

THE PERCEPTIBILITY AND READABILITY OF FACADES ACCORDING TO BUILDING TYPES: A CASE STUDY

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ABSTRACT

The similarity between the mental schema of the user and the built objects / environment have started to decrease, which naturally results in a difficulty in environmental perception, because of the rapid developments in technology and the impetuous growth in building stock due to the population increase. If there is no resemblance or smaller common elements are present, perception gets more difficult and some questions like 'how come?' 'what kind of?' appears." In this context, the aim of this study can be explained as, to investigate architect and architectural student subjects, for the perceptibility and readability of the functions of the buildings when their façades considered. The outline of this article consists of Introduction, Research (explanation of the problematic and the method), Outcome, and Conclusions. In the first phase, the photographs of many public and semi-public buildings in Turkey have been studied. commerce, transportation, religious, and sports among the public ones, and socio-cultural, health related, educational, State and industrial for the semi-public buildings, is selected. Total of 27 photographs have been displayed to 120 of the subjects. The subjects are supposed to mark the buildings which are reflecting the given behavioral positions best, concerning their functions. And at the third phase, they are supposed to mention about their presumptions, whether it is based on, a media related knowledge or the similarity of their mental schema / form relation.

Keywords: Perceptibility, Readability, Building Types, Case Studies, Modern Buildings

INTRODUCTION

While sensation can be explained as the raw data delivered by the help of the sense organs, perception is the process of signification with the help of the interpretation of these sensations [1]. Perception also includes the background experiences, future projections, and learning processes of the subject. In this process, attributes of the stimulant, which means the inner factors that embrace the psychological configuration of the individual, and the global stimuli affect each other and produce a product of perception.

To understand the formal and/or relational structure of the built environment and to perceive the proportions and existential character of space, seeing and hearing senses have the utmost importance. These senses have importance in all activities taking place outside and also very important for the human relations. It is observed that among these two senses, seeing shows variances in perceiving the environment and affecting the design process as well. Therefore, in this study, the visual perception, which makes possible the transfer of the objective world to the subjective consciousness by seeing, is investigated in detail.

In basic design education, there have been mentioned four major principles. These are proximity, similarity, distinctive value and transparency. These principles can be achieved by

various organizations of the literal perception criteria as surface, contour, texture, form, dimension, color, and edge. Some examples of these principles can be found in architecture and paintings. On the other hand, architectural product can be both counted as having the literal (basic meaning) perceptive element and as well as schematic (connoted meaning) perceptive element, which is including the subjective and connoted meanings and besides the pragmatic dimension also by Ertürk, 1984. [4]

Erkman, while categorizing the important properties of perception in architecture, mentions about the subjective character of perception and how it is affected by personality, social status, cultural background and environmental factors. Besides, the subject acquires the environmental knowledge according to his/her purposes. Environment always disperses more knowledge than we can perceive. Personal perceiving capacity of human being is never able to receive all these data. The selection and perception of these are related to value and purpose. For example, a dweller of a vernacular texture and a tourist has different purposes for perceiving the same environment [4].

On the other hand, schematization is also important in environmental perception. Objects are perceived with reference to the comparison of the object with the model that is created in mind. This mental model is created by the schematization of the object and is realized during the familiarity. (Familiarity as a term here is used as meaning; to know and acknowledge the built environment, being a part of it gradually resulting in an abstract adaptation to the environment. Subjects which are familiar to an environment understand it easier than the foreigners.) The mental schema is not finished and precise. When confronting a different object, perception- related to the meaning process- become easier with the similarity between the schema and the object increase. When the similarity decreases, or vanishes perception gets harder, and “what kind of?” “How come?” kind of questions appear. For example, if a person has the “mosque” schema as, “domed, minarets having balcony, etc.” in mind, when confronting a “modern” mosque that doesn’t show the properties of this schema, she/he will not perceive and understand it. However, with this new knowledge added to the bulk of images in the mind, the schema changes and evolves. Therefore, the second time seeing a “modern” mosque will be easier to understand and perceive. The adjustable character of the mental schematization is the reason of the variable character of the perception [3].

Because of the increase in building stock parallel to the increase in population and constantly developing / changing technology in contemporary architectural world, the relation between the mental schema and present built objects get more unattached, and therefore, relatedly / naturally perception gets difficult. Therefore, many research efforts are given to different areas of perception such as statistical visual perception [7,8], machine learning perception [9,10], perception of cities and streets and depth perception [11]. With this rapid change, the mental images of the physical structures which are the defining elements of the cities, started to change, in a sense this means a difficulty in perception of the built environment. In this context, this study aims to discuss the hypothesis; “perception gets easier when the resemblance between the object and the mental schema gets bigger. If there is no resemblance or smaller common elements are present, perception gets more difficult and some questions like ‘how come?’ ‘what kind of?’ appears” considering the contemporary designs over the architects and architecture students. Consequently, the aim of this study can be described as to investigate the architectural product, whether the function of them can be perceived by the user from the facades or not.

THE METHOD AND STAGES

Firstly, the buildings that are chosen for the purpose are classified with reference to the study, grouping them according to their common properties. The literature review, proposes us to classify the building types. Four building types concerning the social and private behavioral positions like public, semi-public, semi-private and private, are selected as criteria for this classification [5].

The buildings can be classified differently, according to their users and the definition of the time they are used; considering to the quality and quantity of the social behavioral positions, which includes the positions that the user can realize he/she is not alone and in consciousness of others. According to Gür, human groups that have classified their behavioral positions can be counted in three groups according to their internal properties and the aim of their togetherness as; experiential, occasional and primary [5]. Social behavior positions, according to the definition of the time they are used, can be classified under three groups as; public, semi-public, and semi-private; and exhibit a relative differentiation. In this context, and for defining the limitations of this study, semi-private buildings have not included in the user surveys and for representing the social behavioral positions only public and semi-public ones have selected.

METHOD OF THE STUDY

Selecting the Building Examples

In order to defining the limitations of this study, representing the social behavioral positions only public and semi-public ones have selected. Among the public buildings, Merchandise, Transportation, Religious related and Sports related functioning ones; among semi-public buildings Socio-Cultural, Education related Administrational and Industrial functioning ones and specially the contemporary examples included to the survey.

The examples have been asked to the 140 of the 400 students of Karadeniz Technical University Architectural Department, of which have succeeded all the lessons [6]. The exact number of the students has determined the number of architect subjects and the total number are fixed in 120. The registration to the Chamber of Architects is considered important. The average age of the students' is 21, and the architects' is 44.

N: Universe (421)

Z: Reliability (%95 Reliability =1.96)

P: Probability in realization (0.5)

Q: Probability in hold off (0.5)

D: Expectable error rate (%5 error rate =0.05)

N: Sample number

$$n = \frac{Z^2 \times N \times P \times Q}{(N-1) \times D^2 + Z^2 \times P \times Q} = 59.28 \quad (1)$$

The student subject number has fixed to 60 with regard to the result of the equation, and defined as half female, half male.

Table 1. Sample Survey Form: Please mark the examples given to you, considering the behavioral positions that match up with the given function

Behavior of the building types according to their location		Examples	The reason for the accurate prediction of functionally			Estimates of carrying the functions of which examples				
			1	2	3	A*	B*	1	2	3
Behavior Locations	Public	Commerce								
		Transportation								
		Religious								
		Sports								
	Semi-Public	Social-cultural								
		Health								
		Education								
		State								
	Industrial									

Note: A* and B* represents ‘ in terms of form’ and ‘Literature’ respectively.

Table 2. Sample Survey Form: Please mark the examples given to you, considering the behavioral positions that match up with the given function.

3 Behavior Locations	Public	Building Types	Examples			Building Types	Examples		
			1	2	3		1	2	3
		Commerce				Cultural			
Transportation				Health					
Religious				Education					
Sports				State					
				Industrial					

Note: A* and B* represents ‘In terms of form’ and ‘Literature’ respectively.

Outcome: The Evaluation of the Survey

The survey sheets have been distributed directly to 60 male and 60 female, architects and architectural students, and the results have been evaluated afterwards. The subjects have been

wanted to replace the buildings whose photographs shown, in the behavioral positions in the table. For each subject, the wrong and right numbers of presumptions identified according to gender difference. This analysis exhibits which of the building types can be read more easily considering the perception from the façade. (Table 3)

Table 3. Function Presumption Analysis as per opinion of Architects and Architectural Students

Building Types/Im. No	Right				Wrong			
	Archit		Stude		Archit		Stude	
	F	M	F	M	F	M	F	M
Commerce 1,2,3	1	1	6	5	1	1	2	2
	2	2	2	2	1	6	7	7
	1	1	1	2	1	1	2	2
Transportation 4,5,6	1	2	5	4	9	6	2	2
	2	2	2	2	4	5	2	2
	1	1	8	5	1	1	2	2
Religious 7,8,9	2	2	1	1	6	4	1	1
	8	9	0	1	2	1	2	2
	2	2	2	2	0	0	0	0
Sports 10,11,12	6	5	1	1	2	2	2	2
	2	2	2	2	0	2	5	3
	1	1	6	8	1	1	2	2
Cultural 13,14,15	2	1	1	1	6	9	1	1
	3	6	0	1	2	2	2	2
	2	2	2	2	3	3	5	7
Health 16,17,18	2	1	2	1	8	1	6	9
	2	2	2	2	2	1	3	5
	6	5	5	7	2	2	2	2
Education 19,20,21	9	1	6	3	1	1	2	2
	2	2	2	2	1	0	2	3
	1	2	1	9	1	8	1	1
State 22,23,24	2	2	2	2	3	0	4	3
	2	2	2	2	5	1	8	5
	2	2	2	2	2	1	3	2
Industrial 25,26,27	1	2	1	1	1	7	1	9
	8	1	5	7	2	1	2	2
	2	2	2	2	1	0	2	3

Some differences and common properties are observed in buildings having higher percentage of readability. This readability can show difference according to both the cultural and professional background and the materials used, color, proximity to human scale, façade order, proportion of solid and void, compositional properties, and functionality also. A viewer, looking to a form, cannot recognize all the parts together in an instance, or record them to the mind. He or she combine all the data received and perceive them as a whole. In this study, as in the statement: person refills the gaps between the parts she sees during the process of perception; it is expected to make an evaluation on the relationship of façade organization and resemblances. The outcome is as follows:

Commerce Buildings: the 1st example’s function cannot be presumed correct, in both of the groups. Example number 2, is presumed correct in both of the groups and example number 3, can only be presumed correct by the architect group.

Transportation Buildings: 1st and 2nd examples’ function presumed correctly by both of the

groups. Example number 3 on the other hand, cannot be presumed correct by both of the groups.

Religious Buildings: in terms of function, first and third examples are presumed correct by both of the groups. However, example number 2 presumed wrong, by both of the groups.

Sports Buildings: 1st example's function cannot, and 2nd example's function however, can be presumed, by both of the groups. 3rd example can be presumed correct by the half of the architect group, and cannot by the whole students group.

Socio-Cultural Buildings: both the architects' group and the students' group can presume 1st and 3rd examples correct. But the 2nd example is presumed wrong in terms of function by both of the groups.

Health Related Buildings: both the architects' group and the students' group can presume the 1st and 2nd examples' function correct. Contrarily, the function of the 3rd example is presumed wrong by both of the groups.

Educational Buildings: 1st and 2nd examples' functions are presumed correct by both of the groups; however, 3rd example can be presumed correct by the half of the architect group, and cannot by the whole students group.

State Buildings: both the architects' group and the students' group can presume 1st and 3rd examples correct. But the 2nd example is presumed wrong in terms of function by both of the groups.

Industrial Buildings: both the architects' group and the students' group cannot presume 1st and 2nd examples correct. But the 3rd example is presumed correct in terms of function by both of the groups (Table 4).

Table 4. Forecasts and analysis of the function of architects and students

Building Types/Im. No	Predicted functions of architects	Predicted functions of students	Weighted results
Commerce 1,3	Health/(34)	State /(36)	Health/(62)
	Cultural/(28)	Health /(27)	
Transportation 1,3	-	Sports/(31)	Sports/(31)
	-	Training/(14)	
	Social-cultural /(24)	Commerce/(34)	-
Religious 2	State /(28)	Training/(28)	Cultural/(59)
	Social-cultural /(37)	Social-cultural /(35)	
Sports 1,3	Training/(9)	State/(21)	Cultural/(66)
	Training/(31)	Social-cultural /(29)	Cultural/(66)
Cultural 2	Social-cultural /(23)	Training/(21)	Cultural/(64)
	-	Social-cultural /(41)	
	Industry/(37)	Training(24)	-
Health 3	Commerce/(26)	Industry/(33)	
	Commerce/(43)	Social-cultural /(27)	
Education 3	Social-cultural /(21)	Industry/(47)	Industry/(84)
	-	State /(16)	Commerce/(84)
State 2	Social-cultural /(22)	Commerce/(41)	Commerce/(84)
	Training/(17)	Social-cultural /(26)	
Industrial 1,2	State /(35)	Social-cultural /(31)	Cultural/(31)
	Health /(23)	Transportation /(29)	
	Health /(41)	Training/(31)	Training/(48)
	Training/(29)	Health /(20)	
		Cultural /(17)	State/(35)
		Training/(15)	
		Health /(39)	Health/(80)
		Training/(31)	

The new function assumptions for the buildings that have been wrong presumed by the subjects are listed below (Figure 1):

Commerce Buildings: the assumption for the 1st building is mostly “health related,” or “State”.

Transportation Buildings: the assumption for the 3rd building is mostly “socio-cultural,” or “State”.

Religious Buildings: the assumption for the 3rd building is mostly “socio-cultural,” or “educational”.

Sports Buildings: the assumption for the 1st building is mostly “socio-cultural,” or “educational”. The assumption for the 3rd building is mostly “industrial,” or “socio-cultural”.

Socio-cultural Buildings: the assumption for the 2nd building is mostly “industrial,” or “commerce”.

Health Related Buildings: the assumption for the 3rd building is mostly “commerce,” or “socio-cultural”.

Educational Buildings: the assumption for the 3rd building is mostly “socio-cultural.”

State Buildings: the assumption for the 2nd building is mostly “educational,” or “socio-cultural”.

Industrial Buildings: the assumption for the 1st building is mostly “State,” or “health related”. The assumption for the 2nd building is mostly “health” related, or “educational”.

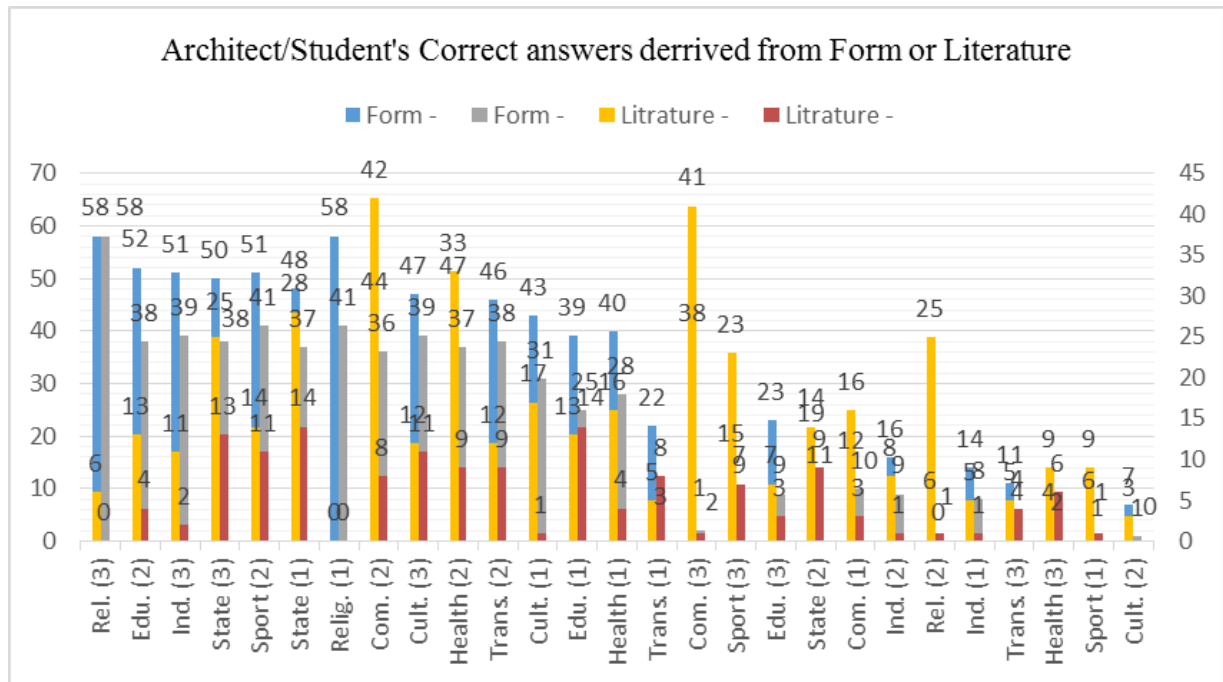


Figure 1. The function of behavior correct and incorrect predictions of structures which are grouped according to their location

OUTCOME AND CONCLUSIONS

In this study, the statement; “Perception gets easier when the resemblance between the object and the mental schema gets bigger. If there is no resemblance or smaller common elements are present, perception gets more difficult and some questions like ‘how come?’ ‘what kind of?’ appears”, has been investigated over the architectural students and architects, using the contemporary architectural examples. The results and discussion about the differentiations and similarities between architect and student subjects are listed below:

1. Among the commerce buildings, the 2nd example has become the correct presumed one because it is a modern formal interpretation of the traditional Turkish city market place. The 3rd example is known well in architectural media; therefore, it is presumed well by architects. 1st example is the wrong presumed one by both of the groups, because of the absence of similarity between the form and the mental schema. The 3rd one on the other hand, despite the subjects cannot find a similarity between the mental schema and the form; the architect subjects have presumed it correct because it is a well-known building from the media. This conclusion refers that the mental schema for the commerce buildings is horizontal organizations of units.
2. Among the transportation buildings, the 1st example is again, a wide spread building in media. Therefore, architect subjects correctly presume its function. This building is also a good example of the similarity between the mental schema and the actual form. The 2nd example also has a similarity of both, and therefore it is also presumed well by both of the subject groups. 3rd example is presumed wrong by both of the subject groups because of the absence of the similarity of mental schema and actual form. This conclusion refers that the mental schema of the subjects about the transportation buildings is a massive unit with a horizontal organization.
3. The religious buildings: 1st and 3rd examples have a direct similarity between the mental schema of the subjects and the actual form, because they represent the traditional typology of a mosque. Therefore, the both groups have presumed their function correct. Although the 2nd example is a wide spread appearance in media, it is presumed wrong by both of the groups. However, half of the architects presumed its function. This conclusion refers that the mental schema of a religious building includes symbols such as dome or minarets, and having a massive appearance.
4. Among the sports buildings, 2nd example represents a very well-known appearance of the type, and it easily connects with the mental schema of the subjects. It is presumed well by both of the groups. 3rd example is however, has a wide spread appearance in media, but it is presumed wrong by both of the groups. On the other hand, half of the architects presumed its function. This conclusion refers that the mental schema of the sports buildings, is a central/circular massive organization.
5. The socio-cultural buildings, the 1st and 3rd example, for they represent a well-known type of kind; and the 3rd example also having a wide spread appearance in media, are presumed correctly by both the architect and architectural student subjects. This conclusion refers that; the mental schema includes some symbols of the culture and has a massive organization of units.
6. Among health-related buildings, because of the 1st and 2nd buildings represent a well-known example of the type, they are presumed correctly by both of the groups. The 2nd example is also a wide spread appearance in media. This conclusion refers that, the mental schema of the subjects about the health-related buildings is a massive, rectangular organizations with an atrium.
7. Among the educational buildings, 1st and 2nd buildings represent well-known examples of the type, and they are presumed correctly by both of the groups. Their forms have a strong connection with the mental schema of the subjects. The architect subjects, because of the same reason, also presume 3rd example correct. This conclusion refers that the mental schema related to the educational buildings is a modular organization of units.
8. Among the State buildings, 1st and 3rd examples have a similarity between the mental schema of the subjects and the actual form, because they represent the traditional typology of the type. Therefore, the both groups have presumed their function correct.

This conclusion refers that the mental schema of the subjects related to the State buildings is, massive, rectangular and solid organization.

9. Among industrial buildings, 3rd example has a similarity between the mental schema of the subjects and the actual form, because it represents the traditional typology of the type. Therefore, the both groups have presumed its function correct. This conclusion refers that the mental schema of the subjects related to the industrial buildings is, modular, structural and massive organization.

These conclusions are parallel to the points that Erkman said;

“Objects are perceived with reference to the comparison of the object with the model that is created in mind. This mental model is created by the schematization of the object and is realized during the familiarity. (Familiarity as a term here is used as meaning; to know and acknowledge the built environment, being a part of it gradually resulting in an abstract adaptation to the environment. Subjects, which are familiar to an environment, understand it easier than the foreigners.) The mental schema is not finished and precise. When confronting a different object, perception- related to the meaning process- become easier with the similarity between the schema and the object increase. When the similarity decreases, or vanishes perception gets harder, and “what kind of?” “How come?” kind of questions appear. For example, if a person has the “mosque” schema as, “domed, minarets having balcony, etc.” in mind, when confronting a “modern” mosque that doesn’t show the properties of this schema, she/he will not perceive and understand it. However, with this new knowledge added to the bulk of images in the mind, the schema changes and evolves. Therefore, the second time seeing a “modern” mosque will be easier to understand and perceive. The adjustable character of the mental schematization is the reason of the variable character of the perception.” [3]

In any ways, these conclusions have a relation with the architectural education referring to the influence of the accepted forms on the user, as well as the educational and practical knowledge. Architects than of students, more correctly presume the examples displayed to the subjects in this study. Architects, different from students, by seeing more buildings and being experienced media followers, showed how much these are important in perceiving the environment. This result, also displays the role of visual knowledge, meaning the visual media and books etc., in the schematization of the mental images.

REFERENCES

- [1] Baş, T. (2006). *Anket*. Ankara: Seçkin Yayıncılık.
- [2] Bitterman, M.S., & Ciftcioglu, O. (2016). *Visual perception with color for architectural aesthetics*. Canada: IEEE World Congress on Computational Intelligence.
- [3] Ciftcioglu, O., & Bitterman, M. S. (2016). *Computational cognitive color perception*. Canada: IEEE World Congress on Computational Intelligence.
- [4] Cüceloğlu, D. (1991). *İnsan ve davranışı temel kavramları*. İstanbul: Remzi Kitabevi.
- [5] Derya, E. (2005). *Mimaride saydamlık-opaklık kavramları ve cephelerin algılanmasına etkileri*. Trabzon: Mimarlık Fakültesi.
- [6] Erkman, U. (1973). *Mimaride etki ve görsel idrak ilişkileri*. İstanbul: İTÜ Mimarlık Fakültesi.
- [7] Ertürk, S. (1984). *Mimari mekanın algılanması üzerine bir çalışma*. Trabzon: Fen Bilimleri Enstitüsü Yayınları.
- [8] Gür, Ş.Ö. (1996). *Mekan örgütlenmesi*. Trabzon: Gür Yayıncılık.
- [9] Julesz, B. (1960). Binocular depth perception of computer generated patterns. *Bell Labs Technical Journal*.
- [10] Kokaram, A., Chao, C., Kum, S., & Wang, Y. (2016). A perceptual visibility metric for banding artifacts. USA: IEEE International Conference on Image Processing.
- [11] Matthew T. (2000). Perceptive media: Machine perception and human computer interaction. *Chinese Journal of Computers*, 12, 1235-1244.