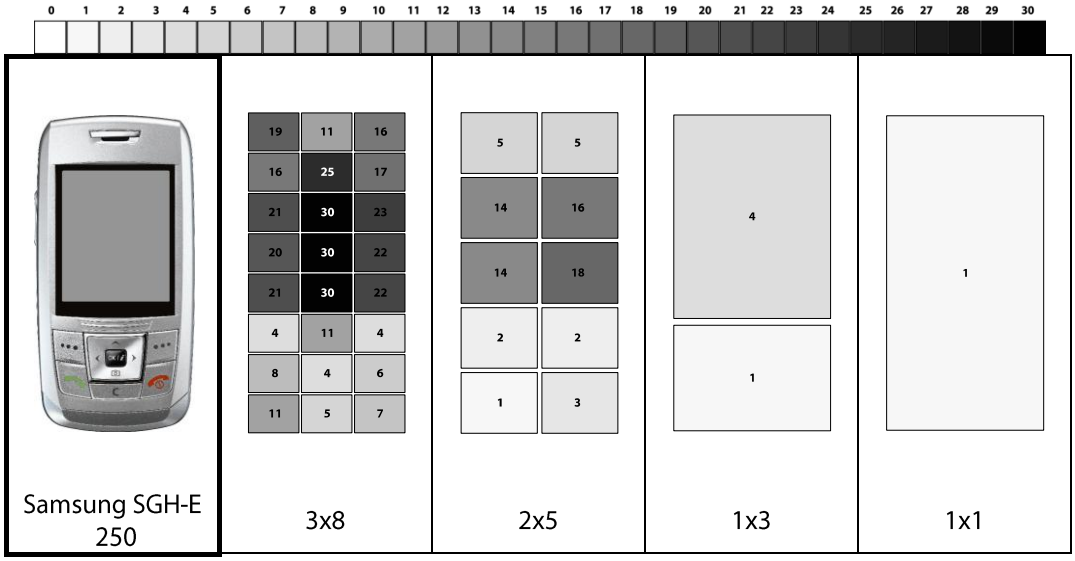


Figure 4.9 : Distribution of unrecognized fragments of Samsung SGH-E 250

4.2 Cross-comparison and Contrast

This part focuses that cross-comparison and contrast of the distribution of responses in terms of their division types to analyze results profoundly. It is also enriched with the responses that are received from the interviews.

First rows of the figures show the original image of the mobile phones with its division type. Second rows illustrates the recognized fragments, third rows show the misrecognized fragments and last rows show the unrecognized fragments in order of; Nokia 6300, Nokia 1203 and Samsung SGH-E 250.

4.2.1 Cross-comparison and contrast of 3x8 division types

In this section, it is interpreted the outcomes comparatively from the empirical part of the study regarding 3x8 division types.

Concerning recognized fragments for all mobile phones, there is an order revealing that Nokia 6300 has more correct fragments (337) than Samsung SGH-E 250's (277) and Nokia 1203's (260) as shown in Figure A.1. This shows that while Nokia 6300 has the maximum frequency of recognized fragments, Nokia 1203 has the minimum. There is an increase in recognized pieces in the middle and lower parts where the functional buttons appear in all mobile phones. This distribution might reflect the mobile phone typology. Both Nokia mobile phones share more similar distribution than those with Samsung. It can be inferred that brand type can be observed from this distribution of recognized fragments.

According to the misrecognized fragments of all mobile phones, Nokia 1203 has the maximum number of misrecognized fragments (93), following with Nokia 6300 (82) and Samsung SGH-E 250 (60). That is, when participants see the fragments of test products in 3x8 division type, they misrecognize Nokia 1203 at most and Samsung model at least in total calculation.

As seen Table F.1 Nokia 6300 is generally attributed as Apple Iphone when upper parts are seen and guessed mainly as Samsung, Motorola or Sony-Ericsson when lower parts are seen. As regards Nokia 1203, red fragments are mostly Samsung or Motorola according to the participants. Samsung mobile phone's wrong fragments might be known as Nokia or other brands. It can be inferred that misrecognition occurs where the relationship between brand identity product features become weaker and where it resembles parts of other brands.

This can be seen more evidently in comparison between Nokia 6300 and Apple Iphone. Participants can get confused when they see a fragment that includes metal frame. They might identify Nokia 6300 as Apple Iphone even though there is a small surface difference in Nokia 6300. Hence; regarding this issue, surface difference in metal frame is not so effective and sufficient to make it as Nokia. It can be because of the effect that Apple Iphone owns metal frame attribution.

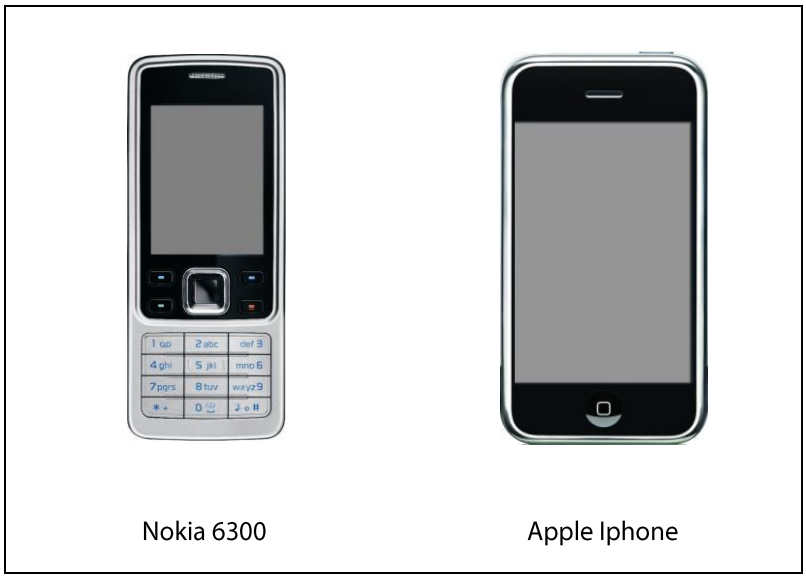


Figure 4.10 : Cross-comparison of Nokia 6300 and Apple Iphone

When unrecognized fragments are considered in 3x8 division type, the number of unrecognized fragments in total is arranged in order as Samsung SGH-E 250 (383), Nokia 1203 (367) and Nokia 6300 (301). Screen parts and around screen parts have the maximum unfamiliarity. None of the participants has a guess on the screen parts where it consists of only middle-grey. Therefore, it does not include any design cues about brand or product or object.

It might be interpreted that if there is a little change or no change in the fragment, the frequency in answering or guessing it decreases and disappears. It can be inferred that if material, surface and color changes occurs or graphical elements are added in fragment, the anticipation frequency on this increases.

Another interpretation might be on functional use that the fragment involves. Keypads where types and frequency of interaction seem to be more identified than other parts. For example, the fact that user both touches and sees the functional buttons might affect the frequency of recognition. Other than these parts, their interactions seem more limited.

4.2.2 Cross-comparison and contrast of 2x5 division types

In this part, distribution of responses is examined relatively among three test products regarding 2x5 division type (Figure A.2).

Second row shows the scattering of the recognized fragments on Nokia 6300, Nokia 1203 and Samsung SGH-E 250. Total correct answers are put into order such as Nokia 6300 (216), Samsung SGH-E 250 (202) and Nokia 1203 (180), which also confirm the order in that of 3x8 division type. In general, it is observed a symmetrical distribution in Nokia 6300 and Nokia 1203 whereas there is a little difference in top part of Samsung's between right and left sides. Similar to those in 3x8 division type, there seems to be an increase in correct answers towards lower parts. While top row might be considered as to be recognized in second order, screen parts get the lowest recognizability.

As shown in third row, in total Nokia 1203 (42) has maximum misrecognized fragments, Nokia 6300 (29) second highest frequency in wrong answers and finally Samsung SGH-E 250 (18) has the minimum. This is also again supported by the 3x8 division type. Nokia 6300 might be identified again as mostly Apple Iphone concerning some fragments, which is discussed in previous section. Some fragments of Nokia 1203 are confused with at most Motorola; then Samsung, General Mobile and Siemens. Samsung SGH-E 250 might be recognized as mostly Nokia.

When last row is considered, it fits the distribution that is also mentioned in 3x8 division type. Screen parts own the most unfamiliar part in all mobile phones. Samsung SGH-E 250 (80) has the maximum number of unidentified part in total, which is slightly more than that in Nokia 1203 (78). On the other hand, Nokia 6300 (55) has the lowest unfamiliarity among 30 participants.

4.2.3 Cross-comparison and contrast of 1x3 or 1x2 division types

This section includes cross-comparison and contrast of test products in 1x3 or 1x2 division types (Figure A.3)

In these division types, functional parts are been considered. That is, screen, controller panel and keypad are divided into three parts. However, in Samsung SGH-E 250 it is divided into two parts; screen and controller part. Therefore, it might not be suitable in this part to make comparison among these three models regarding the frequency since there is difference in numbers of fragments. Via this division, it is intended to make crosscheck to previous geometric vision. Whereas in 3x8 and 2x5 division types it is offered an objective and geometric way, in 1x3 or 1x2 division type its functionality is taken into consider.

Regarding recognized fragments, controller part and keypad have more number of recognized fragments than screen part in Nokia 6300. Nokia 1203 has more or less equal distribution. Correct answers of bottom part of Samsung SGH-E 250 are slightly more than the top part.

Third column shows misrecognized fragments for test products. Screen of Nokia 6300 is attributed incorrectly more than its other parts. Controller panel and keypad of Nokia 1203 share 7 mistakes, which is the maximum in this mobile phone. Both parts of Samsung SGH-E 250 are attributed incorrectly only one time.

As shown in last column, screen of Nokia 6300 is unrecognized by 9 participants, screen of Nokia 1203 is unidentified by 6 participants and screen of Samsung SGH-E 250 is unknown by 4 participants, which are the maximum in each product.

4.2.4 Cross-comparison and contrast of 1x1 division types

In this section, responses are evaluated according to 1x1 division types as illustrated Figure A.4.

Considering first row, Nokia 6300 is recognized by 29 participants, Samsung SGH-E 250 is known by 26 participants and Nokia 1203 is identified by 24 participants. This confirms all other ranges in distribution of recognized fragments.

Nokia 1203 (4) is attributed incorrectly in the maximum number of people. Nokia 6300 (1) has lowest number of wrong identification.

Last row shows how many participants cannot give any responses to mobile phones. According to the results, each participant answers Nokia 6300 when it is seen entirely. While two participants do not have guess on Nokia 1203, only one participant is not able to anticipate Samsung SGH-E 250.

4.2.5 Cross-comparison and contrast of all types

When all results are considered, it seems that all test products are highly recognized properly. Frequency of recognized fragments is more than misrecognized fragments and unrecognized fragments. This can confirm the fact that these products are common in the sense of recognition. However, while recognition rate is higher in some fragments, some of them lacks in being identified.

Regarding recognized fragments in 3x8 and 2x5 division types in total, Nokia 6300 (553) has the maximum number. Nokia 1203 (440) has the lowest one. Samsung SGH-E 250 is recognized 479 times when 3x8 and 2x5 types are summed up. Among those, Nokia 6300 is identified more than other test products, which shows that it can be considered as fragmentally the most identifiable.

Concerning 3x8 and 2x5 types again, frequency of misrecognized fragments in test products are ranked like Nokia 1203 (135), Nokia 6300 (111) and Samsung SGH-E 250 (78). It can be inferred that among those products, Samsung SGH-E 250 has the most distinguished features from other mobile phones. That is, when participants see fragments of it, they are less likely to make misrecognized fragments. In contrast, when participants see different parts of Nokia 1203, they have more inclination to make confusions with other brands.

When 3x8 and 2x5 types are summed up, test products are unknown in this descending order: Samsung SGH-E 250 (463), Nokia 1203 (445) and Nokia 6300 (356). According to this, fragments of Nokia 6300 are answered at most. On the other hand, mobile phone of Samsung remains unknown more than others.

Table 4.1 : Cross-comparison and contrast of all types

Mobile phone	Recognized fragments	Misrecognized fragments	Unrecognized fragments
Nokia 6300	**553 (1)**	111 (2)	356 (3)
Nokia 1203	440 (3)	**135 (1)**	445 (2)
Samsung SGH-E 250	479 (2)	78 (3)	**463 (1)**

As seen in Table 4.1, total answers of fragments in 3x8 and 2x5; namely recognized fragments, misrecognized fragments and unrecognized fragments, are listed. In recognized fragments, Nokia 6300 has the maximum; in misrecognized fragments, Nokia 1203 has the greatest number and in unrecognized fragments Samsung SGH-E gets the highest number. As seen in parentheses in Table 4.1, each mobile phone places in different ranks according to results. For instance, as Nokia is the first place in recognized fragments, second place in misrecognized fragments and third place in unrecognized fragments etc. When these findings are crosschecked with other division types (1x3, 1x2 or 1x1), these ranking show vast similarities.

4.3 Thematic Implications of the Study

Apart from the interpretations of cross-comparison and contrast in previous sections, this part emphasizes four themes that can be extracted from this study. Observed results can be summarized in mainly four sections; namely the themes of position, material/color/texture, symmetry/asymmetry and graphical elements.

Following sections include for further discussions and aims to enlarge the potential of the study. Even not fully proven by all empirical findings, it is worth to open a debate and make categorization under following headings. Those empirical outcomes elicit some arguments and they are clustered according to similar inferences.

This type of categorization resembles conceptual clustering in terms of generating conceptual descriptions and fitting into groups, which is explained in Section 2.1.6. Arguments that share similar themes are discussed in following parts.

4.3.1 The theme of position

This theme comes from the outcomes of the empirical study, where there are differences and similarities in distribution of responses regarding their position. Some responses in different kind of mobile phone might intensify in certain positions. In general, recognized fragments seem to center around in that order: bottom part (4), middle part (3), top part (1) and upper-middle part (2). There seems to be an inclination for correct attributions to be gathered in keypad part that suits for the typology of mobile phones. In other words, these parts can also be named according to their functional tasks; i.e. keypad part (4), controller panel (3), ear part (1) and screen (3).

1	Earpiece
2	Display
3	Left and right selection keys
4	Navi™ key: 4-way scroll key and middle selection key
5	Call key
6	Keypad
7	End key

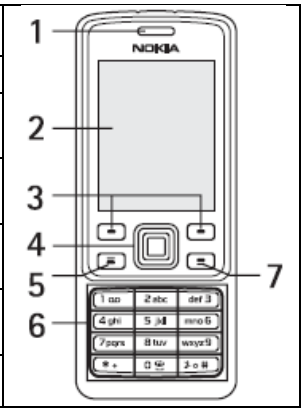


Figure 4.11 : Layout of Nokia 6300 (Nokia 6300 User Guide, 2008)

Figure 4.11, Figure 4.12 and Figure 4.13 show layouts of front views of the test products according to their user guides. Even though there are buttons specified for certain functions of each product, they consist of common parts in general. These user guides that illustrate parts of mobile phones are given place in this section in order to reveal functional division of each phone.

1	Earpiece
2	Display
3	Selection keys
4	Navi™ key
5	Call key
6	End/Power key
7	Keypad

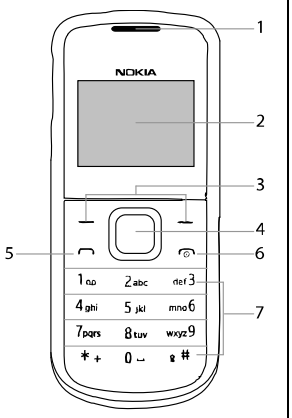


Figure 4.12 : Layout of Nokia 1203 (Nokia 1202/1203 User Guide, 2009)

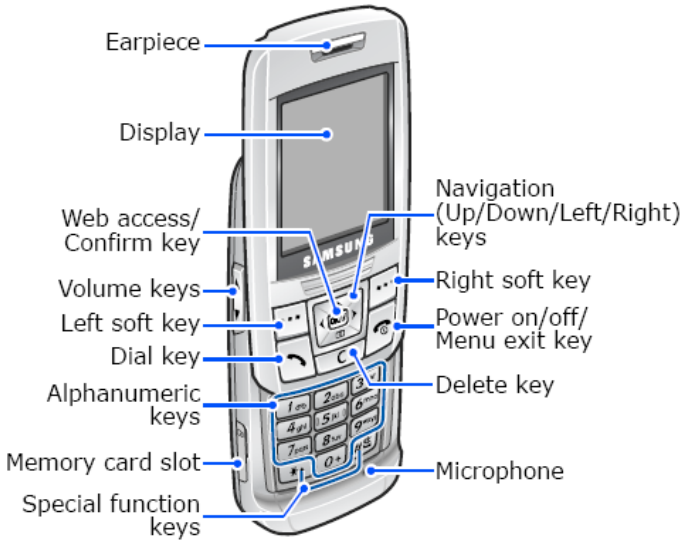


Figure 4.13 : Layout of Samsung SGH-E250 (SGH-E250 User's Guide, 2006)

Eliasson & Kjellman (2010) propose button layout terminology for their empirical study focusing on hardware usability on mobile phones. Functional tasks of these buttons are concerned while making divisions. This type of grouping seems similar to proposed layout.

Figure 4.14 : Button layout terminology (Eliasson & Kjellman, 2010)

After examining those types of divisions above and outcome of empirical study, it can be proposed a layout that shows grouping in responses. Hereunder, there seems to be a horizontal grouping, which is visualized in Figure 4.15. Although there are some minor differences among test products, this general type of layout is proposed. Parts are named according to both their positions and functional tasks seen in mobile phone typology. Semi-structured interview also contributes this naming. While participants are commenting on specific parts, they often choose words such as "upper part", "middle button" etc. In other words, they perceive parts by grouping them visually or functionally.

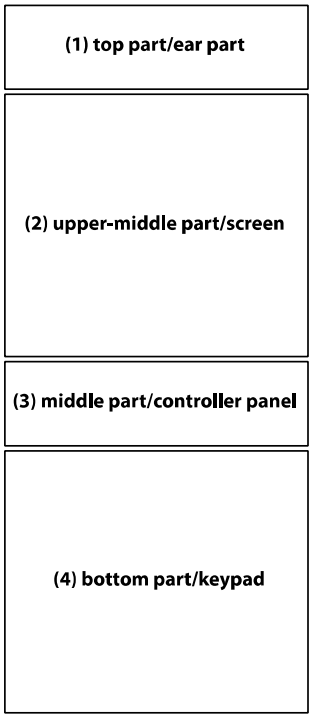


Figure 4.15 : Proposed layout

Hence, in general according to distribution of the number of correct or wrong responses, intensify in this descending order; (4) bottom part/screen, (3) middle part/controller panel, (1) top part/ear part and (2) upper-middle part/screen. In other words, tendency in guessing or answering a fragment in general aspect can be observed to create a horizontal distribution. Thus, it might be inferred that in general some part of mobile phones in empirical part of this study include more design cues about brand identity than others. Unrecognized fragments in general also support this argument since there is a descending rank for this type such as (2) upper-middle part/screen, (1) top part/ear part, (3) middle part/controller panel and (4) bottom part/screen. For instance, participants are not able to guess or know screen utmost.

4.3.2 The theme of material/color/texture

As mentioned in Section 2.3.2, according to Chen and Owen (1997), materials, color and textures are the elements that create design cues with respect to brand identity. Therefore, this section concentrates on these elements in accordance with the results of recognition test and semi-structured interview.

In general, in parts of test products it seems that where changes occur regarding material, color and texture, frequency in guessing is higher than in parts with no change. For example, changes in surface, color and in some points textures, which are mainly gathered on keypad part, is the most recognized section. Therefore, when there is no elements appeared i.e. in screen part the number of recognizability decreases. Similarly, concerning top part (ear part), when middle part compared among test products in 3x8 division types, earpiece of Samsung SGH-E 250 is recognized correctly more than Nokia's models. Although each of them has a change regarding material, texture and in a way color, Samsung's change can be interpreted as the most visible one. In Nokia 6300 earpiece is under the black surface and seems not so dominant to be noticed. Moreover, according to interviews, 3 participants declare that earpiece of Nokia 6300 is not perceptible. Even if there is color change in earpiece of Nokia 1203, it remains the lowest unrecognized one. This may be because dimensions are not so big to notice. As a result, it does not seem to be so characteristic that has attribution to its brand. However, Samsung SGH-E 250 is recognized as half of the total participants. It can be interpreted that texture and material change in this part provide a design cue on Samsung more than other test products do.

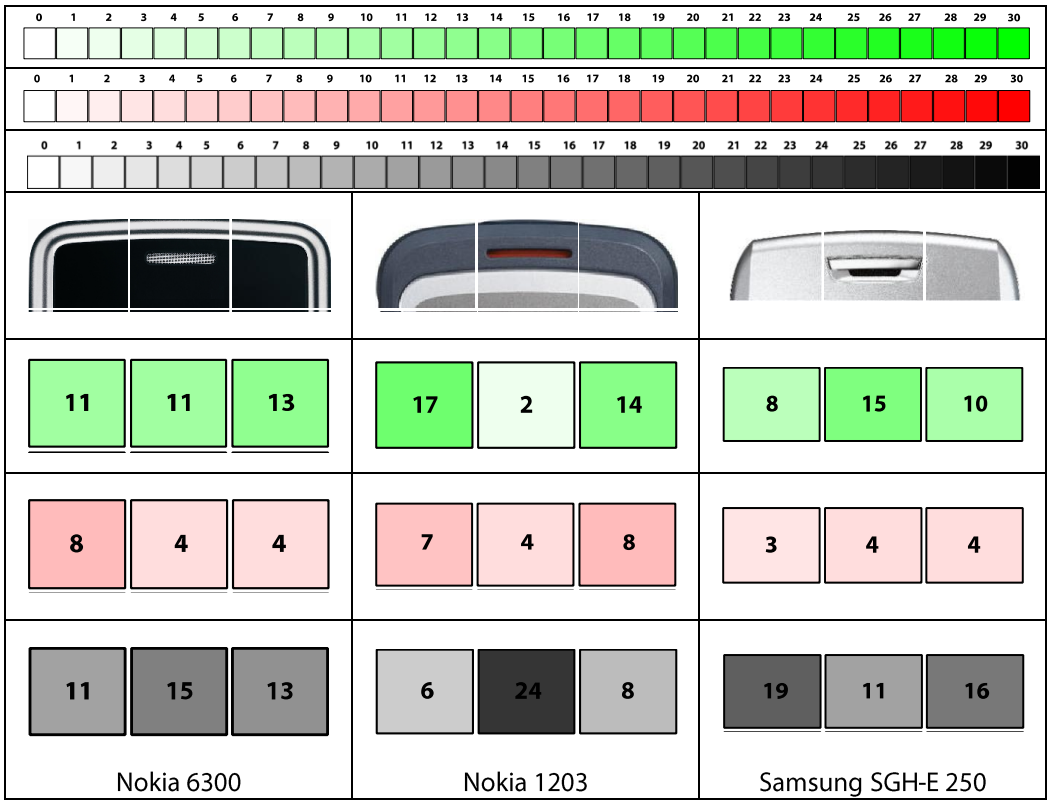


Figure 4.16 : Cross comparison of top part/ear part

4.3.3 The theme of symmetry/asymmetry

Although it is expected a symmetrical distribution of recognition for test products, in some cases there seems to be some asymmetrical scatterings. In this section, it is endeavored to explain and open to debate.

In Table 4.2 and 4.3, right and left sides of recognized fragments, misrecognized fragments and unrecognized fragments are summed up separately according to 3x8 and 2x5 division types. There seems to be differences in right and left sides. The maximum gap between right and left sides is observed in misrecognized fragments of Nokia 1203 (28-44) in 3x8 division type. It is followed by Samsung SGH-E 250 (107-95) according to 2x5 division type.

When examined thoroughly, there seems not to be a general pattern behind this asymmetrical distribution. One point to underline is that regarding Nokia test products distribution of the responses differs in 3x8 and 2x5 division types. However, concerning Samsung SGH-E 250, there is parallel distribution in both division types except for unrecognized fragments. That is, as shown in Table 4.2 and 4.3, while left side is more than right side regarding unrecognized fragments in 3x8 division type, right side is more than left side.

Table 4.2 : Cross-comparison of symmetrical distribution in 3x8 division type

	Nokia 6300		**Nokia 1203**		**Samsung SGH-E 250**	
	Left	Right	Left	Right	Left	Right
Recognized fragments	122	**127**	87	**93**	**100**	96
Misrecognized fragments	30	30	28	**44**	20	**27**
Unrecognized fragments	**88**	83	**109**	103	**120**	117

Table 4.3 : Cross-comparison of symmetrical distribution in 2x5 division type

	Nokia 6300		**Nokia 1203**		**Samsung SGH-E 250**	
	Left	Right	Left	Right	Left	Right
Recognized fragments	**111**	105	**91**	89	**107**	95
Misrecognized fragments	12	**17**	**22**	20	7	**11**
Unrecognized fragments	27	**28**	37	**41**	36	**44**

There can be a relationship between this theme and reading direction. In other words, since participants are used to reading from left to right, it can be expected an increase in number of identifying left side. However, there does not seem any evidence or pattern to show this inference. In further studies, the relation can be focused.

4.3.4 The theme of graphical elements

One of the important aspects that reflect brand identity is consistency in graphical elements; fonts, logos, icons etc. In mobile phones, these graphical elements take place mostly in keypads and controller panels. Since these parts include the most recognized fragments, graphical elements play an important role in identifying parts.

In semi-structured interview, significant notes related to graphical elements are revealed first on Nokia 6300 in following:

- *Participant A:* Right and left selection keys, call and end keys are the parts that include most clues about Nokia. Middle selection key is the characteristic part in Nokia 6300.

- *Participant B:* Keypad and middle key are the elements where Nokia characteristics take more place. Moreover, expressions in keypad are easily understandable.
- *Participant D:* Font in keypad includes more elements regarding Nokia.
- *Participant F:* Numbers and letters in keypad are the parts that are mostly related to Nokia.

Comments on Nokia 1203 are indicated as following:

- *Participant A:* Selection keys and end key/power key of Nokia 1203 has more clues.
- *Participant B:* Fonts, positions of numbers and letters in buttons and red cancel key give more information on Nokia.
- *Participant D:* Concerning one button, placement of number is important to identify the brand.

Finally, details on graphical elements in Samsung SGH-E 250 that are taken from the interview are below:

- *Participant A:* The button that include letter "C" is different from other brands.
- *Participant B:* Red power on/off and exit button and green dial key are the elements that are similar to other mobile phones' parts. However, the letter "i" in the middle part makes contribution on Samsung familiarity.
- *Participant C:* Icon of arrows and text in the middle have more clues about Samsung brand identity.
- *Participant D:* Three dots on buttons of both sides are distinctive for this product. Red and green buttons are not so characteristic.
- *Participant E:* shapes on buttons are distinctive for this product.

As stated in Section 2.3.2., according to Ranscombe et al. (2010), 'graphics' have the most significant effect on brand recognition, which support this theme.

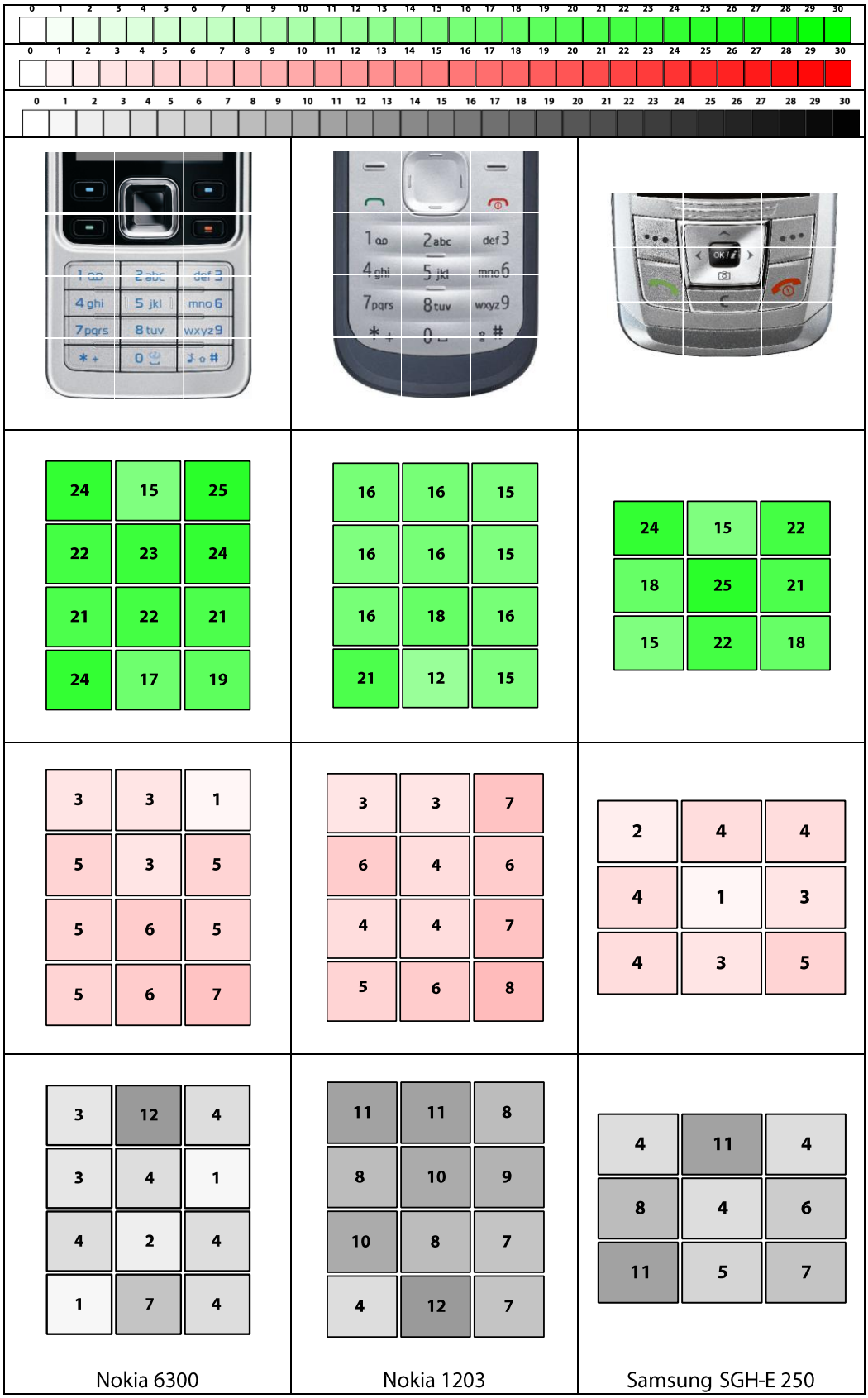


Figure 4.17 : Cross-comparison of graphical parts in 3x8 division types

5. CONCLUSIONS

In this chapter, final remarks extracted from the study are discussed. With the help of extensive information gathered from literature review; empirical study, its results and analysis are concluded by considering their interrelationship. Limitations of the study and directions for further studies are revealed as following sections.

5.1 Final Remarks

In this study, it is aimed to seek brand recognition through fragments of product. In Chapter 2 literature regarding the context of study was reviewed; mainly on cognitive sciences, marketing research and design research. Related basic concepts, definitions and methods were investigated in the scope of object recognition in cognitive sciences. Afterwards, under marketing research, brand, brand recognition and visual brand identity were emphasized. Lastly, recognition in the context of design research and relationship between brand identity and product design were sought. Chapter 3 explained the design and conduct of the empirical study by focusing on objective of the study and methodology. In Chapter 4, current study was concluded and analyzed by distributing, cross-comparing and contrasting of responses. Afterwards, four themes were suggested in the light of outcomes of empirical study.

Throughout this study, research questions, which are asked in Section 1.2, are endeavored to be replied.

Chapter 2, literature review, seeks answers to the following questions:

- What are the related theories and discussions on this issue?
- How is recognition handled in cognitive sciences? Are there any counterparts of this issue in design research and marketing literature?

Chapter 4, results and analysis of empirical study, investigates replies to the following questions

- What is the relationship between fragments of products and brand recognition?
- How do product features affect the brand recognition?
- On which fragments of the product is the brand recognition intensified?

As a result, this study seems relatively closer to the image-based (or view based) object recognition theory since in recognition test, only front views are evaluated, which mobile phones are becoming two-dimensionally. That is, their geon-based structures are disappeared.

Regarding this result, today's mobile phone technology, which has advances especially in touch screens, brings more and more two-dimensional approach. In other words, they are becoming screen-dominant products, which hinder companies from being distinctive in the market with their products. The results of empirical part of this study show the fact that frames around screen is not so powerful to make a brand recognizable.

While disappear in keypad and controller panel parts and increase in the size of mobile phones' screens seem to bring about similarity in the market. Hence, misrecognized fragments and unknown parts in such a study have the potential to rise. Figure 5.1 shows the latest models of popular brands in the market.

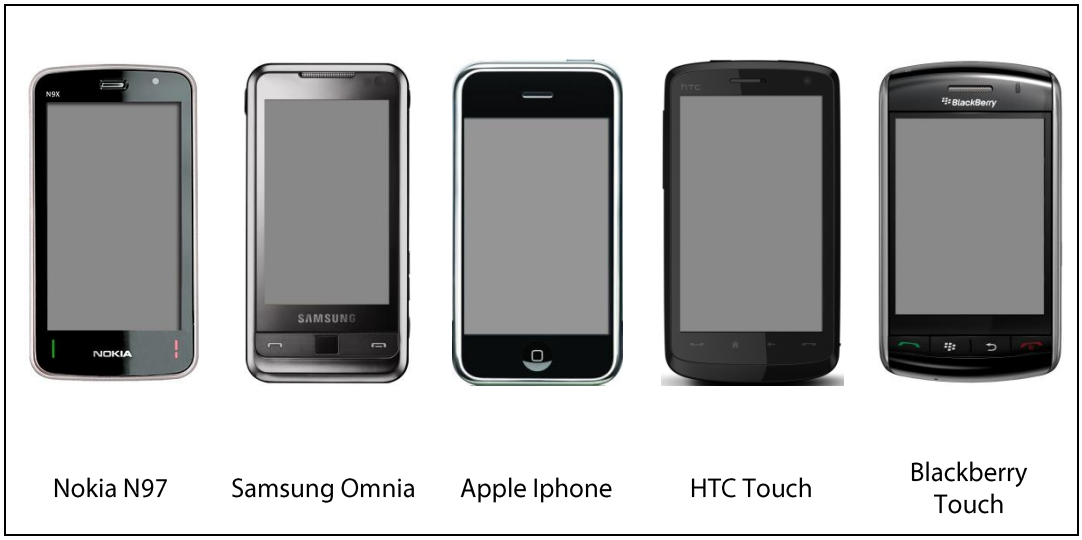


Figure 5.1 : Screen-dominant touch screen mobile phones

Finally, in this section it is drawn conclusions over entire thesis to where this study has possibly contribution:

Product development:

In order to sustain in product identity and constitute product family the approach in empirical study can be applied. That is, prominent fragments can be stabilized among product portfolio in a certain brand to create or maintain identity. Where recognition seems higher fragmentally might be used in product family to carry on identifiable characteristics. Moreover, this approach can be developed for design education again in order to transform recognizable features among product types.

Advertising:

It is crucial for advertising to use identifiable and attractive images of products. So as to reveal recognizable parts, empirical part of this study might contribute to determine major identifiable fragments to apply in advertisements. Figure 5.2 shows some examples of advertisements where parts of objects are used. While Mini Cooper discloses its front grill and headlights, which are thought as identifiable parts, in advertisement of History Files, two brown areas seem sufficient to make people to recognize Adolf Hitler. Part of Coca Cola bottle is used in last example.

Mini Cooper, (miniforum.com)

History Files, (teknikportal.com)

Coca Cola, (adsoftheworld.com)

Figure 5.2 : Examples of advertisements for fragmental approach

5.2 Limitations of the Study

Number and variety of test products and participants in empirical study: In empirical part of this study, three common mobile phone models (Nokia 6300, Nokia 1203 and Samsung SGH-E 250) were used. It seems to be beneficial to enlarge the variety of test products to make comparison. Even though product number seems limited, three products also provide potentially rich inferences to make comparison. Another limitation might be on the variety in the participants' selection since the empirical part was carried out only among Turkish people. It may be thought that the results are culturally dependent. However, the results and analysis of the study show parallelism with current related literature. Moreover, it is tried to choose participants randomly from active mobile users.

Limitations in the selection of front views of the stimuli: Empirical study was conducted by using front views of the mobile phones. It can be expanded to also other sides. However, it is assumed that front view is the part that is mostly interacted in terms of vision and usage. Since the screen of mobile phone is changeable, in empirical study was carried out while mobile phones are inactive. Further studies might be on how screen graphics affect recognition.

5.3 Further Studies

Current study examined brand recognition through fragments of product by making an extensive research on related literature and concluded by empirical study. It is thought that this study has potential to go through different directions.

On the whole, as stated in 'Thematic Implications of the Study' (Section 4.3), results and analysis can be examined in more focused approach on a specific theme; position, material/color/texture, symmetry/asymmetry and graphical elements. They were explained in detail, to which directions they can explore.

In this study, one type of products and two types of brands were investigated. For further studies, types of them can be broadened in order to attain prosperous results and analysis. Moreover, it can be examined all views of test product to make comparison among views. Further studies can be done considering marketing segmentation, where products share similar qualities in terms of price, target group or gender etc.

REFERENCES

Aaker, D. A. 1991. *Managing Brand Equity*. The Free Press, New York, NY.

Aaker, D. A. 2007. *Strategic Market Management* (8th ed.). John Wiley & Sons, New York.

Allen, T., & Simmons, J. 2004. Visual and verbal identity. In R. Clifton & J. Simmons (Eds.), *Brands and branding*. London: The Economist/Profile Books.

American Psychological Association. 1992. Ethical principles of psychologists and code of conduct. *American Psychologist, 47*, 1597-1611.

Bar, M., & Biederman, I. 1998. Subliminal visual priming. *Psychological Science, 9*, 464–469.

Biederman, I. 1987. Recognition-by-components: A theory of human image understanding. *Psychological Review, 94*, 115-147.

Biederman, I., & Cooper, E. E. 1992. Size invariance in visual object priming. *Journal of Experimental Psychology: Human Perception and Performance, 18*, 121-133.

Biederman, I., & Gerhardstein, P. C. 1993. Recognizing depth-rotated objects: Evidence and conditions for three dimensional viewpoint invariance. *Journal of Experimental Psychology: Human Perception & Performance. 19*, 1506-1514.

Booch, G. 1994. *Object-oriented analysis and design, with applications* (2nd ed.). Redwood City, Calif.: Benjamin/Cummings.

Bülthoff, H. H., & Edelman, S., 1992. Psychophysical support for a two-dimensional view interpolation theory of object recognition. *Proceedings of the National Academy of Sciences, 89*, 60-64.

Chen, K., & Owen, C. L. 1997. Form language and style description. *Design Studies, 18(3)*, 249-274.

Cowley, E. 2004. Recognition confidence, recognition accuracy and choice. *Journal of Business Research, 57(6)*, 641-646

Çekceoğlu, E. 2006. *Communicating corporate identity through form attributes and evaluating visual analogy of digital cameras.* Middle East Technical University, Turkey. (Master's thesis).

Driver, J., & Baylis, G. C. 1996. Edge-assignment and figure-ground segmentation in short-term visual matching. *Cognitive Psychology, 31*, 248–306.

Dudai, Y. 2002. *Memory from A to Z: Keywords, concepts and beyond.* Oxford: Oxford University Press.

Eliasson, D., & Kjellman, P. 2010. *Exploring hardware usability on mobile phones - A mobile phone concept for an expanded demographic, including users with high demands on usability.* Lund University, Sweden. (Master's thesis).

Ellis, W. D. 1969. *A sourcebook of gestalt psychology*. London: Routledge & Kegan Paul Ltd.

Enns, J. T. 2004. *The thinking eye, the seeing brain: Explorations in visual cognition*. New York: W. W. Norton & Company.

Evans, V. 2010. The perceptual basis of spatial representation. In V. Evans & P. Chilton (Eds.), *Language, Cognition and Space: The State of the Art and New Directions* (pp. 21-48). Equinox publishing.

Eysenck, M. W., & Keane, M. T. 2005. *Cognitive Psychology: A Student's Handbook* (5th ed.). London: Psychology Press.

GfK Turkey May 17, 2010. *Results of GfK TEMAX® Turkey for the first quarter. Press Release*. Retrieved 2010-07-06. Archive copy at http://www.gfkrt.com/gfktemax/country_reports/gtme/turkey/index.en.html

Grill-Spector, K., & Kanwisher, N. 2005. Visual recognition: As soon as you know it is there, you know what it is. *Psychological Science, 16 (2),*152-160.

Gibson, J. J. 1979**.** *The Ecological Approach to Visual Perception*. Boston, MA: Houghton Mifflin.

Harris, P. 2008. *Designing and reporting experiments in psychology* (3rd ed.). Buckingham, GBR: Open University Press.

Hoeffler, S., & Keller, K. L. 2002. Building brand equity through corporate societal marketing. *Journal of Public Policy and Marketing, 21 (1),* 78-89.

Hsu, S. H., Chuang, M. C., & Chang, C. C. 2000. A semantic differential study of designers' and users' product form perception. *International Journal of Industrial Ergonomics, 25*, 375-391.

Hummel, J. E., & Biederman, I., 1992. Dynamic binding in a neural network for shape recognition. *Psychological Review, 99*, 480–517.

Jolicoeur, P., 1987. A size-congruency effect in memory for visual shape. *Memory & Cognition, 15*, 531-543.

Jolicoeur, P., Gluck, M., & Kosslyn, S. M., 1984. Pictures and names: Making the connection. *Cognitive Psychology, 16*, 243-275.

Kapferer, J. N. 1997. *Strategic brand management* (2nd ed.). Kogan Page.

Karjalainen, T.-M. 2004. *Semantic transformation in design. Communicating strategic brand identity through product design references.* Helsinki: University of Art and Design Helsinki.

Karjalainen, T.-M., & Snelders, D. 2010. Designing visual recognition for the brand. *Journal of Product Innovation Management, 27 (1),* 6-22.

Karjalainen, T.-M., & Warell, A. 2005. Do you recognise this tea flask? - Transformation of brand-specific product identity through visual design cues. *International Design Congress - IASDR 2005* Taiwan.

Keller, K. L. 1998. *Strategic brand management: Building, measuring and managing brand equity*. New Jersey: Prentice Hall.

Kirkpatrick, K. 2001. Object recognition. In R. G. Cook (Ed.), *Avian visual cognition.* Retrieved from www.pigeon.psy.tufts.edu/avc/kirkpatrick/

Kotler, P. 1999. *Kotler on marketing: How to create, win, and dominate markets.* New York: The Free Press.

Kotler, P., & Keller, K. L. 2007. *A framework for marketing management* (3rd ed.) New Jersey: Pearson Prenctice Hall.

Kreuzbauer, R., & Malter A. J. 2006. Product Design Perception and Brand Categorization. *Advances in Consumer Research, 34*, 240-246.

Krippendorff, K. 2006. *The semantic turn: A new foundation for design.* Taylor&Francis, Boca Raton.

Krippendorff, K., & Butter R. 2008. Semantics: Meanings and contexts of artifacts. In H. N. J. Schifferstein & Hekkert (pp. 353-376) (Eds.) *Product experience*. Amsterdam: Elsevier.

Laurent, G., Kapferer, J. N., & Roussel, F. 1995. The underlying structure of brand awareness scores. *Marketing Science, 14(3)*, 170-17.

Levitin, D. 2002. Experimental design in psychological research. Chapter 6 in D. J. Levitin (Ed.), *Foundations of Cognitive Psychology: Core Readings* (pp. 115-130). The MIT Press

Lynch, J. G., Jr & Srull, T.K. 1982. Memory and attentional factors in consumer choice: concepts and research methods. *Journal of Consumer Research*, 9, 18-37.

Macdonald, E., & Sharp, B. 1996. Management perceptions of the importance of brand awareness as an indication of advertising effectiveness. *Marketing Research On-line, 1*, 1-15.

Marr, D. 1982. *Vision: A computational investigation into the human representation and processing of visual information*. San Francisco, CA: WH Freeman.

Marr, D., and Nishihara, H. K. 1978. Representation and recognition of three dimensional shapes. *Proceedings of the Royal Society of London, Series B, 200,* 269-294.

Matsumoto, D. (Ed.). 2009. *The Cambridge dictionary of psychology*. New York: Cambridge University Press.

Mestçi, A. 2005. Mobil teknolojisinde teknolojik haber etkinliğinin yükseltilmesi. *Akademik Bilişim 2005 Konferansı Bildirileri Gaziantep Üniversitesi*

Montague, M. 1999. Integrating the product + brand experience. *Design Management Journal, 10 (2),* 17-36.

Mozota, B. B. 2003. *Design management.* Canada: Allworth Press.

Norman, D. 1990. *The Design of Everyday Things*. New York, NY: Doubleday Business.

Peirce, C. S. 1955. *Philosophical writings* of Peirce (J. Buchler, Ed.). *New York*: Dover Books.

Perreault, W. D., Cannon, J. P., & McCarthy, E. J. 2008. *Basic marketing: A marketing strategy planning approach* (17th ed.). McGraw-Hill/Irwin

Peterson, M. A. & Gibson, B. S. 1994. Must shape recognition follow figure-ground organization? An assumption in peril. *Psychological Science, 5,* 253–259.

Peterson, M. A., and Kim, J. H., 2001. On what is bound in figures and grounds. *Visual Cognition, 8*, 329–348.

Ranscombe, C., Hicks, B., Mullineux, G., & Singh, B., 2010. Vehicle design and brand perception: An investigation into visually decomposing product forms. *Proceedings of Design and Semantics of Form and Movement,* 110-118.

Rosch, E., Mervis, C. B., Gray, W. D., Johnson, D. M., & Boyes-Braem, P. 1976. Basic objects in natural categories. *Cognitive Psychology, 8,* 382-439.

Search Engine Marketing Glossary of Terms (SEMPO) 2010. *Brand*. Retrieved from http://www.sempo.org/learning_center/sem_glossary

Spetch, M. L., & Friedman, A. 2006. Comparative cognition of object recognition. *Comparative Cognition & Behavior Reviews,1,* 12-35. Retrieved from http://psyc.queensu.ca/ccbr/index.html

Tarr, M. J. 2000. Visual pattern recognition. In A. E. Kazdin (Ed.), *Encyclopedia of psychology* (pp. 1-4). *Washington, DC: American Psychological Association.*

Tarr, M. J. 2002. Vision: object recognition. In: L Nadel (Ed.), R. Goldstone (Section ed.) *Encyclopedia of cognitive science* (490-494). London,UK: Nature Publishing Group/Mcmillan Publishers Limited.

Tarr, M. J., & Bülthoff, H. H. 1998. Image-based object recognition in man, monkey, and machine. *Cognition, Special issue on "Image-based Recognition in Man, Monkey, and Machine", 67,* 1-20.

Tarr, M. J., Bülthoff, H. H., Zabinski, M., & Blanz, V. 1997. To what extent do unique parts influence recognition across changes in viewpoint? *Psychological Science, 8(4),* 282-289.

Tarr, M. J., & Cheng, Y. D. 2003. Learning to see faces and objects. *Trends in Cognitive Sciences, 7,* 23-30.

Tarr, M. J., & Pinker, S. 1989. Mental rotation and orientation-dependence in shape recognition. *Cognitive Psychology, 21,* 233-282.

Tarr, M. J., & Vuong, Q. C. 2002. Visual object recognition. In H. Pashler (Series Ed.) and S. Yantis (Ed.), *Stevens' Handbook of Experimental Psychology: Sensation and Perception* (3rd ed., Vol. 1, pp. 287-314). New York, NY: John Wiley & Sons, I.

Ullman, S. 1998. Three-dimensional object recognition based on the combination of views. *Cognition, 67,* 21-44.

Ullman, S. 2006. Object recognition and segmentation by a fragment-based hierarchy. *Trends in Cognitive Sciences, 11,* 58-64.

Warell, A. 2001. *Design Syntactics: A Functional Approach to Visual Product Form - Theory, Models, and Methods* (Doctoral dissertation). Product and Production Development, Engineering and Industrial Design, Chalmers University of Technology, Gothenburg.

Warell, A. 2004. *Towards a Theory-Based Method for Evaluation of Visual Form Syntactics*. TMCE 2004, Tools and Methods of Competitive Engineering, Lausanne

APPENDICES

APPENDIX A : Cross-comparison of test products in all division types

APPENDIX B : Demographic information of participants involved in recognition test

APPENDIX C : Information on recognition test and questionnaire

APPENDIX D : Information on interview

APPENDIX E : Demographic information of participants in semi-structured interview

APPENDIX F : Interview questions

APPENDIX G : Distribution of misrecognized fragments

APPENDIX A

Test products	Nokia 6300	Nokia 1203	Samsung SGH-E 250
Recognized fragments	11 11 13 7 0 10 7 0 8 6 0 7 24 15 25 22 23 24 21 22 21 24 17 19	17 2 14 9 0 9 3 0 2 5 0 7 16 16 15 16 16 15 16 18 16 21 12 15	8 15 10 13 4 9 8 0 7 8 0 7 6 0 2 24 15 22 18 25 21 15 22 18
Misrecognized fragments	8 4 4 1 0 1 2 0 4 1 0 3 3 3 1 5 3 5 5 6 5 5 6 7	7 4 8 3 0 4 0 0 2 0 0 2 3 3 7 6 4 6 4 4 7 5 6 8	3 4 4 1 1 4 1 0 0 2 0 1 3 0 6 2 4 4 4 1 3 4 3 5
Unrecognized fragments	11 15 13 22 30 19 21 30 18 23 30 20 3 12 4 3 4 1 4 2 4 1 7 4	6 24 8 18 30 17 27 30 26 25 30 21 11 11 8 8 10 9 10 8 7 4 12 7	19 11 16 16 25 17 21 30 23 20 30 22 21 30 22 4 11 4 8 4 6 11 5 7

Figure A.1 : Cross-comparison of test products in 3x8 division types

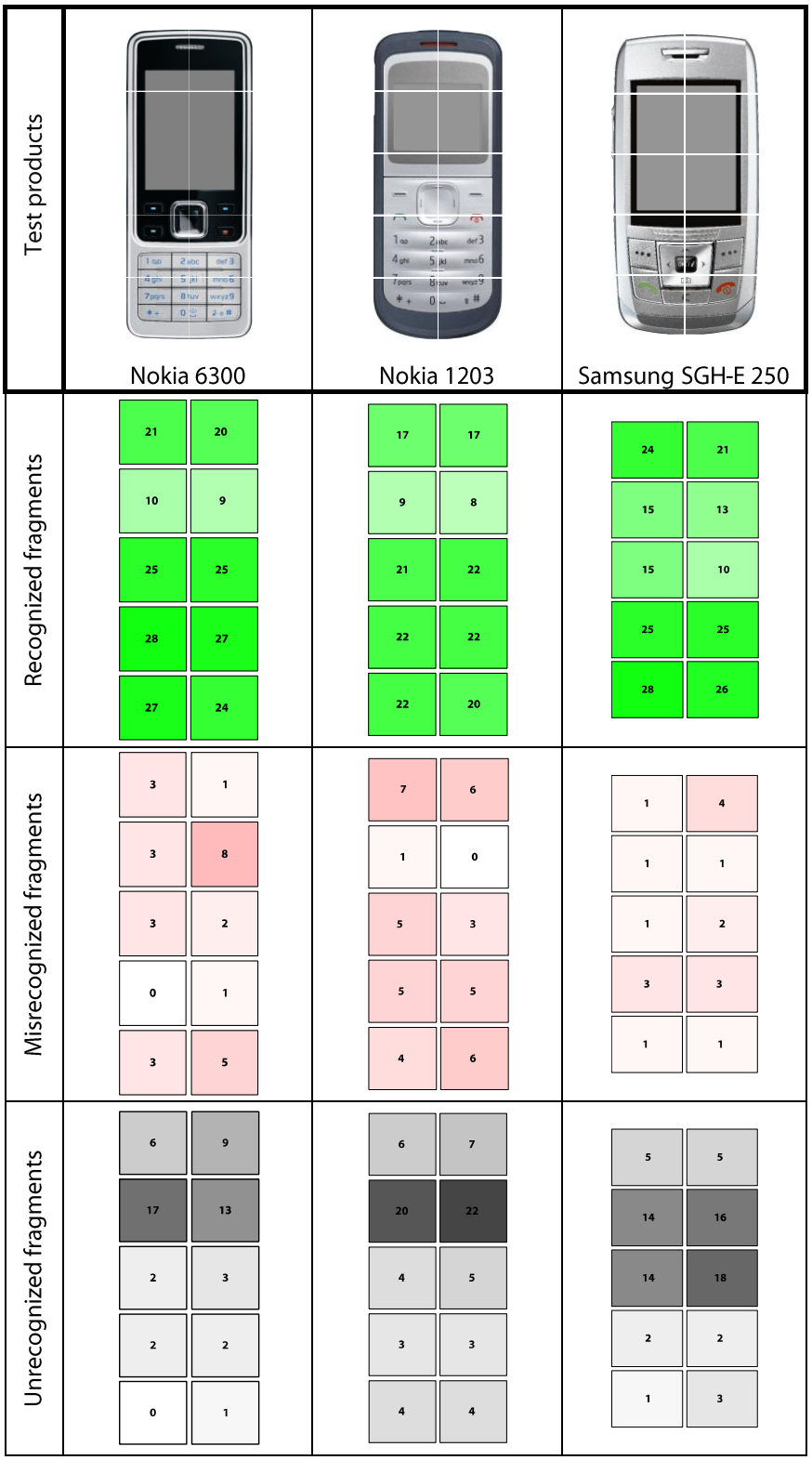


Figure A.2 : Cross-comparison of test products in 2x5 division types

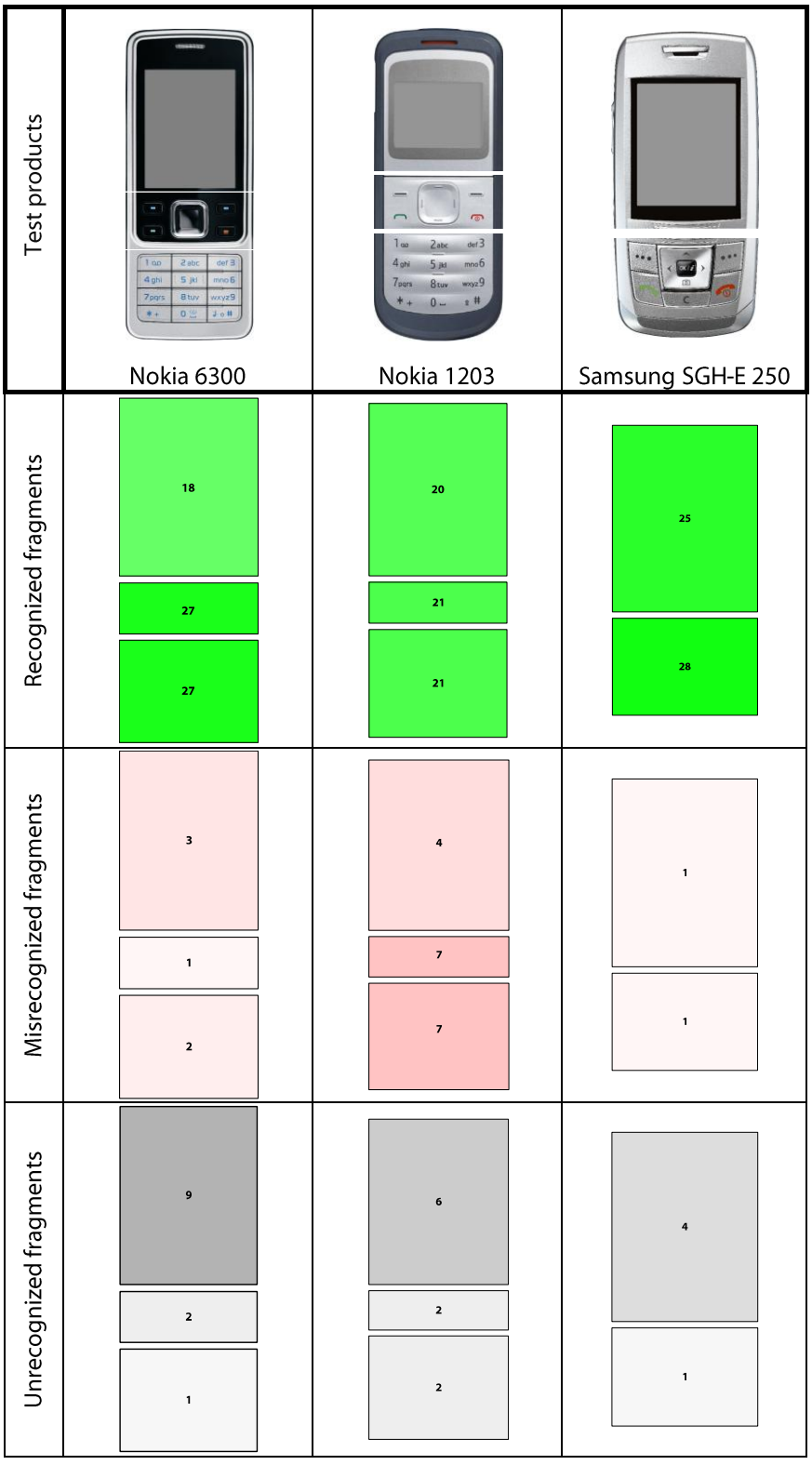


Figure A.3 : Cross-comparison of test products in 1x3 or 1x2 division types

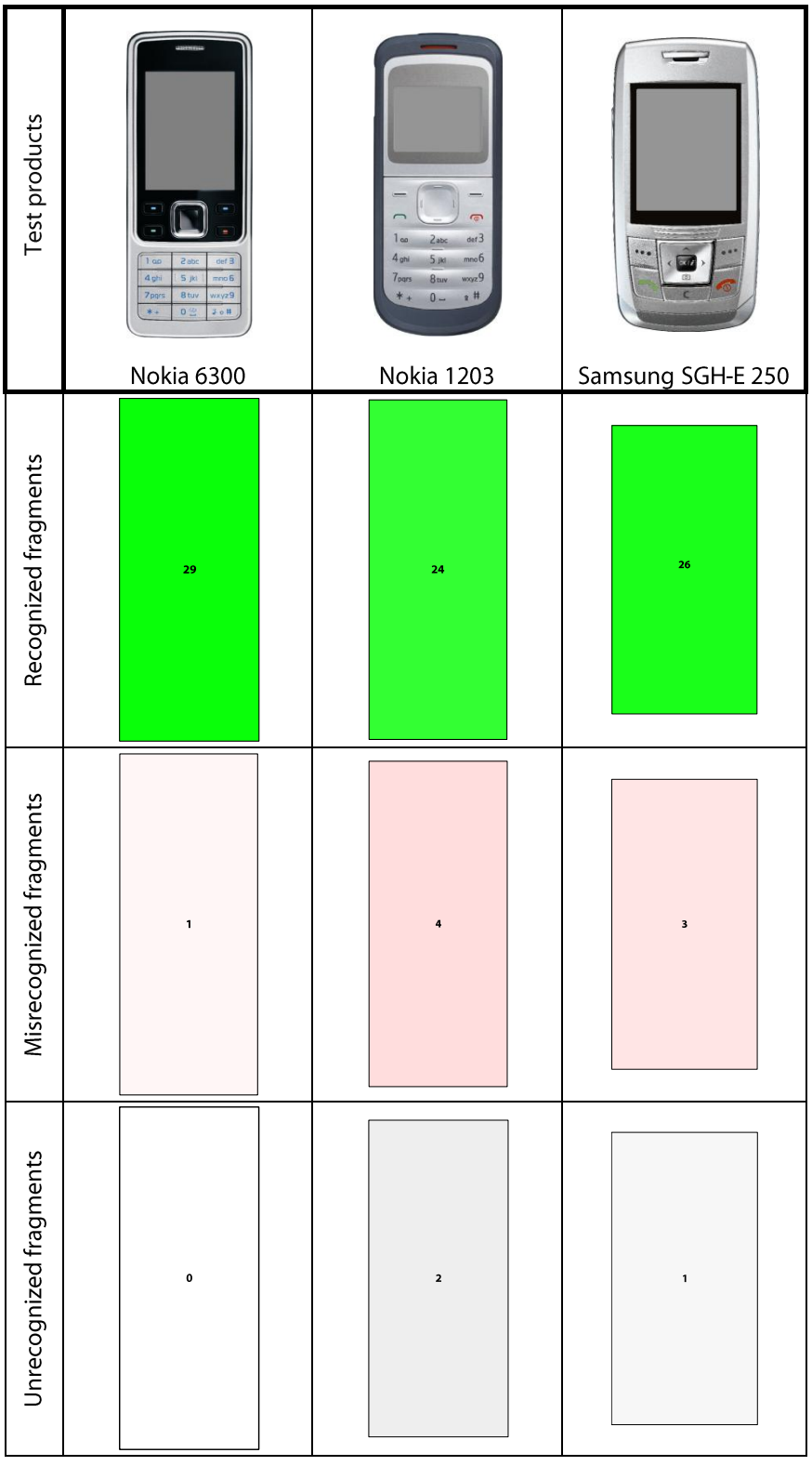


Figure A.4 : Cross-comparison of test products in 1x1 division types

APPENDIX B

Table B.1 : Demographic information of participants involved in recognition test

No.	Gender	Age	Profession	Brands participants have used	Models participants have used	Usage time
1	Male	17	Student	Nokia	6300	2,5 years
				Nokia	6020	1,5 years
2	Female	18	Student	Nokia	6300	3,5 years
				Nokia	6020	4 years
3	Female	20	Student	Nokia	3310	3 years
				Philips	-	2 years
				Sony-Ericsson	-	4 months
				Nokia	6500	2 years
4	Female	18	Student	Siemens	-	1 year
				Nokia	-	1 year
				LG	-	1 year
5	Female	18	Student	Nokia	6300	2 years
				Siemens	-	3 months
6	Female	24	Secretary	Nokia	1100	1 year
				Nokia	2300	2 years
				Samsung	M620	1,5 years
7	Male	17	Student	Apple	Iphone	1 year
				Nokia	1203	1 year
				Nokia	6020	2 years
				Nokia	6070	2 years
				Nokia	3200	3 years
8	Female	20	Student	Ericsson	T10	3 years
				Nokia	2100	2 years
				Nokia	-	4 years
9	Female	21	Student	Nokia	6220	1 year
				Samsung	E250	3 years
10	Female	20	Student	Nokia	1200	2 years
				Siemens	C65	3 years
11	Male	20	Student	Nokia	-	2 years
				Nokia	3100	2 years
				Sony-Ericsson	-	1 year
				Samsung	-	1 year
				Samsung	B3410	1,5 years
12	Male	20	Student	Nokia	3510i	3 years
				Sony-Ericsson	K300i	2 years
				Samsung	C6160	1 year
13	Male	20	Student	Nokia	2300	6 months
				Nokia	1101	1 year
				Samsung	-	1 month
				Nokia	N95	6 months
				Nokia	N70	2 years

14	Male	18	Student	Sony-Ericsson	S500i	2 years
15	Male	24	Engineer	Nokia	E72	2 months
				Nokia	6600	5 years
				Motorola	-	3 years
				Sony-Ericsson	-	3 years
				Ericsson	-	2 years
16	Male	20	Student	Samsung	-	3 months
				Nokia	7250	1 year
				Nokia	-	2 years
17	Male	20	Student	Nokia	3500C	2 years
				Nokia	-	3 years
18	Male	21	Student	Nokia	5110	1 year
				Nokia	3200	3 years
				Nokia	8200	1 year
				Samsung	D840	2 years
				Philips	-	2 months
				Motorola	-	3 months
				Nokia	5800Express	1 year
19	Male	21	Student	Nokia	3510	1 year
				Samsung	P850	3 months
				Samsung	E200	5 months
				Samsung	U700	1,5 years
				Apple	Iphone	2,5 months
				Nokia	1100	6 months
				LG	-	3 months
20	Male	23	Student	Sony-Ericsson	6705	6 months
				Sony-Ericsson	-	2 years
				Samsung	-	2 years
				Nokia	3310	1 year
21	Male	24	Engineer	Sony-Ericsson	-	4 years
				Nokia	-	6 years
22	Male	20	Student	Nokia	1203	2 years
				Nokia	1100	1 year
				Nokia	1200	2 years
				Nokia	3310	2 years
23	Female	18	Student	Sony-Ericsson	K700i	1 year
				Samsung	3035	1 year
				Samsung	E250	1 month
24	Female	20	Student	Samsung	E250	1 year
				Nokia	6300	2 years
25	Male	24	Officer	Wentto	F71	1 year
				Wentto	F8	6 months
				Nokia	-	3 years
				Nokia	-	2 years
				Panasonic	-	1 year
26	Male	24	Engineer	Nokia	2100	5 years
				Nokia	6600	3 years
				Samsung	D880	2 years

				Nokia	-	1 year
27	Female	20	Student	Nokia	-	4 months
				Samsung	-	3 days
				Sony-Ericsson	W 580i	1 year
				Sony-Ericsson	-	2 years
				Sony-Ericsson	-	2 years
				Motorola	-	1 year
				Motorola	-	1 year
				Ericsson	-	1 year
28	Female	24	Research Assistant	Nokia	-	4 years
				Panasonic	-	2 years
				Ericsson	-	2 years
29	Female	24	Engineer	Nokia	6110	4 years
				Sony-Ericsson	-	5 years
				Samsung	SGH-D880	2 years
				General Mobile	-	15 days
30	Female	24	Engineer	Ericsson	-	1 year
				Nokia	3310	3 years
				Nokia	-	5 years

APPENDIX C

Information on recognition test (Turkish)

Katılımcı :____

İstanbul Teknik Üniversitesi

Endüstri Ürünleri Tasarımı Bölümü

Değerli Katılımcı,

Bu çalışma, İstanbul Teknik Üniversitesi, Endüstri Ürünleri Tasarımı Bölümü'nde yürüttüğüm 'Ürünün Parçaları Yoluyla Marka Tanınırlığının Aranması' başlıklı yüksek lisans tez çalışması için kullanılacaktır.

Çalışma, iki kısımdan oluşmakta olup birinci bölümde size bazı ürünlerin parçalarının fotoğrafları gösterilecek ve bunların hangi markaya ait olduğunu belirtmeniz istenecektir. İkinci bölümde ise size vereceğim anketi doldurmanız istenecektir.

Çalışmanın birinci kısmında size sunulacak olan ürün parçaları çeşitli markaların cep telefonlarına aittir. Bu markalar alfabetik olarak aşağıda listelenmiştir:

Apple Iphone, Blackberry, General Mobile, LG, Motorola, Nokia, Philips, Samsung, Sony-Ericsson vb.

Size sunulacak görseller bu markaların hepsini içerebildiği gibi sadece bir veya birkaçını da içerebilmektedir. Sunulacak görseller tamamen rastgele sıralanmış olup sadece ön görünüşleri sunulmaktadır. Ürün parçalarını ekranda gördükten sonra ürünün ait olabileceği markayı tahmin ederek söyleyebilirsiniz. Eğer ürün üzerinde hiçbir tahmininiz yoksa cevap vermeyebilirsiniz.

Bu çalışmada, doğru ya da yanlış cevap olmadığını belirtmek isterim. Önemli olan sizin ifadelerinizdir. Bu test bir değerlendirme olmayıp, verdiğiniz cevaplar genel bir veri tabanı içinde değerlendirilecektir.

Katılımınız için teşekkür ederim.

Koray Gelmez

Araştırma Görevlisi

İTÜ Endüstri Ürünleri Tasarımı Bölümü

Questionnaire (Turkish)

Kişisel Bilgiler

Yaşınız:_____

Cinsiyetiniz: K E

Mesleğiniz:_____

Herhangi bir görme probleminiz/bozukluğunuz varsa lütfen belirtiniz.

_____

Lütfen aşağıdaki tabloyu kullandığınız cep telefonu markası, modeli ve kullanım süresi şeklinde doldurunuz.

	Kullandığınız Cep Telefonu Markası	**Kullandığınız Cep Telefonu Modeli**	**Kullanım Süresi**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Information on recognition test (English)

Participant:____

Istanbul Technical University

Department of Industrial Product Design

Dear Participant,

This study will be used for the thesis that I have been carrying out at Istanbul Technical University in the Department of Industrial Product Design, titled as 'Seeking Brand Recognition through Fragments of Product'.

This study consists of two sections; in the first section you will be presented images of fragments of some products and asked to indicate to which brand these fragments belong. In second section, you will be asked to fill out the questionnaire.

The product fragments that will be presented in the first section of the study are belong to several mobile phone brands. These brands are listed alphabetically below:

Apple Iphone, Blackberry, General Mobile, LG, Motorola, Nokia, Philips, Samsung, Sony-Ericsson etc.

Images that will be presented to you might include all these brands or just one or a couple of them. Images that will be shown is in random order and only the front views will be presented. After seeing the product fragments on the screen, you can say the name of brand that belongs to by anticipating. If you do not have any idea on the image, you can give no answer.

I would like to indicate that there is no true or false answer in this study. Your ideas is rather more important. This test is not an evaluation, the responses that you will give will be used for general database.

Thank you for your participation.

Koray Gelmez

Research Assistant

ITU Department of Industrial Product Design

Questionnaire (English)

Personal Information

Age:_____

Gender: F M

Occupation:_____

Please indicate if you have any vision problems.

_____

Please fill out the following table as brand of your mobile phone, model of your mobile phone that you have used and usage time.

	Brand of your mobile phone that you have been used	**Model of your mobile phone that you have been used**	**Usage time**
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

APPENDIX D

Information on interview (Turkish)

Katılımcı :____

İstanbul Teknik Üniversitesi

Endüstri Ürünleri Tasarımı Bölümü

Değerli Katılımcı,

Bu çalışma, İstanbul Teknik Üniversitesi, Endüstri Ürünleri Tasarımı Bölümü'nde yürüttüğüm 'Ürünün Parçaları Yoluyla Marka Tanınırlığının Aranması' başlıklı yüksek lisans tez çalışması için kullanılacaktır.

Çalışma, iki kısımdan oluşmakta olup birinci bölümde size bazı ürünlerin fotoğrafları gösterilecek ve bunlarla ilgili kısa bir görüşme gerçekleştirilecektir. Görüşmenin daha sonra hatırlanabilmesi için görüşme sırasında isteğiniz doğrultusunda ses kaydı yapılacaktır. Bu kayıt bu çalışma kapsamında kullanılacak olup 3. şahıslarla paylaşılmayacaktır. İkinci bölümde ise size vereceğim anketi doldurmanız istenecektir.

Bu çalışmada, doğru ya da yanlış cevap olmadığını belirtmek isterim. Önemli olan sizin ifadelerinizdir. Bu test bir değerlendirme olmayıp, verdiğiniz cevaplar genel bir veri tabanı içinde değerlendirilecektir.

Katılımınız için teşekkür ederim.

Koray Gelmez

Araştırma Görevlisi

İTÜ Endüstri Ürünleri Tasarımı Bölümü

Information on interview (English)

Participant :____

Istanbul Technical University

Department of Industrial Product Design

Dear Participant,

This study will be used for the thesis that I have been carrying out at Istanbul Technical University in the Department of Industrial Product Design, titled as 'Seeking Brand Recognition through Fragments of Product'.

This study consists of two sections; in the first section you will be presented images of some products and carried out short interview on these images. In order to remember some points, during interview there will be a voice record if you want. This record will be used only for this study and not be shared with third party. In second section, you will be asked to fill out the questionnaire.

I would like to indicate that there is no true or false answer in this study. Your ideas is rather more important. This test is not an evaluation, the responses that you will give will be used for general database.

Thank you for your participation.

Koray Gelmez

Research Assistant

ITU Department of Industrial Product Design

APPENDIX E

Table E.1 Demographic information of participants in semi-structured interview

Participant	Gender	Age	Profession	Brands participants have used	Models participants have used	Usage time
Participant A	Male	22	Student	Nokia	3310	4 years
				Nokia	-	4 years
				Sony-Ericsson	-	2 years
Participant B	Male	24	Engineer	Nokia	6110	5 years
				Sony-Ericsson	-	5 years
				Samsung	-	2 years
Participant C	Female	24	Officer	Ericsson	T10	3 years
				Panasonic	-	2 years
				Nokia	6600	2 years
				Samsung	-	2 years
				Samsung	-	1 year
Participant D	Female	21	Student	Nokia	-	2 years
				Nokia	-	4 years
Participant E	Male	19	Student	Nokia	3510i	2 years
				Nokia	1100	1 year
				Sony-Ericsson	W810i	2 years
				Nokia	1200	1 year
				Samsung	-	3 months
Participant F	Female	18	Student	Nokia	6300	2 years
				Siemens	-	4 years
				Nokia	-	2 years

APPENDIX F

Interview questions (Turkish)

Aşağıdaki sorular gösterilen her telefon görseli için ayrı ayrı görüşülmüştür.

1. Ekrandaki telefonun hangi markaya ait olduğunu biliyor musunuz?

   1.a. Biliyorsanız hangi markaya aittir?

   1.b. Bilmiyorsanız hangi markaya ait olduğunu tahmin edebilir misiniz?

2. Ekrandaki telefonun hangi modele ait olduğunu biliyor musunuz?

3. Sizce bu telefon hangi yönüyle diğer telefonlardan ayrılmaktadır?

4. Sizce bu telefon hangi yönleriyle diğer telefonlarla benzeşmektedir?

5. Size göre, telefonun hangi kısmı markayla ilgili en çok ipucu içermektedir? Lütfen fotoğraf üzerinde işaretleyiniz.

6. Size göre, telefonun hangi kısmı markayla ilgili en az ipucu vermektedir? Lütfen fotoğraf üzerinde işaretleyiniz.

7. Sizce telefonun en dikkat çekici/karakteristik/ayırt edici bölgesi neresidir? Lütfen fotoğraf üzerinde işaretleyiniz.

8. Sizce telefonun en az dikkat çekici karakteristik/ayırt edici kısmı neresidir? Lütfen fotoğraf üzerinde işaretleyiniz.

9. Bu markanın ürünlerini ne kadar biliyorsunuz?

Genel soru: Bu telefonlardan hangi ikisi aynı markaya ait olabilir? Neden? Hangi noktalarda benzerlik var? Hangi noktalarda farklılaşma görüyorsunuz?

Interview questions (English)

Following questions are interviewed for each mobile phone separately.

1. Do you know which brand belongs to the mobile phone on-screen?

1.a. If you know, which brand does it belong to?

1.b. If you do not know, can you guess which brand belongs to?

3. For you, which aspects is this mobile phone distinguished from other mobile phones?

4. For you, which aspects does this mobile phone resemble to other mobile phones?

5. For you, which parts of this mobile phone include more clues about brand? Please mark them on its photograph.

6. For you, which parts of this mobile phone gives least clues on brand? Please mark them on its photograph.

7. For you, which regions of this mobile phone is the most attractive/characteristic/distinctive? Please mark them on its photograph.

8. For you, which regions of this mobile phone is the least attractive/characteristic/distinctive? Please mark them on its photograph.

9. How much do you know the products of this brand?

General question: Which of these two brands can belong to the same brand? Why? In which points are there similarities? In which points do you see differences?

An example for semi-structured interview

5.For you, which parts of this mobile phone include more clues about brand? Please mark them on its photograph. [Size göre, telefonun hangi kısmı markayla ilgili en çok ipucu içermektedir? Lütfen fotoğraf üzerinde işaretleyiniz.]

APPENDIX G


1. Apple Iphone
2. Apple Iphone
3. Apple Iphone
4. Apple Iphone
5. Apple Iphone
6. Blackberry
7. LG
8. Samsung
1. Apple Iphone
2. Motorola
3. Samsung
4. Samsung
1. Apple Iphone
2. Apple Iphone
3. Apple Iphone
4. Blackberry
1. Samsung
0
1. Apple Iphone
1. Apple Iphone
2. Samsung
0
1. Apple Iphone
2. Apple Iphone
3. Apple Iphone
4. LG
1. LG
0
1. Apple Iphone
2. Apple Iphone
3. Apple Iphone
1. LG
2. LG
3. Sony-Ericsson
1. Samsung
2. Samsung
3. Siemens
1. Sony-Ericsson
1. GM
2. Panasonic
3. Sony-Ericsson
4. Sony-Ericsson
5. Sony-Ericsson
1. Samsung
2. Samsung
3. Samsung
1. Motorola
2. Philips
3. Samsung
4. Samsung
5. Siemens
1. Motorola
2. Samsung
3. Samsung
4. Sony-Ericsson
5. Sony-Ericsson
1. Motorola
2. Motorola
3. Motorola
4. Samsung
5. Samsung
6. Sony-Ericsson
1. Motorola
2. Samsung
3. Samsung
4. Samsung
5. Sony-Ericsson
1. Motorola
2. Samsung
3. Siemens
4. Sony-Ericsson
5. Sony-Ericsson
1. Motorola
2. Motorola
3. Motorola
4. Samsung
5. Samsung
6. Samsung
1. Motorola
2. Samsung
3. Samsung
4. Samsung
5. Sony-Ericsson
6. Sony-Ericsson
7. Sony-Ericsson
3x8
1. Blackberry
2. Motorola
3. Samsung
1. Apple Iphone
1. Apple Iphone
2. Apple Iphone
3. Samsung
1. Apple Iphone
2. Apple Iphone
3. Apple Iphone
4. Apple Iphone
5. Apple Iphone
6. Apple Iphone
7. Apple Iphone
8. Blackberry
1. GM
2. Samsung
3. Sony-Ericsson
1. Samsung
2. Sony-Ericsson
0
1. LG
1. Motorola
2. Sony-Ericsson
3. Sony-Ericsson
1. Motorola
2. Samsung
3. Siemens
4. Sony-Ericsson
5. Sony-Ericsson
2x5

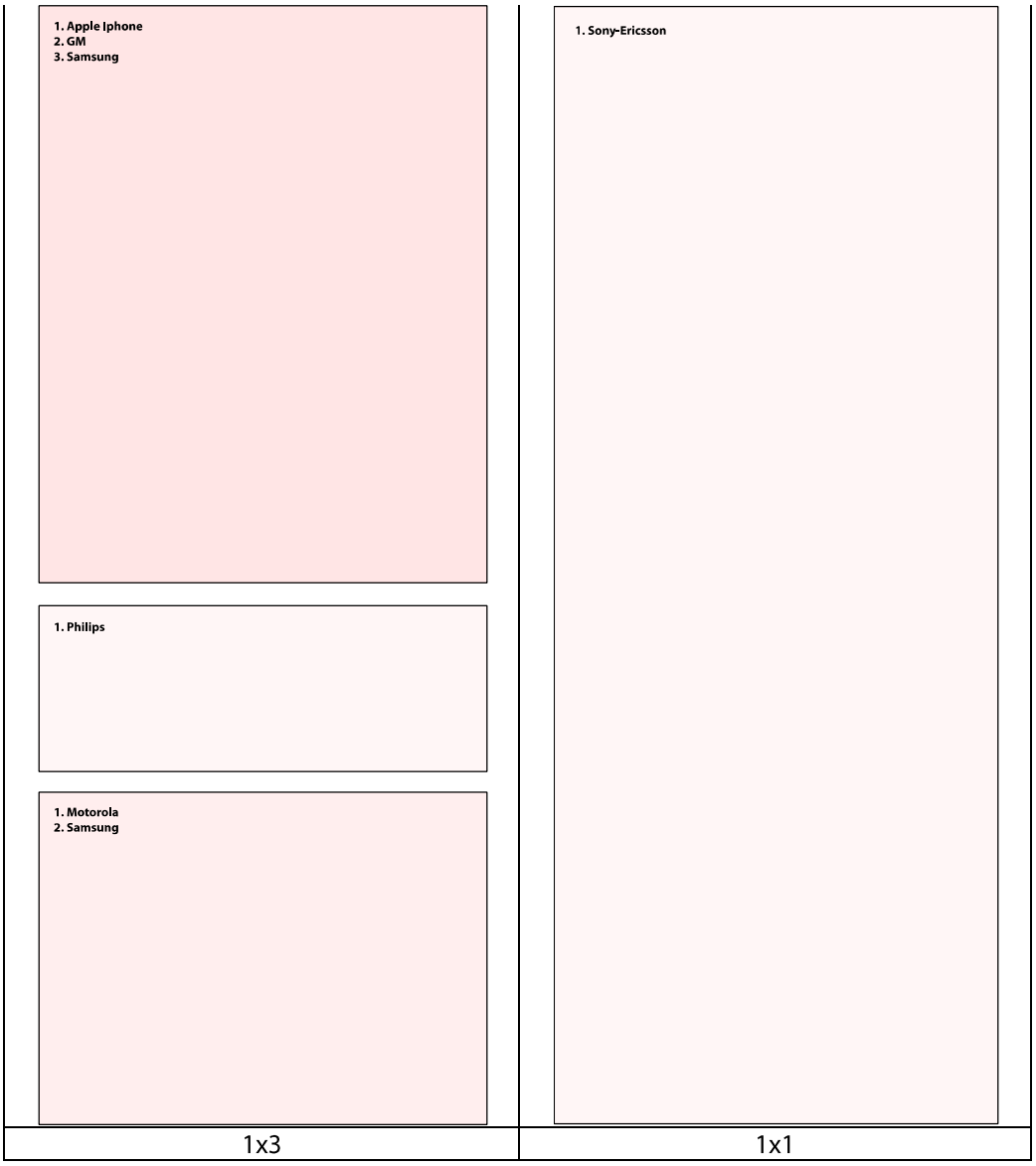
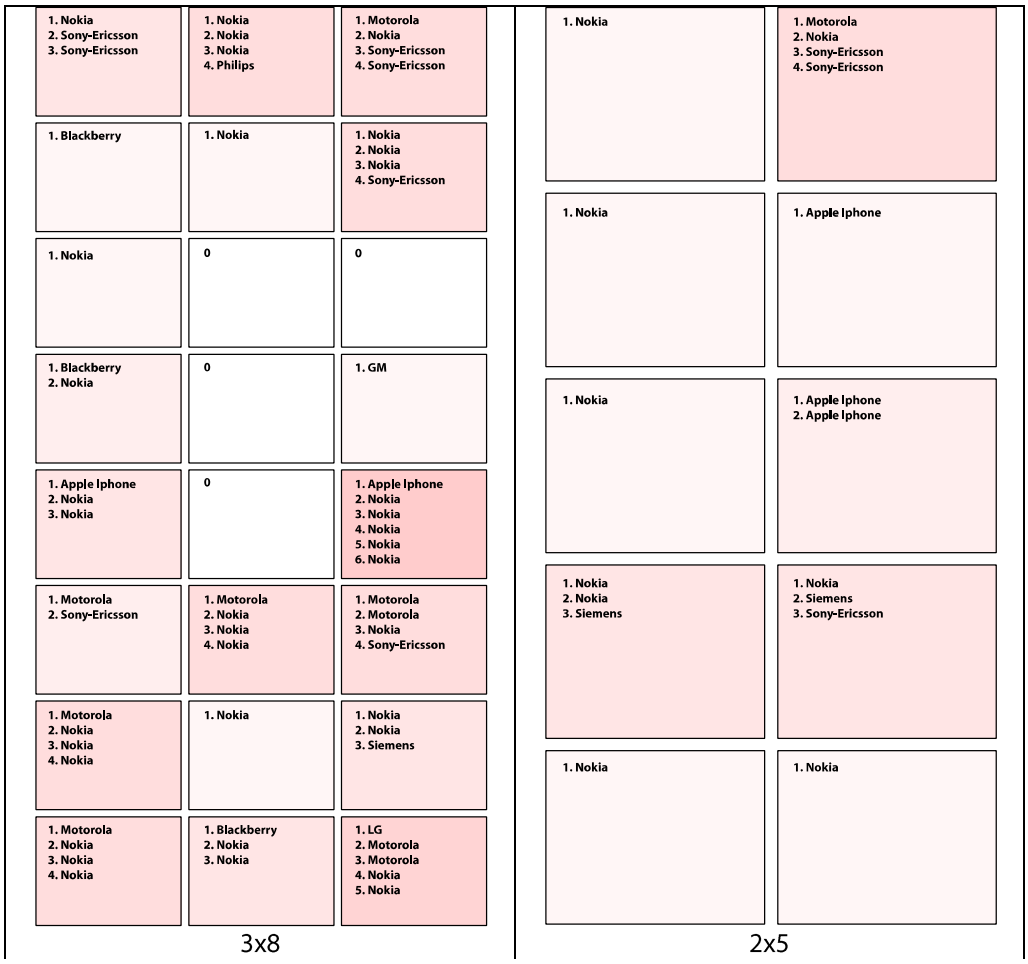


Figure G.1 : Distribution of misrecognized fragments of Nokia 6300 (detailed)


1. GM
2. Motorola
3. Motorola
4. Motorola
5. Motorola
6. Samsung
7. Samsung
1. Blackberry
2. Samsung
3. Samsung
4. Sony-Ericsson
1. GM
2. Motorola
3. Motorola
4. Motorola
5. Samsung
6. Samsung
7. Siemens
8. Sony-Ericsson
1. Apple Iphone
2. Motorola
3. Samsung
0
1. Apple Iphone
2. GM
3. Philips
4. Sony-Ericsson
0
0
1. Apple Iphone
2. GM
0
0
1. GM
2. Samsung
1. Motorola
2. Motorola
3. Samsung
1. Samsung
2. Samsung
3. Sony-Ericsson
1. GM
2. Motorola
3. Motorola
4. Motorola
5. Motorola
6. Philips
7. Samsung
1. GM
2. Motorola
3. Samsung
4. Samsung
5. Samsung
6. Samsung
1. Motorola
2. Samsung
3. Samsung
4. Sony-Ericsson
1. Motorola
2. Philips
3. Samsung
4. Samsung
5. Samsung
6. Siemens
1. GM
2. Motorola
3. Motorola
4. Samsung
1. Motorola
2. Samsung
3. Samsung
4. Siemens
1. GM
2. Samsung
3. Samsung
4. Samsung
5. Samsung
6. Samsung
7. Siemens
1. GM
2. Motorola
3. Motorola
4. Motorola
5. Samsung
1. GM
2. Motorola
3. Motorola
4. Motorola
5. Samsung
6. Sony-Ericsson
1. GM
2. Motorola
3. Motorola
4. Motorola
5. Motorola
6. Samsung
7. Samsung
8. Sony-Ericsson
3x8
1. GM
2. Motorola
3. Motorola
4. Motorola
5. Samsung
6. Samsung
7. Siemens
1. GM
2. Motorola
3. Motorola
4. Philips
5. Samsung
6. Siemens
1. Apple Iphone
0
1. GM
2. Motorola
3. Motorola
4. Motorola
5. Siemens
1. GM
2. Motorola
3. Motorola
1. GM
2. Motorola
3. Motorola
4. Samsung
5. Siemens
1. GM
2. Motorola
3. Motorola
4. Samsung
5. Siemens
1. GM
2. Motorola
3. Samsung
4. Siemens
1. GM
2. Motorola
3. Motorola
4. Samsung
5. Samsung
6. Siemens
2x5

Figure G.2 : Distribution of misrecognized fragments of Nokia 1203 (detailed)


1. Nokia
2. Sony-Ericsson
3. Sony-Ericsson
1. Nokia
2. Nokia
3. Nokia
4. Philips
1. Motorola
2. Nokia
3. Sony-Ericsson
4. Sony-Ericsson
1. Blackberry
1. Nokia
1. Nokia
2. Nokia
3. Nokia
4. Sony-Ericsson
1. Nokia
0
0
1. Blackberry
2. Nokia
0
1. GM
1. Apple Iphone
2. Nokia
3. Nokia
0
1. Apple Iphone
2. Nokia
3. Nokia
4. Nokia
5. Nokia
6. Nokia
1. Motorola
2. Sony-Ericsson
1. Motorola
2. Nokia
3. Nokia
4. Nokia
1. Motorola
2. Motorola
3. Nokia
4. Sony-Ericsson
1. Motorola
2. Nokia
3. Nokia
4. Nokia
1. Nokia
1. Nokia
2. Nokia
3. Siemens
1. Motorola
2. Nokia
3. Nokia
4. Nokia
1. Blackberry
2. Nokia
3. Nokia
1. LG
2. Motorola
3. Motorola
4. Nokia
5. Nokia
3x8
1. Nokia
1. Motorola
2. Nokia
3. Sony-Ericsson
4. Sony-Ericsson
1. Nokia
1. Apple Iphone
1. Nokia
1. Apple Iphone
2. Apple Iphone
1. Nokia
2. Nokia
3. Siemens
1. Nokia
2. Siemens
3. Sony-Ericsson
1. Nokia
1. Nokia
2x5

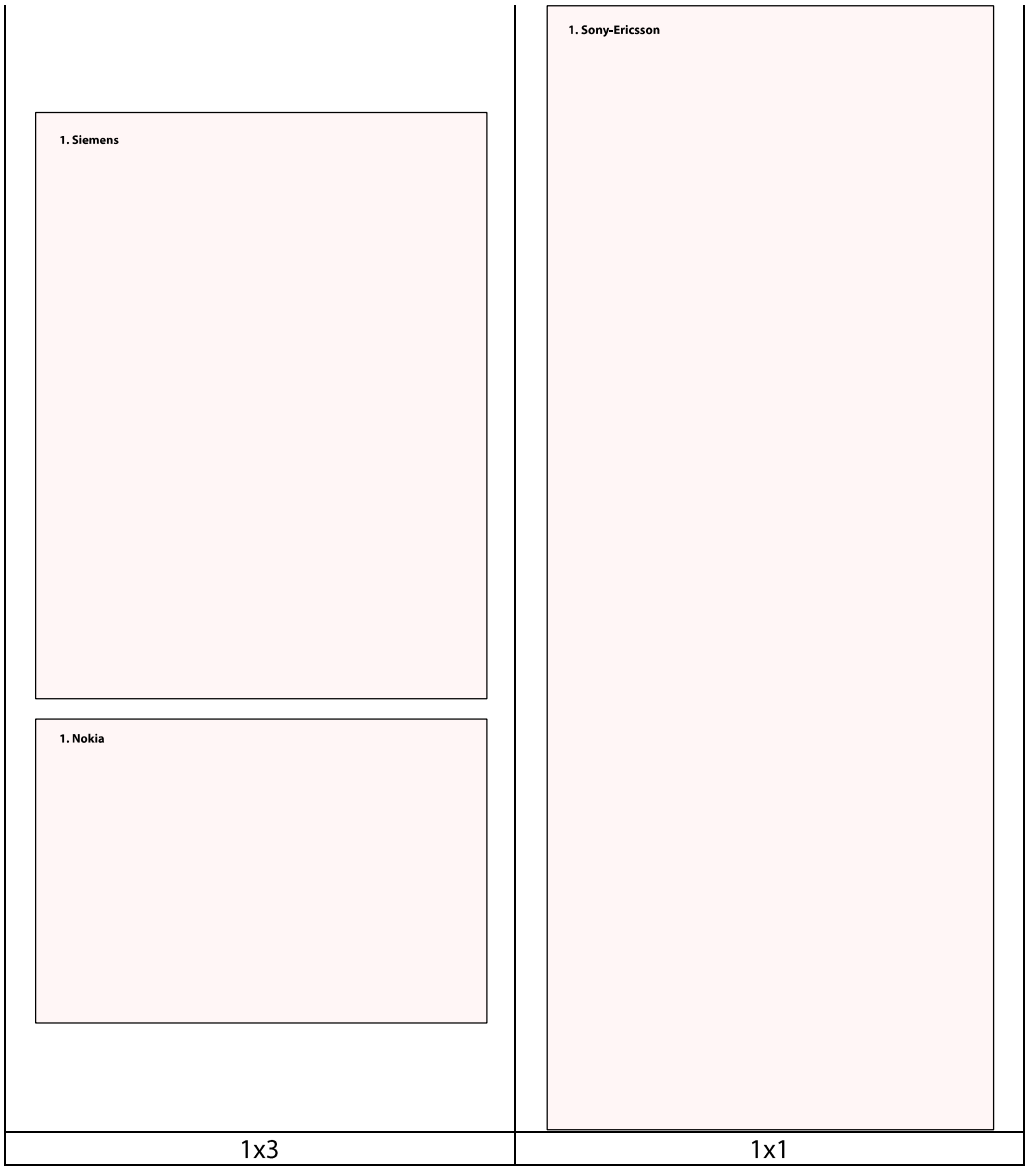


Figure G.3 : Distribution of misrecognized fragments of Samsung SGH-E 250 (detailed)

CURRICULUM VITAE

Candidate's full name: Koray GELMEZ

Place and date of birth: Manisa / 01.05.1985

Address: Istanbul Technical University (ITU)
Department of Industrial Product Design
Taşkışla - Taksim, Istanbul 34437 Turkey

Universities attended: Department of Industrial Design, BID
Middle East Technical University (METU)

Publications:

Er, H.A., H. Bağlı, E. Arıburun, Ö. Merzalı Çelikoğlu and K. Gelmez (2009). 4. Ulusal Tasarım Kongresi: Tasarım veya Kriz [4. National Design Congress: Design or Crisis] (8-9 October 2009) - Proceedings, ITU Department of Industrial Product Design, Istanbul (ISBN 978- 975-561-360-4)