Interactive Spaces in Art Museums: A Landscape of Exhibition Strategies

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Introduction

The number of museums, which transform audience experience from passive to active, are on the rise (Schubert, 2004, p. 65). The audience and the quality of their experiences in museums have become important. Audience research studies shows that museums need interactive arrangements that help audience to get experience and learn actively in exhibitions, instead of just being an observer from a distance. Arrangements that allow active participation of audience to be a part of museum experience with opportunities provided by technological development gives the audience the opportunity to participate in the museum environment (Greenhill, 1992; Schubert, 2004, p. 65).

Museum spaces provide a setting for formal and informal learning. As Maximea states (2012, p. 110) "in addition to the spaces that house and interpret museum collections, museums increasingly invest in specialized spaces for education". Interactive spaces are one of the most important environments that could transform the experiences of visitors. "The physical context" is one of the important elements of museum experience with "the personal context" and "the sociocultural context". Falk and Dierking conceptualized the museum visit as involving three contexts. The physical context includes the architecture and feel of the building, as well as the objects and artifacts contained within. These physical context factors strongly influence how visitors move through the museum, what they observe, and what they remember. (Falk, Dierking, 2013, pp. 26-28)

Interaction, in common sense, is believed to be to the access of information by just the touch of a button and this gives people the freedom to

pick what they want by pushing a button. The term, "interaction" is controversial and varies on the field of use. In its simplest form, interaction is a notion of communication. Michael Jackel (1995) defines the interaction as an exchange and mutual effect. According to Jackel, depending on the field being focused, interaction has differing and various definitions (Jensen, 1998, p. 188). Early examples of interactive spaces started with science museums. In the 1920s, European science museums devoted primarily to science developed exhibits that visitors could interact with. Museums, which focus more on interactive exhibits, demand more physical interaction from the visitors. After the idea spread to United States, in 1933, interactivity had been accepted as a vital element for science museums (Bedno, 1999, p. 4). Later on, other types of museums also focused on research about interactive spaces. In 2002, the Smithsonian Institute published a guideline as to how to develop interactive exhibitions. The guideline explained the process and pitfalls of interactive exhibition development in terms of concept, design and evaluation. The United Kingdom was the first to develop hands-on exhibits, which consisted of interactive tools.

The application of interactive spaces in art museums began in the 2000s. J. Paul Getty Museum organized a symposium called "Family-Oriented Interactive Spaces in Art and History Museums" in 2005. Family audiences and their needs, learning styles, experiences and the role of object, were the subject of the discussion at the symposium. In 2005, High Art Museum's "Understanding Visitor: Interactive Family Gallery" and in 2013, Cleveland Art Museum's "Transforming the Art Museum Experience" were works based in High art museum's and Cleveland art museum's own interactive galleries.

Today, there is a growing interest for interactive spaces in museums. Especially art museums have been establishing interactive spaces in many countries. The aim of this study[1] is to gather data about the exhibition design strategies of art museums' interactive areas regarding the installation, display and interpretation of art objects for target audiences related to the physical context. Basically this study sought answers for the three questions to reach its aim:

1. How many art museums have interactive spaces?
2. What do these interactive spaces look like? What are their aims, objectives, exhibition strategies and methods?

1 This paper presents findings from a master research study that was conducted by Nesli Gul at the Yildiz Technical University Museum Studies Program, under the supervision of Kadriye Tezcan Akmehmet.

3. How are the art objects installed, displayed and interpreted for the target audience in interactive spaces?

In this study, interactivity is defined on the interrelationship of human and surroundings such as objects, surfaces and medium (Shettel, 1991). Interactive exhibits studied in this research are limited to physical interaction through an instrument or a tool; it is not interested in the cognitive aspect (Bitgood, 1991, p. 4). Interactive space refers to exhibitions or galleries that which have interactive tools or setups in museum, within this study. Exhibition instruments or tools in interactive spaces, which affect the physical context of the targeted audience, are the subjects of this study. Therefore, virtual applications like virtual museums and interactive art are out of the scope of this study.

Methodology

This study presents the findings of the survey that was conducted at art museums in United States of America and Europe.

Questionnaire Design Process

The questionnaire was designed to be completed by the museum director or an individual who is managing or involved with educational and curatorial works of the museum. It uses a combination of 'open-ended' and 'closed-ended' questions. The survey has four sections:

1. General Information about the Museums
2. Interactive Spaces
3. Art Objet and Interactive Spaces
4. Contact Information

All sections consisted of 35 questions. The result of the survey was analyzed by SPSS (Statistical Package for Social Sciences) for Windows 21.0 program. Descriptive statistical methods were used for the evaluation of data. Standard and closed-ended questions were analyzed via figures and tables. Item analysis was used to organize the open-ended questions.

Sample Selection

The study sample consisted of American and European Art Museums. One of the reasons for this limitation was the leading position of these art museums on interactive spaces. The other reason was the majority of interactive spaces in these countries. The 250 museums from America and 200 museums from Europe art museums were randomly select.

Data Collection

E-mails with a link to the web-based questionnaire were distributed to the 250 museum from America and 200 museums from Europe. They were generally sent to the e-mail address of the museum director or the museum staff member who is involved with educational and curatorial works of the museum. Each museum received only one questionnaire. A total of 50 art museums participated in the study. 33 museums responded from USA and 17 museums responded from Europe. Data collection occurred from 6 January 2014 to 28 March 2014. The majority of participants were the education directors or curators of the museum followed by museum administrators.

Description of Sample

In the first part of the questionnaire, study participants were asked about general information of participating museums. The data shows that the majority of participants worked in a private museum (64%) followed by municipality museums (16%). When we looked at the size of the museums, we observed that the majority of them are medium-sized and large museums. This data suggests that small museums may not have interactive spaces. Further research is required to understand this trend. The funding of interactive spaces of museums usually comes from the museum budget (33%) and private companies (26%) followed by non-governmental organizations (18%).

Results

This study investigated three research questions:

1. How many art museums have interactive spaces?
2. What do these interactive spaces look like? What are their aims, objectives, exhibition strategies and methods?
3. How are the art objects installed, displayed and interpreted for the target audience in interactive spaces?

The questions in the survey relating to the second and the third research questions were asked only to art museums that indicated they had interactive space(s). We asked participants to think of a permanent interactive space in their museum and answer a set of questions related to the research questions. In the second part of the survey, we asked questions to get data about the nature of interactive spaces and exhibition design strategies of art museums' interactive areas. In the third part, we asked questions regarding the installation, display and the interpretation of art objects for the target audiences related to the physical context.

According to the given answers, most of the education departments were responsible for interpretation, display and installation of the art objects in interactive spaces followed by museum curator and less likely, museum administration.

How Many Art Museums Have Interactive Spaces?

When we looked at how many art museums have interactive spaces, it was observed that 58% of museums have interactive space. As seen in Table 1, the data shows that art museums have an interest in interactive spaces. 37,9% (n: 11) of these museums have one interactive space, at least. It has been noticed that some museums (27,6%) have more than three interactive spaces.

Table 1: The number of the Interactive Spaces of Art Museums

Number	Frequency(n)	Percentage (%)
One	11	37,9
Two	5	17,2
Three	5	17,2
More than three	8	27,6
Total	29	100,0

Participants that have interactive spaces were asked: "When did this interactive spaces start functioning?" Table 2 shows the range of responses to this question and indicates that most of them (70,6%) had interactive spaces after 2000 and 11,8% of museums had between 1990 and 1999.

Table 2: Time Period of Interactive Spaces Start Functioning

Groups	Frequency(n)	Percentage (%)
Before 1960	1	5,9
1970-1979	1	5,9
1980-1989	1	5,9
1990-1999	2	11,8
After 2000	12	70,6
Total	17	100,0

The participant museums, which do not have interactive spaces, were asked: "If your museum does not have any interactive spaces, what are the reasons for this". Participants chose mostly the "other" option (27,5%) in the survey (Table 3) as their responses could not be organized under the categories. They provided general answers such as the following: the museum design is not appropriate to establish an interactive space; museums usually establish interactive spaces temporarily and integrate them with their exhibitions/they don't organize a separate area. The data suggests

that a lack of funds was the dominant reason of not having interactive spaces followed by a lack of space and a lack of staff.

Table 3: The Reasons for Not Having Any Interactive Space

Table (Reasons)	Frequency(n)	Percentage (%)
Lack of time	5	12,5
Lack of funds / budget	7	17,5
Lack of Space	6	15
Lack of Staff	6	15
Lack of Equipment	5	12,5
Other	11	27,5
Total	40	100

What do these interactive spaces look like? What are their aims, objectives, exhibition design strategies and methods?

The participants from museums, which have interactive spaces were asked about the basics of their interactive spaces.

In an open-ended question, participants were requested to describe the aims of the interactive space. Eighteen (36%) of the participants responded. We organized the seventeen (34%) of the participants' responses under the categories (using item analysis) as follows: to provide opportunities those families and children could experience art (n: 8, 44%); (experience art object by hands-on replicas (n: 4, 22%); comprehensive knowledge about collections and art history (n: 3, 16,7%); achieve tactile experience (n: 2, 11,1%); according to educational objectives, achieve satisfaction, success and sense of power via experiencing (n: 1, 5,6%). The aims of interactive spaces tend to be designed for the purpose of providing opportunities for families and children to experience art (44%). The data showed that art museums have various aims to develop interactive spaces.

Participants were asked to describe the objectives of the interactive space. 14 participants responded this question. The majority of the museums (72%) described their objectives as to offer various opportunities so that audiences could get more information about the exhibition.

The other museums gave several responses as follows: related to the museums' ability to discover; analyze and create; to make the audience talk about the art object; discover art; be able to create art objects by using art materials and to support school courses.

Study participants were asked: "Which groups of audiences does the interactive space target?" As illustrated in Table 4, the majority of them target families (28,81%) and children (27,12%). This finding is confirmed by our observation that many of the interactive spaces of art museums

in both United States and Europe are developed for families and usually named as "interactive family gallery (cite). Some of them are; The Speed Art Museum "Art Sparks" Interactive Family Gallery, Birmingham Museum of Art Nart's Art'Venture Interactive Family Gallery and The Walters Art Museum Family Art Center.

Table 4: Target Audience of Interactive Spaces

Tables (Audiences)	Frequency(n)	Percentage (%)
Family	17	28,81
Children	16	27,12
Adults	13	22,03
School Groups	9	15,26
Researchers	2	3,39
Others	2	3,39
Total	59	100

Study participants were asked to describe "What the interactive space focuses on?" Participants responded in different ways to this open-ended question. The data shows that half of the spaces (n:8) focused on museum collections and art history. Participants mentioned a variety of focus as follows: rules and elements of art, artists and their works, objects of art, special exhibitions and crafts and design. Interestingly one of the participant responded that they did not have a specific focus.

Participants were asked to describe the design elements of the interactive space. 8 of the 11 museums (72%) mentioned elements that were organized for the target audience like texts, chairs, tables, instructions for games, audio-visual equipment and iPads, video screens. Analysis of these qualitative responses suggested that many interactive spaces designed their areas according to their target audience. The others gave several responses as follows: Some of them mentioned the materials they used or devices of exhibition concept and exhibition techniques and elements like luminous colours or pastel colours.

Participants were asked: "Which interaction technologies do you use in interactive spaces?" As seen in Table 5, the majority of them referred to the 'Surface Technologies / Multi-touch / Terminals. 'Mobile Technologies' were also preferred. Interestingly participants do not use wearable technologies, so none of the museums answered the question "Which wearable technologies do museum interactive space have?"

Table 5: Usage of Interactive Technologies

Tables (Technologies)	Frequency (n)	Percentage (%)
Wearable Technologies	0	0,0
Mobile Technologies	4	17,4
Surface Technologies / Multi-touch / Terminals	10	43,47
Ambient Technologies	2	8,7
Others	7	30,43
Total	23	100

Study participants were asked "Which mobile technologies do museum interactive space have?" According to the responses of the six participants, we observed that smartphones were used by 66% of museums (n: 4) and iPads were/are used by half of the museums.

When we looked at the preferred surface technologies museum interactive space have, we observed that the majority of them (n: 7; 53%) have touch screens. The other results are as follows:

multi-touch screens (n: 2, 28%); microtile /vocal video presenter system (n: 2, 28%) video panels (n: 2, 28%), digital table (n: 1, 14%), video and computer screenings (n: 1, 7%).

17 of the participants (34%) responded to the question "Which surface technologies does your museum have in the interactive space?" We observed that they prefer audio installations and video projections.

Study participants were asked "Which analogue interactive devices do museum interactive space have?" The data shows that the majority of them (n: 5, 62,5%) use activity materials such as painting, lithography, drawing and screening areas.

Participants were asked to describe the hands-on activities the interactive space have. 14 participant gave several responses as follows: Re-enactment by replica costumes (n: 4, 28%); providing drawing stations (n: 2, 14%); modifiable magnetic paintings museums (n: 2, 14%). The data showed that each of the museums offer hands-on activities to improve skills of the target audience such as decoration of ceramics, painting, mask making, puppet play, making art objects by art materials, multiply games, climbing activities, chair making, architectural drawing, learning activities about photography and animation techniques.

Study participants were asked "Are the interactive spaces based on any education theory?" 17 participants responded the question: 29,5% responded positively and 70,5% negatively. The analysis of these qualitative responses suggested that while many said their program was informed by theory, few articulated the theory in detailed ways. More often, they

provided general answers such as the following: tactile and participatory learning (n: 2, 12%); they adopt an education approach in order to develop creativity and make the art more understandable (n: 2, 12%); they pursue especially a constructivist learning model alongside various learning models (n: 1, 6%).

When participants were asked "Has your museum been doing any kind of evaluation study throughout the developments process of this interactive spaces?" 41% of the museums responded positively. Table 6 shows the types of evaluations conducted. As seen in the table, the majority of the study participants referred to "Front-end" evaluation followed by summative evaluation. For effective interactive spaces there is a need to conduct various evaluation types.

Table 6: Types of Evaluation

Evaluation Type	Frequency (n)	Percentage (%)
Front-end	6	33,3
Formative	3	16,7
Remedial	3	16,7
Summative	4	22,2
Other	2	1,1
Total	18	100

How are the art objects installed, displayed and interpreted for the target audience in interactive spaces?

Study participants were asked about the use of art objects in the interactive spaces. According to the responses received from 20 respondents, it is observed that they mostly (35%) use original art objects. 30% of museums use replicas as well as original art objects.

Table 7: The Use of Art Object

Table	Frequency(n)	Percentage (%)
Only Replicas	5	25,0
Both Replicas and Original Art objects	6	30,0
Just Original Art Object	7	35,0
The Others	2	10,0

The question of "briefly explain what the art objects are placed on" was answered by the 17 of the participants. 4 (23,5%) of the participants stated that shelves, walls and platforms are benefitted in the establishment of the art objects. Other museums gave different answers to this question. A museum has indicated that while statues took part in showcases, paint-

ings and printing works are framed and hanged on the wall. A museum specified that installation was realized with the interactive tools by making thematically grouping. This museum stated that they have a point of storytelling and they allow audience to explore the Art with the method of zoom in and out as visual of art object's images. One of the museums stated that the installations, which allow audiences to use their emotions, were prepared by the artists and they transformed the space for audience learning.

When the participants were asked to describe how to display the art objects, 17 of the participants responded this question. The responses show that representations of interactive spaces art objects are mostly carried out taking into consideration the children. Low height of the displays and suitable shelves for children's physical properties were preferred. A museum also stated that a regulation for people in wheelchairs has been made. Walls and bases are the most preferred methods of display of the objects. One of the museums stated that the installations occupy the entire space and also indicated that they included the item hanging from the ceiling.

17 (34%) of the participants answered the question of "Please briefly explain how the art object is interpreted". Two of the museums stated that they use interpretive panels. One of the museums has stated that they took into consideration of the audiences' interests and needs for work and used as this to draw attention to the nature of the art objects. Art objects are supported with texts, more often a minimal comment. According to the constructivist approach, it is expected that the audience interpret something on their own. One of the museums stated that the cards containing information about art objects were prepared.

Study participants were asked "In which way the art objects interact with the audience in interactive space". As seen in Table 7, in the process of creating interaction between art object and audience, mostly images (38%) and then words (32%) were used (Table 7). 7 participants responded as senses (20,6%) and 3 of them responded as the others (8,8%).

Table 8: In Which Way the Art Objects Interact with the Audience in Interactive Space

Tables	Frequency(n)	Percentage (%)
Words	11	32,35
Senses	7	20,6
Images	13	38,23
The Others	3	8,82
Total	34	100

Discussion and Conclusion

The aim of this study is to gather data about the exhibition design strategies of art museums' interactive areas regarding the installation, display and interpretation of art objects for target audiences related to the physical context. Basically this study sought answers for the three questions to reach its aim:

1. How many art museums have interactive spaces?
2. What do these interactive spaces look like? What are their goals, aims, exhibition design strategies and methods?
3. How are the art objects installed, displayed and interpreted for the target audience in interactive spaces?

According to the answers given by participants, mostly the education department is responsible for the installation, display and interpretation of art objects in interactive spaces and the person/s who is responsible for education is the curator of education or coordinator.

How many of the art museums have interactive spaces?

Our data suggest that more than half (58%) of the museums have interactive spaces. Museums usually have (37,9%) one interactive space, however museums, which have more than three interactive spaces, have a significant ratio (27,6%). According to the data, interactive spaces were developed predominantly after 2000 by art museums. However, the data shows that museums had interactive spaces before 1960. 11,8% of the museums facilitated interactive spaces between 1990 and 1999. This data matches up with the literature about interactive spaces. The number of interactive spaces has increased due to it becoming a common practice to design experiences that meet the expectations and interests of audience in 1990s and especially after 2000s (Adams, Moussouri, 2002, p. 6; Adams et al., 2004, p. 158).

We found that reasons of not having interactive spaces were largely due to the problems relating to space. Museums tend to integrate their interactive exhibition elements with their temporary or permanent exhibitions. A lack of funds, lack of space and lack of staff were dominant reasons for not having interactive spaces.

What do These Interactive Spaces Look Like? What are Their Aims, Objectives, Exhibition Strategies and Methods?

When we looked at the aims of the interactive spaces, we saw that they frequently focused on providing opportunities for families and children to experience art and art object by hands-on learning and achieve satisfaction, success and a sense of power. Participants also pointed out (16%) an-

other aim of providing information about art history relating to art objects and making this knowledge comprehensive.

Most of the interactive spaces described their objectives using an audience-based approach. The majority of them offer various opportunities that audiences could get more information about the exhibition. They have also objectives focused on art object or art history in order to give more information, motivation to discover, examine and create, to talk about art object and discover art.

Most of the interactive spaces described in our study target families and children. Studies on interactive spaces show that they tend to be more targeted families and children, so this is not surprising (Adams, Moussouri, 2002, p. 6). School groups are also another group targeted but not too much. As a result of the increase in family visitor figures of museums in last twenty years and parallel to the studies on family audience researches; it's been understood that the need for experience in these areas, specifically designed for families, had increased drastically (Adams and Moussouri, 2010, p. 5).

Mostly, museum education department, education or museum curator are responsible for the interpretation, display or installation of art objects in interactive art spaces. This data shows that interactive galleries are established by museum staff in charge of education. This finding is different from the general trend of the formation of galleries of art museums.

When we looked at the focus of interactive spaces, we saw that the spaces frequently focus on museum collections and art objects. In these spaces, artists and their works could be featured as replica or original. The theme of the interactive space and museum collection are crucial in the exhibition development process (Vom Lehn et al., 2005, p. 5).

We found that the target audience is the most important factor that affects the process designing elements of the exhibition. Texts, chairs, tables, instructions for games, audio visual equipment, iPads, video screens were design the interest and needs of the target audiences. Colour usage is also prioritized; museums prefer luminous colours as well as white and pastel colours. The most remarkable factor in the process of design of interactive space is the audience. Interactive tools are used in this order and vary. Thus, it helps museum and exhibitions to be understood easier.

Considering which interactive technologies are used in art museums, most of museums mainly use surface technology such as multi-touch screens, digital panels, digital tables, microtiles, video display, and computer-based display in interactive spaces. At the same time, mobile technologies like iPads and phones are common in these spaces. Apart from iPads and phones, tablets are also used for interactive spaces. However,

virtual reality (related with mobile and surface technology) and green screen technology are rarely seen in art museums.

It is determined that microtile, display panels, digital table, video and computer screenings are used by art museums. Audio installations and video projectors are media technologies used by museums. Analogue interactive instruments are used in interactive spaces as well as in hands-on exhibitions being used as activity material. Painting, lithography, drawing are noted as analogue interactive instruments.

Analysis of hands-on activities of museums show that replicas and stories told usings re-enactments with costumes are common. Drawing stations and modifiable magnetic paintings are preferred. Hands-on exhibition activities to improve manual skill varies. Some of those mentioned activities are as follow; decoration of ceramics, painting, mask making, puppet play, making art objects by art materials, multiply games, climbing activities, chair making, architectural drawing, learning activities about photography and animation techniques. An activity to improve social life adaptation is offered by just one museum.

The education model of interactive space is important for development process of exhibition (Vom Lehn et al., 2005, p. 5). Although many museums report that their programs were based on a theory, the data suggests that museum practitioners may not be familiar with theory related to context of learning. Tactile learning and participatory learning are emphasized by museums. Museums have an educational approach to reveal the creativity and to make art understandable. Also interactive spaces in art museums are based on the constructivist learning model but there are lots of studies that show diversity. As a result, it is seen that interactive spaces in art museums are established with the educational aims (Tsitoura, 2010, p. 89).

It has been obtained that museums usually do not evaluate the development process of interactive spaces. Concept, development, functionality and evaluation phases are rarely evaluated. The ones, which evaluate the processes, mostly use front-end and summative methods. However, few art museums prefer the formative and remedial methods, which involve audiences in order to obtain better exhibitions. It is s a necessity to improve these evaluation methods in art museums.

How are the Art Objects Installed, Displayed and Interpreted for the Target Audience in Interactive Spaces?

When the art objects in museum interactive space are studied, it is obtained that mostly original art objects are used besides replicas. Some museums prepare and establish the installations for the use of the senses. Par-

ticipants gave a limited number of answers about installation, display and the interpretation of art objects in art museums. It is therefore necessary to do more detailed research on this subject.

Based on the analysis of tools to install art objects in art museums, usually walls, bases and shelves are preferred. Paintings and prints are framed and hanged, sculptures are in display cases as stated. This includes museums, which have theme oriented installation. Some museums prepare and establish the installations for the use of the senses. Installations are created and constructed by artists. Children and people who use wheelchair, are taken into consideration in the display of art objects. Yet again, walls, bases and shelves are preferred to display. It is stated that art museum prefer the interpretation of the art object with texts of minimal expression. However, it has been expected from the audience to experience this interpretation using existing interactive instruments. The information panels use the interpretation and consist of the information cards.

Images and words are mostly used to provide the interaction with the audience of art objects in interactive spaces. Sense based interaction is fewer than image and word based. In the result of this study, it is been concluded that it is a necessity to do further researches about interactive space in terms of exhibiting and audience experience. It is expected that this study will contribute to provide more information on exhibition design strategies about target audiences in interactive spaces of art museums.

This research indicated that the target audience is the basic element of the installation, display and interpretation of the art objects in interactive spaces. We believe that audience research is crucial from the planning to the final stage of the design of interactive spaces. Research on the effects of the interactive spaces on the audience might help the design of these spaces related to personal context and social context.

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