BEHAVIORAL RESPONSES TO NOMADIC CHAIRS: UTILITY OF MOVABLE CHAIRS AT A UNIVERSITY PARK

By

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ABSTRACT

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Human behavior is impacted by both the physical and social environment. Within this broader area of study, only few studies have explored people's sitting behavior in public spaces. This study aims (a) to identify personal, social and environmental factors that have significant effects on people's sitting preferences; (b) to examine differences in both personal and environmental factors for different sociodemographic groups; and (c) to investigate the relationship between people's sitting behavioral performance and the social and physical environment at a public space within the Michigan State University campus. To collect data, surveying and observation mapping were conducted to record the sitting behavior of students, faculty members, and community members. The site was an open space, which consisted of several intersectional walkways, a large lawn area, canopy trees, and some fixed benches. There were 105 visitors who participated in the survey on weekdays, and 55 visitors participated in the survey on a football game day (Saturday). Logistic regression model was performed on the data to identify the variables that influence people's decisions to use nomadic chairs. Results of this study showed that occupation, the importance of chairs are movable, group size, and why they move chairs all have significant effects on whether people like to move their chairs within the designated area. Additionally, age, group size, and importance of chairs are movable were also predictors to people's preference for sitting on nomadic chairs less or more than 20 minutes. The study provided sufficient evidence to support factors that may affect people's decisions on using nomadic chairs on campuses that could be beneficial for planners, and landscape architects.

I dedicate this thesis to my parents
Thank you for all your support along the way

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CHAPTER ONE
INTRODUCTION

As a popular topic, public space has been discussed by many scholars for more than 20 years. There are different definitions of public space in terms of ownership, management, accessibility and function (Mehta, 2014). In this paper, public space refers to "publicly accessible places where people go for group or individual activities" (Ward, 1993). Although people have different understanding of public space, there is no doubt that it is becoming an essential part of our life. From ancient periods to recent years, public space has never disappeared, and it is changing its forms from piazzas and church squares to public parks and shopping malls. The value of public space is significant, it provides us "the channels for movement, the nodes for communication, and the common grounds for play and relaxation" (Ward, 1993). Public space is all around us, the high quality of public space will bring us numerous benefits. For example, a high quality public environment will attract more businesses and residents; improve our physical and mental health; promote and protect biodiversity.

In public life, public space is a vital part that helps people satisfy their various needs. Therefore, the public space becomes the place where people spend the most time when they are not at work or home, people like to go to public spaces to engage with their communities. All groups and individuals who are legally allowed to interact in society are invited to public spaces (Dolbec and Castilhos, 2017). In public spaces, groups and individuals may behave differently depending on spatial designs and normative social influences. Humans are social animals, whose behavior is influenced by other humans. In the public space, human behavior is largely dependent on more indirect forms of social influences (Aarts and Dijksterhuis, 2003). Individuals' preferences and decisions conform to the social environment. Moreover, human behavior is also strongly influenced by design elements in public spaces.

The Street Life Project, conducted by William H. Whyte, is one of the most well-known public space researches that filmed people's behaviors in small parks and plazas in New York City. Through studying New York City's public spaces, Whyte has found elements that will attract people to these public spaces (Whyte, 1980). Sittable space was examined to have major influence in plaza use. Visitors would like to use these plazas when there are places to sit. Natural elements, such as trees, wind, water feature, were indicated to influence people's sitting preference. For instance, people tend to sit in the sun when temperature is comfortable, but they also like to sit in the shade when there is sun. Thus, Whyte advocates to use movable chairs instead of fixed seating options to attract users to plazas. In addition, food, street and triangulation were also discussed to positively influence the use of plaza. The plaza of the Seagram Building was recorded in the film, which has attracted a lot of people during lunch time. Although the plaza was not planned for people to use, it became a popular gathering area for office workers from nearby buildings since there are plenty of sittable areas. Compared with other plazas in the film, the plaza of the Seagram Building did not provide furniture for sitting, but the ledges and steps with appropriate elevation attracted many people to sit on. The simple and inviting sittable spaces encouraged visitors to use the plaza. However, other plazas that people rarely visited were found that there were no such sitting areas as in Seagram Building's plaza (Whyte, 1980). Therefore, the spatial design is used to not only attract people to stay but also to disperse crowds from the space.

The spatial design can either attract people to stay or disperse crowds from the space. For example, in urban areas, many office building plazas are supposed to be occupied by the public. There were instances, however, where these plazas were observed to be underused and virtually empty (Smithsimon, 2008). Smithsimon (2008) indicated that these plazas are designed

intentionally to repel people from the proposed public space, by incorporating unfavorable elements. Therefore, human behavior changes easily and readily in both social and physical environments. The present study explores correlations between human behavior and environment through a nomadic chair project, which is research on people's behavior with movable chairs on the Michigan State University campus. Studying why people choose or choose not to use the nomadic chairs, as well as how people use the nomadic chairs on campus, is important for future public space development. This study can help MSU, and campuses like it, decide in favor of nomadic chairs, as appose to fixed benches, for their versatility.

Prior research of human behavior in public spaces addressed pedestrians' movement patterns, and how their movement is influenced by the personal attributes of study participants and the physical characteristics of streets. According to the social force model, walking patterns of pedestrian crowds are influenced by self-organized processes, which dependent on interactions among pedestrians (Guo, Ding, Ling, Shi, and Takashi, 2013). In predicting walking patterns of crowds, various factors affect how humans negotiate public spaces.

Among these factors, Gjersoe's group believe that they can be classified as personal (age and gender), situational (group size and level of mobility) and environmental (time of day and location) in their study. The findings indicated that People are influenced by personal, situational and environmental factors in uncluttered environments, spaces where people have freedom to select their position in space and the speed at which they walk (Gjersoe, Havard, Kukla, Kerridge, and Willis, 2004). These factors affect how people behave, and guide their decision-making in a certain environment. However, people's behaviors also affect how an environment is designed. Behavioral needs of the people, such as exercise needs, promote pedestrian friendly environments. Consequently, environmentally friendly designs encourage physical activities that

promote public health in an urban space (Frank and Engelke, 2001). The linkage between the environment and behavior draws many researchers to the elements and factors that influence human behavior the most.

Research on behavioral performance in public space provides scope on how urban space incorporates human behavior. Since William H. Whyte indicated that "people tend to sit where there are places to sit" from his Street Life project, the seating space has received a lot of attentions from designers and researchers (Whyte, 1980). Mehta conducted multiple studies that focus on the relationship between characteristics of public space and human behavior. In Mehta's projects, he found both seating provided by business owners and seating provided by public authorities contribute to stationary and social activities in public space (Mehta, 2007). The commercial seating and public seating were found as significant factors to predict the liveness of public space (Mehta and Bosson, 2018). Besides seating space, Whyte also discussed some physical elements, such as tree and water, associate with human behavior in public space (Whyte, 1980). Chang (2002) evaluated different design elements that contribute to the activities and qualities of the public space, which promotes urban design in accordance to the behavioral needs of users. Although the empirical literature provides purposely collected data relating a specific group of users and case-study locations, a more comprehensive study of how environment affects human behavior is required to complement the integrity and reliability of the data. With the exception of design elements (such as outdoor facilities and vegetation), identifying and predicting behavioral performance, personal, social/ situational and environmental factors should be considered when analyzing human behavior in the public space. For example, when predicting people's movement behavior, size of group significantly influences behavioral performance. Singles walk faster than groups, and groups like to walk on

the road rather than on the sidewalk (Gjersoe, Havard, Kukla, Kerridge, and Willis, 2004). However, behavioral performance and predictability are at times difficult to determine due to the overlapping characteristics of participants. For example, in Gjersoe, Havard, Kukla, Kerridge, and Willis's study (2004), men tended to walk on the edge of the sidewalk, while those carrying a bag tended to walk on the middle of the sidewalk. The study did not adequately explain if, for example, men carrying bags tended to exhibit characteristics more in line with men or with bag-carrying. The present research of the nomadic chairs project conducts a more systematic investigation on why behavioral performance is affected by the environment, in that each participant characteristic is explained in isolation and with other overlapping participant characteristics.

Predicting human behavioral performance becomes an increasingly important goal to landscape architects and urban planners pursuing effective public spaces in their designs. However, most studies were conducted in office building plazas, the behavioral research in campus setting was deficient. In many American college towns, the role of the campus is not only a place for learning but also becomes a symbol, a park and a cultural and social center. Thus, the college campus is an important public space that serves students and faculty, or even the population of a town and region (Gumprecht, 2007). Among limited number of research about campus plaza, Aydin and Ter (2008) indicated physical environment and user characteristics are important components that contribute to the campus plaza's quality. But, the relationship between physical elements and user behavioral performance was not discussed.

In addition, proposing a predictive model is not a simple process due to existing large numbers of confounding variables. This study will attempt to consider some of these variables in the data collection stage such as weather and time of day. These variables provide opportunities

to extend the study to a deeper understanding of space. For example, space can be divided by gender through situated social practices, and gender may help in studying space in social relations (Panayiotou, 2015). The present research of how people use nomadic chairs on the MSU campus aims to show what the most influential factors are on people's sitting preferences in public space. The significance of this study is to provide a comprehensive understanding of how people negotiate space when they are free to select and move chairs in public spaces.

The purpose of this study is to understand humans' sitting behavioral performance within public spaces specifically within campus settings. The main objective of this research is to identify and explain the factors that contribute to people's behavioral performance on campus. The research questions to be addressed in this thesis are: Do personal factors affect sitting behavior? Do social/ situational factors affect sitting behavior? And do environmental factors affect sitting behavior? Figure 1.1 represents the conceptual framework for this thesis.

To meet this end, the researcher examined the use of nomadic chairs on the Michigan State University campus. Specifically, the researcher utilized the study on the "Idea Chair project" at Michigan State University. The Idea Chair project was initiated by the Infrastructure and Planning Facilities department where they brought colorful nomadic light-weight chairs to an open space on campus. The site is located at an open area between two buildings. The site is described as a large lawn area with intersectional sidewalks and trees, named People's Park. The researcher surveyed users of this site in October 2017. The methodology chapter describes the participants of this study, the instruments used for the surveys and the statistical method used for the analysis. The discussion chapter delves into the outcome of the study and discusses ways to incorporate seating preferences in future design guidelines for campus plazas.

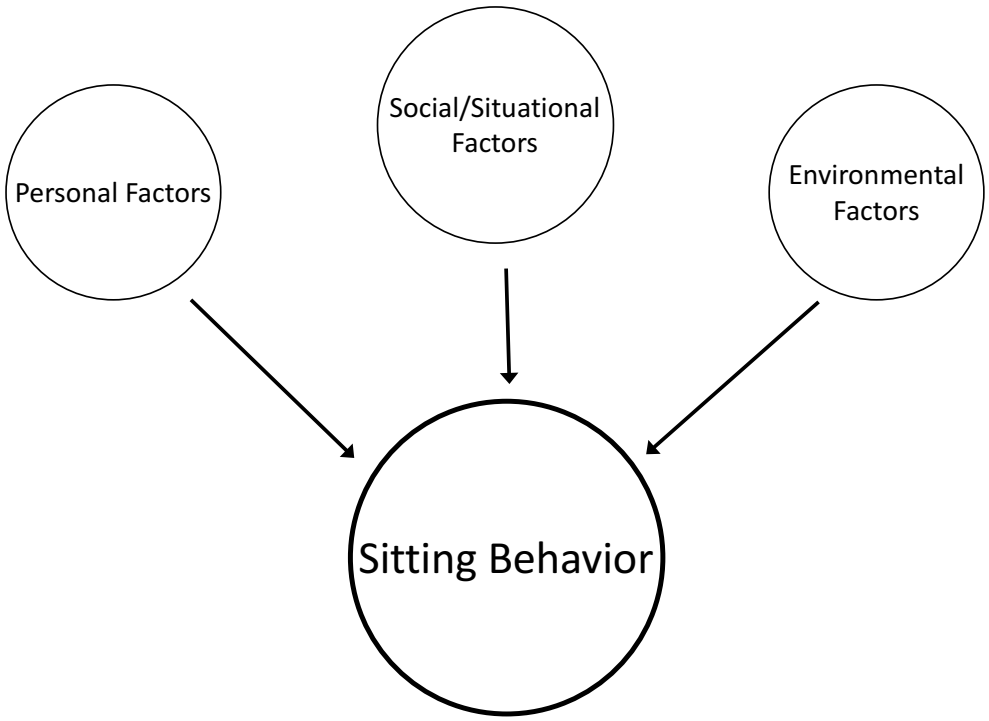

Figure 1.1 Conceptual Framework

CHAPTER TWO
LITERATURE REVIEW

A public space is designed to provide an open social space, inviting all groups and individuals. It encourages social behaviors, which allow people to communicate and interact with each other. As social animals, humans may influence, and be influenced by, the behaviors of others. In public spaces, humans attempt to conform to the social expectations in an environment, rather than controlling their own behavior. Research on human behavior and different environments reveals that human behavior is correlated with the environment through design elements and social norms in public spaces (Whyte, 1980). This review is divided into three sections. The first section discusses how public spaces are built on both urban areas and college campuses, and how public spaces are used and function in these areas. The second section describes and discusses human behaviors in public spaces, and focuses on what personal, social/situational and environmental factors may impact humans' behaviors. Finally, the third section specifically discusses human decision making and behavior when using street furniture, which relates back to the research topic of how and why people use nomadic chairs on the Michigan State University campus.

2.1 Use of Public Spaces

The public space is an important place in urban planning and design. The amount that public spaces are used globally, reveals that for people who are living in urban area, maintaining the quality of a public space is essential for the well-being of its residents. Typical urban public spaces include parks, plazas, roads, and beaches. As one of the most visited public spaces, plazas provide space for socializing, relaxing, reading, eating, and exercising. However, Mitchell (2017) indicates that public spaces are often occupied by homeless people, so other people

consider these spaces are unsafe. Therefore, in many cities, urban plazas are designed intentionally to repel people from using public spaces (Smithsimon, 2008). Architects and planners identified the developer as the one responsible for the uninviting and inaccessible privately owned plazas (Smithsimon, 2008). In the article, however, specific decisions (such as intentionally not providing seating) made by the developers to prevent people from using the public space are not fully explained. Therefore, the current study aims to investigate specific elements that either invite or repel people using public spaces. In urban areas, land resources are extremely limited and valuable, and uninviting plazas restrict the efficient use of space, which is unhealthy for urban development. From previous studies, uninviting plazas are intentionally designed to repel people, a tendency that needs to be avoided in college campuses.

Contrasting with urban areas, campuses in American college towns are considered both environments of learning and public spaces (Gumprecht, 2007). Campuses that incorporate large areas of green space provide both psychological and physiological benefits for students (Hipp, Gulwadi, Alves, and Sequeira, 2016). Hipp, Gulwadi, Alves, and Sequeira (2016) indicate that campus environments have the potential to affect students' health, and need more studies on impacts of how specific design elements can help students concentrating on different subjects. In America, college campuses may include performance centers, sports stadiums, museums, and landscape grounds. Events and activities attract both students and nearby residents. Therefore, campuses become not only a learning space, but also a landscape park, a social and culture center, and a symbol of the college (Gumprecht, 2007). The author also suggests that colleges should promote campus as an attraction to recruit students, and to strengthen the relationship with alumni, residents, and benefactors. Consequently, college campuses are a microcosm of how cities implement public space, that have potential research value for public space design.

The current study will focus on campuses as a study site to conduct a survey to understand the relationship between human behavior and public spaces.

2.2 Spatial Behavior

Human behavior can be easily changed and impacted by personal, social/ situational, and environmental factors (Gjersoe, Havard, Kukla, Kerridge, and Willis, 2004). These factors can be categorized into two areas: people's behavior is influenced by other people and people's behavior is influenced by objects, such as seats, trees, and water features. Based on these two factors, people have opportunities to understand their behavior in depth. As social animals, humans are indirectly yet heavily impacted by social influence (Aarts and Dijksterhuis, 2003). Aarts and Dijksterhuis (2003) indicate when people are in a particular situation, they may conform to the normative behavior that is expected of them from society in that situation. For example, people are quiet when visiting a library or church. Therefore, a social environment effects people's behavior (Aarts and Dijksterhuis, 2003). The limitation of the article is that the research sites are indoor spaces, which have well-established situational norms. Outdoor spaces have external factors, such as weather, that effect how people behave in an environment. Indoor spaces do not have these external factors. In this way, indoor spaces are stable, which causes stable behaviors; outdoor spaces are variable, which causes people to behave in a larger variety of ways. The current research focuses on outdoor spaces that combine complex and uncontrolled factors to explore people's behavior in social environments.

Contrasting with social environments that imperceptibly impact human behavior, physical environments are easier to be observed and measured by researchers. People tend to visit urban plazas with seats, food, and sculptures more than plazas without those elements

(Abdulkarim and Nasar, 2014). Even when these preferred plazas have slightly higher levels of crowding, people choose to stay in these plazas rather than moving to plazas with less preferred environmental conditions (Wu, Zacharias, and Stathopoulos, 2004). Whyte (1980) conducted a prominent study about urban public spaces in New York City in 1971. He identified elements that attract people and make streets and plazas vibrant. Moreover, these elements have different effects on changing people's behavior. For example, triangulation is a process that externally stimulates interaction between people, encouraging strangers to stop and talk with one another. Food is another factor in plazas that helps to attract more people and vendors. Through visual experiments, Abdulkarim and Nasar (2014) indicate that the combination of different elements attracts people to public spaces the best. However, most previous studies only focused on people's behavior, in terms of how their behavior was influenced by people or objects. The present research discusses how both factors may affect people's behavior in public spaces. More specifically, the research will test personal factors (such as age and occupation), situational factors (such as whether people like to sit next to strangers), and environmental factors (such as sitting under sunlight or shade).

2.3 Street Furniture

Street furniture is one of the most important physical features that improves the quality of streets and activates public spaces (Ewing, Hajrasouliha, Neckerman, Purciel-Hill, and Greene, 2016). Previous research on seating in public spaces identifies fixed or movable seats as important in attracting people to public spaces (Whyte, 1980; Mehta, 2007; Abdulkarim and Nasar, 2014). Seating furniture not only attracts a large number of people, but also contributes to the amount of time that people decide to spend in a space. Mehta (2007) indicates that people

spent the more time in public spaces with seating than in those without. Although previous research proves that seating has effects on human behavior, understanding the motivation of public place visitors' decisions is helpful for researchers to know why people choose their seats.

Seat material, design, and comfort are potential factors that guide people's decisions. Neto and Munakata (2015) focus on how distance impacts people's choice of seat. They conducted an observational survey to identify the relationship between behavioral patterns and seat choice at the central plaza in Chiba University. The survey recorded the movement and choice patterns of 37 participants, and evidence supports the conclusion that the visual distance of seats guides people in how they choose their seats in public spaces. People prefer seats that are the closest to them, but groups may choose seats further away from them than individuals would. However, 37 participants are too small of a sample size to support the theory from the research. The present research surveyed more than 150 participants to explore people's behavior on movable chairs in a large open space on the Michigan State University campus. In understanding how seating furniture guides people's decisions and behaviors in public spaces, an investigation of why people choose to use the nomadic chairs on the Michigan State University campus becomes meaningful and useful for planners and designers to implement public spaces in the future.

Previous research shows that human behaviors are closely related to surrounding environments. Existing articles provide general background for the present research on human behavior in public spaces. However, many are limited in their sample size and site location selection. With background on how public spaces are built on both urban areas and college campuses, spatial behaviors in public spaces, and human decision making and behavior when using street furniture, this present research uses a case study of human behavior to explore how

nomadic chairs effect public space design. The current research focuses on a campus as a research site to explore personal, situational, and environmental factors, which may affect why students and faculty choose to use nomadic chairs on the site.

CHAPTER THREE
METHODOLOGY

This research is an extension of "The Idea Chair" research that is conducted by the School of Planning, Design, and Construction at Michigan State University. It aims to administer a survey to understand why people choose or choose not to use nomadic chairs on campus. This methodology chapter is divided into three sections. The first section describes the location of the selected research site. The second section discusses how participants were selected for the research. The third section discusses how data was collected and measured in this research.

3.1 Site Description

Figure 3.1 People using the People's Park nomadic chairs under shade (2017)

The research site is an open space bordered by Wells Hall and the International Center on the Michigan State University campus. The site was assigned by the Infrastructure Planning and

Facilities (IPF) department of Michigan State University. The IPF supported the Idea Chair project to explore people's behaviors and motivations when using nomadic chairs on the site (see Figure 3.1). The findings from this research will inform how nomadic chairs are implemented on campus public spaces in the future. Since the selected site is in the central area of the campus, many students and faculty pass by the site while walking to classrooms and offices (see Figure 3.2). The open space, called People's Park, consists of several walkways, a large lawn with sun exposure, trees, and a few fixed benches.

Figure 3.2 Top view of the site

3.2 IRB Approvals

The researcher completed the Human Research Protection Program (HRPP) certification training. After crafting the survey questions, the researcher obtained all the necessary approvals from the Institutional Review Board (IRB) at Michigan State University.

3.3 Participants

Participants were selected from people who were using the nomadic chairs at site. The researcher approached these people, introduced himself and the project, and informed them that their participation in the research would be voluntary. Those using the chairs were asked if they wanted to participate before being given the survey. All participants agreed to sign the consent form that was approved by the Institutional Review Board (IRB). Participants were free to not answer any questions or stop participating at any time. The survey responses were kept anonymous to assure participant confidentiality. Future use for reporting, publication, or presentation of the data will be aggregated. According to the IRB application requirement, surveys were only given to participants who were 18 or older. There were in total 155 people who participated in the survey on weekdays, and 55 people who participated on a football game day (Saturday). All participants were not compensated for participating in this research. Among those participants, 59% of them were female and 41% of them were male. The top three professions/majors that participants were affiliated with were Natural Science (22%), Engineering (13%) and Social Science (11%). About 47% of the population were individual users, 38% users were in small groups (1-4 people) and 15% users were in large groups (5 people and more). Figures 3.3, 3.4 and 3.5 display these descriptive statistics.

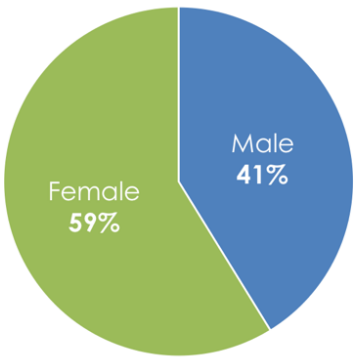

Figure 3.3 Gender. There were 59% female and 41% male from the participants

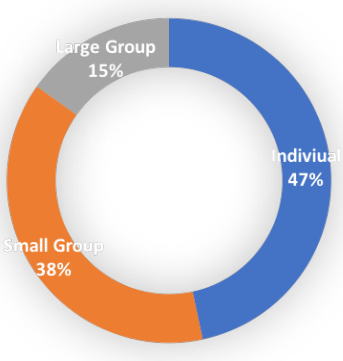

Figure 3.4 Group Size. There were three types of group size that included individual, small group and large group

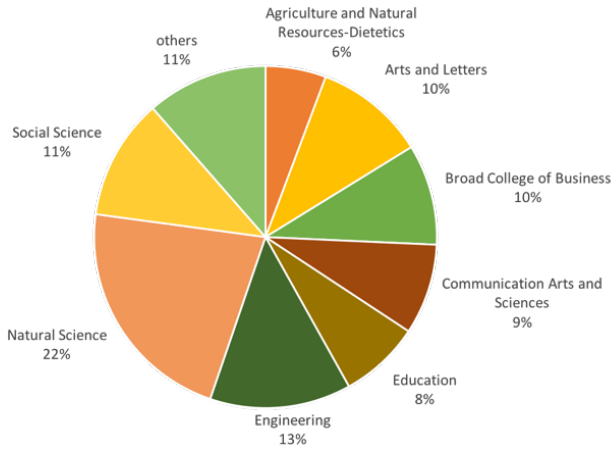

Figure 3.5 Profession/Major. The graph showed that participants were mostly from 9 professions in MSU

Additionally, the researcher conducted a building analysis (see figure 3.6) on MSU main campus and was able to identify two types of population that were the primary users of the study site. One was the Commuting Population that consisted of students (93.3%), faculty (5.7%) and community members (1%). They often visited the site in weekdays during working hours as individuals or in small groups. Another one was Event-based Population that consisted of visitors (60%), students (30%) and faculty (10%). They visited the site for sports events in weekend, but they only came in groups. The group size could be small and large, the range for these groups

was from 2 to 12 people. Figure 3.7 graphically illustration the distribution of the population observed on campus.

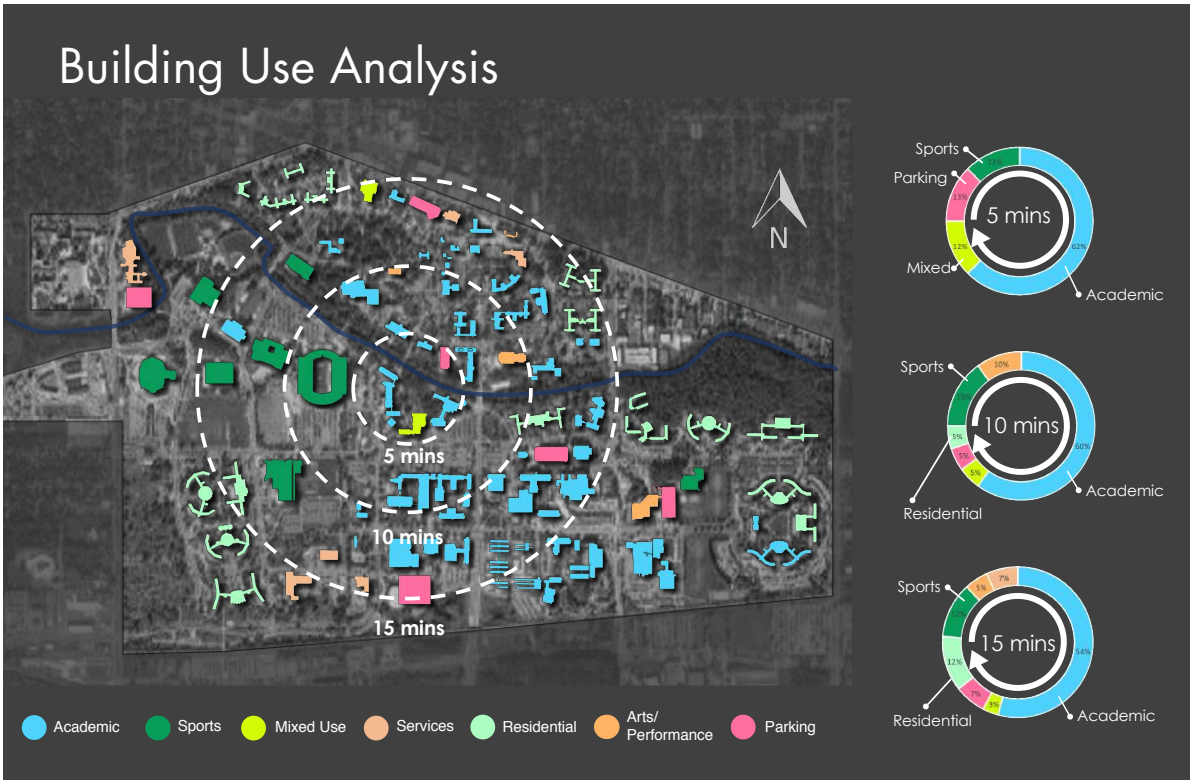

Figure 3.6 Building Use Analysis. The analysis showed the composition of building types on MSU main campus for 5 mins, 10 mins and 15 mins walking circle

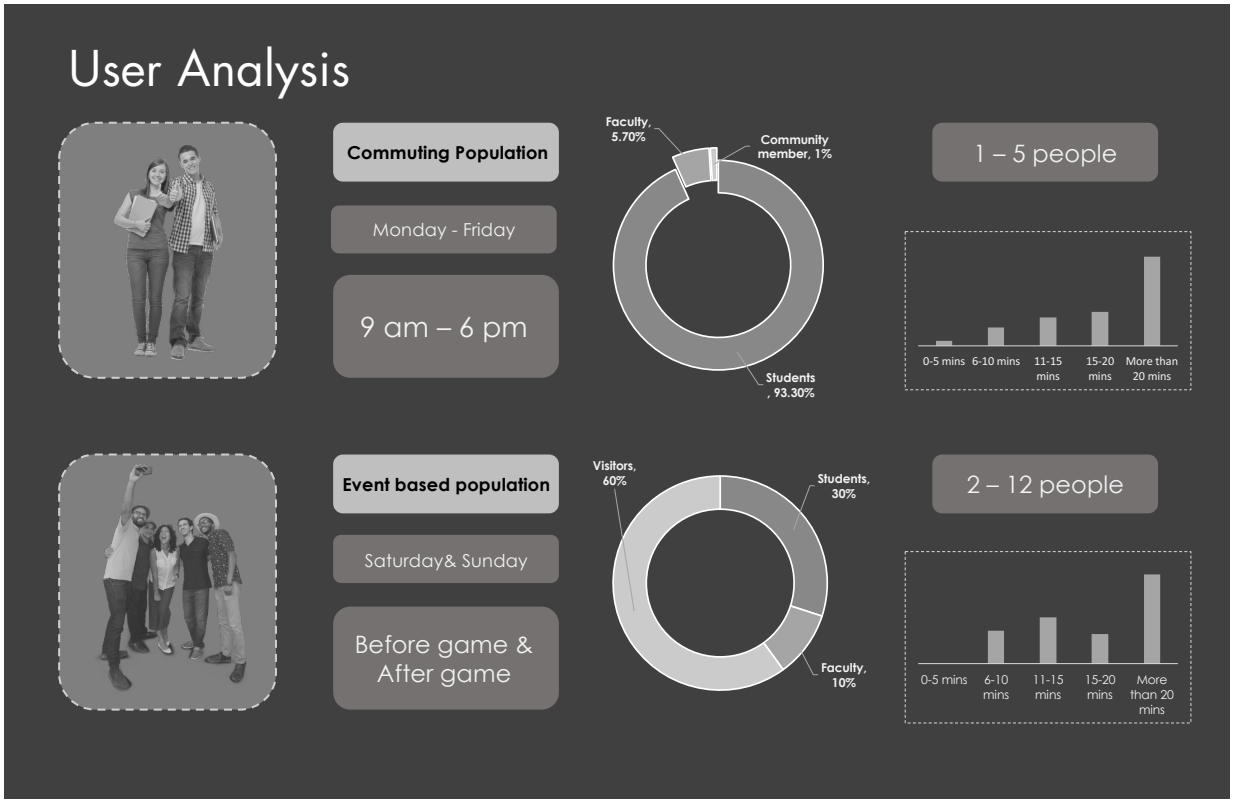

Figure 3.7 User Analysis. The analysis showed two types of population who were the potential users of the site. They have different occupation, group size and usage time and date

3.4 Measurement Procedure

In urban planning research, surveys are a common method for interpreting a phenomenon. A survey was conducted for this research to explore people's decisions and behaviors while using nomadic chairs. In order to enhance the reliability of the research, responses were gathered during both weekdays and a game day. The research question focused on what is the most influential factor that motivates students and faculty to use nomadic chairs on MSU campus? Previous research on park usage incorporated variables such as age, gender, occupation, and group size into surveys (Lapham et al., 2016; Phau, Lee and Quintal, 2013). This survey uses many of those same variables along with ones such as time people anticipate spending on nomadic chairs and colors of the nomadic chairs. Open-ended questions, such as

"What invites you to use this space?" and "What did you decide to view?" were also included in the survey to explore the potential reasons for participation. In order to understand the importance of chair mobility and the surrounding environment, Likert Scale questions were included in the survey. Questions like "How would you rate the surrounding environment?" were based on a 10-point Likert Scale ranging from 1 (not at all enjoyable) to 10 (very enjoyable). However, there is no midpoint in this 10-point scale, so it will force participants to select leaning toward either important (6-10) or not important (1-5). For example, 6 is slightly important, and 5 is slightly not important. See Appendix to access the full version of the survey

The independent variables were age, gender, occupation, major, group size, sit with other or alone, select chair by color, why select the color, day interview, select chair for particular view, why use the space, why they move chair and surrounding environment, because these variables were based on influences that cannot be controlled in the environment and sampling method. The key independent variable was the importance of chairs are movable, which was measured by a 10 point Likert scale from 1 (not at all important) to 10 (extremely important). The dependent variables were the time people anticipate spending on nomadic chairs and whether people moved their chairs. The time that people anticipate spending on nomadic chairs was measured by 5 categories, and each category was based on the following time intervals: 0-5 minutes, 6-10 minutes, 11-15 minutes, 16-20 minutes, and 20 minutes or more. Whether people moved their chairs was measured by two categories, Yes or No. Possible confounding variables included weather and time of the day.

3.5 Statistical Analysis

All variables that were collected from the survey were coded and transferred into the SPSS program (version 25) in order to understand the relationship between independent variables and dependent variables.

Regression Analysis as a powerful statistical model can help researcher to examine the relationship between two or more variables of interest. The results from the model could provide detailed insight to determine which factor is the most significant one and how it influence other variables. Based on the variables from the survey, the independent variables include all three levels data (nominal, ordinal, scale). But the dependent variables only include two levels data, time is at scale level and whether people moved chairs is at nominal level. Therefore, logistic regression and linear regression analysis could be used in this study to test how the dependent variable changes when an independent variable is varied, holding other variables constant. The logistic regression analysis will help the study to identify whether the importance of chairs are movable most associates with people's willingness to move chairs. Then, the linear regression analysis will help the study to identify the independent variable that has the strongest relationship with the time people anticipate spending on nomadic chairs. The equation of the linear regression analysis is $Y_i = b_0 + b_1X_{1i} + b_2X_{2i} + \varepsilon_i$, Y_i is the time variable, X_{1i} is the importance of chairs are movable, and X_{2i} can be dummy variables, such as gender and sun/shade.

However, the linear regression model could not provide any strong findings for this study. One of the limitations of linear regression analysis was that only linear relationship can be found in the model. Other reasons could be attributed to the fact that data distribution of the time people anticipates spending on nomadic chairs was not normally distributed. Also, half of the respondents chose to sit on the chairs more than 20 minutes. Thus, the variable was reclassified

into the following two categories: 0 representing “less than 20 mins and 1 representing “20 mins and more”). This is known as nominal level data. Therefore, the study will only run the logistic regression to identify independent variables that were most associated with whether people moved their chairs and time people anticipate spending on nomadic chairs (less than 20 minutes or 20 minutes and more).

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Personal, Social/ Situational and Environmental Factors

In this study, independent variables can be categorized into three types of factors. One was internal personal factors that consisted of age, gender, major, occupation and group size. Another was social/ situational factors that consisted of group size and sit with other of alone. The last one was external environmental Factors that included chair color, why they move chair, day interview, select chair for particular view, why use the space, sit with other people, surrounding environment and importance of chair's movability. Table 4.1 summarizes personal factors, social/ situational and environmental factors that might have influence on the dependent variables "whether people moved their chairs" and "time people anticipate spending on nomadic chairs". Table 4.2 summarizes the findings from the logistic regression analysis discussed in the previous chapter. In personal factors, age was examined having distinct relationship with the time people anticipate spending on nomadic chairs and occupation was examined having relationship with whether people moved their chairs. In social/ situational factors, findings indicated that group size was associated with both dependent variables. Similarly, in environmental factors, the importance of chair's movability was also associated with both dependent variables. Additionally, why they move chair directly impacted with whether people moved their chairs.

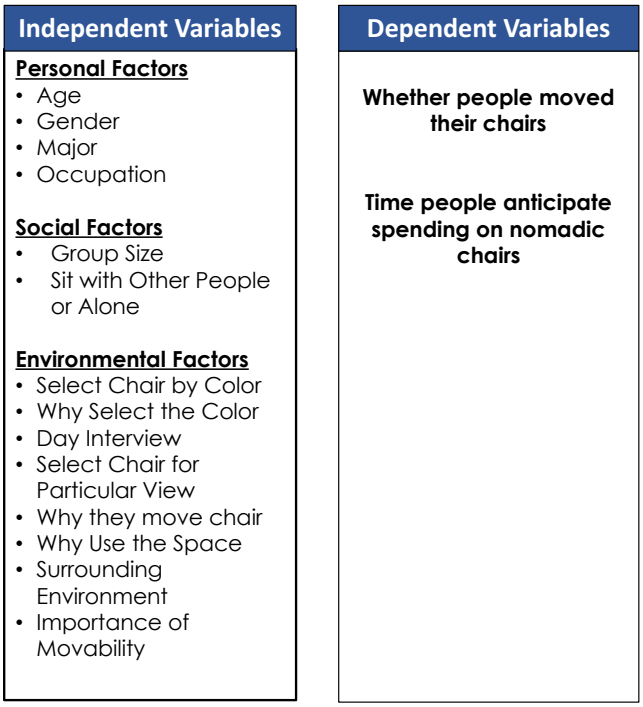

Figure 4.1 A summary of personal, social/ situational and environmental factors with dependent variables

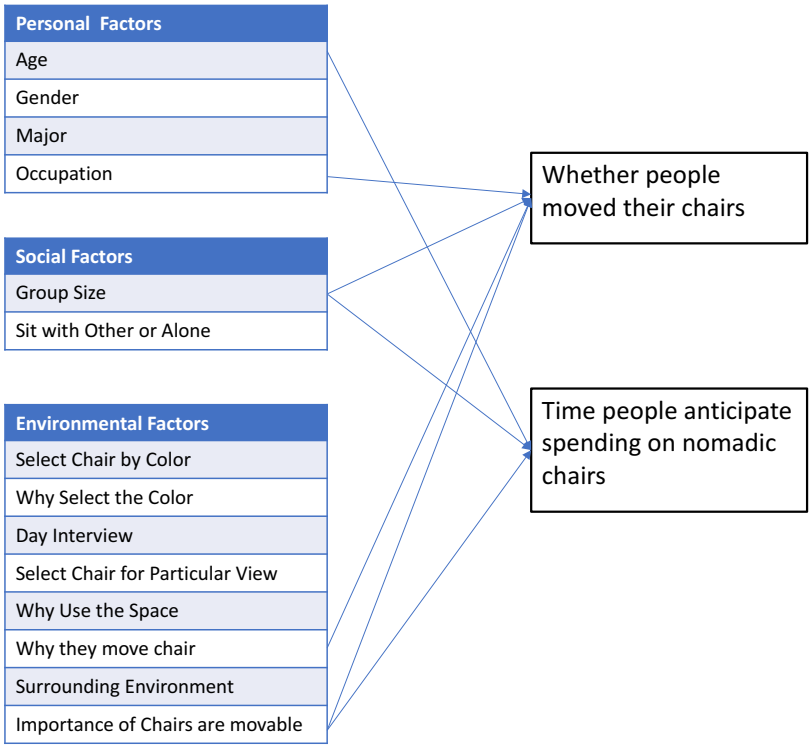

Figure 4.2 Summarizes the findings from the logistic regression analysis

4.2 Descriptive Statistics

Section 3.3 showed some descriptive statistics about the demographics of the participants such as gender, group size and major. In this section, the researcher summarizes the descriptive statistics for variables that address personal, social/ situational, and environmental factors (see Table 4.1, Table 4.2 and Table 4.3).

Personal Factors				
	Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Gender				
female	97	58.8	58.8	58.8
male	68	41.2	41.2	100.0
Total	165	100.0	100.0	
Major				
Agriculture and Natural Resources	7	4.2	6.9	6.9
Arts and Letters	11	6.7	10.8	17.6
Broad College of Business	10	6.1	9.8	27.5
Communication Arts and Sciences	9	5.5	8.8	36.3
Education	8	4.8	7.8	44.1
Engineering	14	8.5	13.7	57.8
Human Medicine	1	0.6	1.0	58.8
James Madison College	1	0.6	1.0	59.8
Natural Sciences	23	13.9	22.5	82.4
Others	5	3.0	4.9	87.3
Social Sciences	12	7.3	11.8	99.0
Veterinary Medicine	1	0.6	1.0	100.0
Total	102	61.8	100.0	
System Missing	63	38.2		
Total	165	100.0		
Occupation				
student	116	70.3	70.3	70.3
faculty	12	7.3	7.3	77.6
community member	37	22.4	22.4	100.0
Total	165	100.0	100.0	
Age				
N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
165	18.0	71.0	27.5	12.663

Table 4.1 A summary of descriptive statistics for personal factors

Social/ Situational Factors				
	Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Sit with other or alone				
alone	59	35.8	35.8	35.8
with others	45	27.3	27.3	63.0
both	61	37.0	37.0	100.0
Total	165	100.0	100.0	
Group Size				
N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
165	1.0	12.0	2.75	2.941

Table 4.2 A summary of descriptive statistics for social/ situational factors

Environmental Factors				
	Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Select chair by color				
No	122	73.9	73.9	74
Yes	43	26.1	26.1	100
Total	165	100.0	100.0	
Why select the color				
Like the color	26	15.8	15.8	16
Not important	122	73.9	73.9	90
Available at location	17	10.3	10.3	100
Total	165	100.0	100.0	
Day interview				
Weekday	105	63.6	63.6	64
Weekend	60	36.4	36.4	100
Total	165	100.0	100.0	
Select chair for view				
No	61	37.0	37.0	37
Yes	104	63.0	63.0	100
Total	165	100.0	100.0	
Why they move chair				
No reason	57	34.5	34.5	35
Sit with friends	33	20.0	20.0	55
In sun or shade	60	36.4	36.4	91
Sit in quiet place	7	4.2	4.2	95
nice location	8	4.8	4.8	100
Total	165	100.0	100.0	
Surrounding Environment				
N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
165	5.0	10.0	9.40	0.955
Importance of chairs are movable				
N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
165	1.0	10.0	8.59	1.804

Table 4.3 A summary of descriptive statistics for environmental factors

4.3 Logistic Regression Model Output

Logistic Regression was used to determine the significant factors that will influence whether people move their chairs and the time people anticipate spending on nomadic chairs.

4.3.1 Dependent Variable 1: Whether people moved their chairs

When the dependent variable was whether people moved their chairs and independent variables were gender, age, occupation, group size, why they move chairs, importance of chairs are movable and surrounding environment, results showed that occupation, why they move chair and importance of chairs are movable became the significant factors (see Table 4.4). Additionally, community members were less likely to move chairs than students; people who have a specific reason to move their chairs were more likely to move chairs than people who did not provide a reason; people think that chairs are movable is more important are more likely to move chairs. On the other hand, gender, age, group size, major, chair color, day interview, sit with other or alone and surrounding environment were not significant factors for people choosing to move their chair.

Model 1 Summary		
	Cox & Snell R Square	Nagelkerke R Square
	0.395	0.527

Variables in the Equation				
			95% CI for EXP(B)	
	B	Sig.	Lower	Upper
Personal Factors				
1. Gender	-0.148	0.732	0.369	2.014
2. Age	0.249	0.273	0.822	1.999
3. Major	NA			
4. Ocuppation				
Subject is Faculty	-0.84	0.465	0.045	4.115
Subject is Community Member	-2.091	**0.034**	0.018	0.849
Social Factors				
5. Group Size	0.032	0.782	0.824	1.293
6. Would you like to sit with other or alone				
Sit alone	0.187	0.711	0.447	3.256
Sit with other people	0.348	0.588	0.402	4.984
Environmental Factors				
7. Why they move chair				
Sit with Friends	4.209	**0.000**	10.072	449.378
Sit in Sun or Shade	1.992	**0.000**	2.72	19.762
Sit_Quiet Place	2.647	**0.02**	1.518	131.318
Sit_Nice Location	2.817	**0.008**	2.079	134.564
8. Importance of chairs are movable	0.523	**0.001**	1.241	2.295
9. Surrouding environment	-0.373	0.123	0.429	1.106
10. Why use the space	NA			
11. Select Chair by Color	NA			
12. Why select the color	NA			
13. Day Interview	NA			
14. Select Chair for particular view	NA			
Constant	-3.04	0.217		

Table 4.4 Logistic Regression Output 1

More specifically, statistical results can be summarized as follow:

- Controlling for the effect of gender, why they move chair, importance of chairs are movable, surrounding environment, group size and age, community members are less likely to move chairs than students. However, there is no significant difference between students and faculty members in the likelihood to move a chair. The odds of moving chairs among community members are 0.124 times lower than the odds of moving chairs among students.
- Controlling for the effect of gender, age, occupation, group size, importance of chairs are movable and surrounding environment, results showed the following:
    - People want to sit with friends are more likely to move chairs than people whom moved chairs for no reason. The odds of moving chairs for sitting with friends is 67.277 times higher than the odds of moving chairs for no reason.
    - People want to sit in sun or shade are more likely to move chairs than people whom moved chairs for no reason. The odds of moving chairs for sitting in sun or shade is 7.331 times higher than the odds of moving chairs for no reason.
    - People want to sit in quiet place are more likely to move chairs than people whom moved chairs for no reason. The odds of moving chairs for sitting in quiet place is 14.117 times higher than the odds of moving chairs for no reason.
    - People want to sit at a nice location are more likely to move chairs than people whom moved chairs for no reason. The odds of moving chairs for sitting at a nice location is 16.727 times higher than the odds of moving chairs for no reason.
- Controlling for the effect of gender, age, occupation, group size, why they move chair and surrounding environment, people think that chairs are movable is more important are

more likely to move chairs. The unit increase in the importance of chairs are movable is associated with 1.688 increase in the odds of moving chairs.

The model' summary in Table 4.4 shows that between 39.5% and 52.7% variation in whether people moved chairs are explained by gender, age, occupation, group size, why they move chair, importance of chairs are movable and surrounding environment.

In independent variables, why they move chair and why use the space included four to five categories, thus the study has recoded them into individual dummy variables in order to run the regression analysis. However, the input variables could not include all dummy variables, which might cause the regression analysis fail. Besides, the dummy variables from why they move chair and why use the space were very similar, which could cause correlation between dummies. Thus, the study had to examine their relationship with dependent variable separately.

When dependent variable was whether people moved their chairs and independent variables were gender, age, occupation, group size, why use the space, importance of chairs are movable and surrounding environment. Table 4.5 showed that group size and importance of chairs are movable became the significant factors. In addition, the group size was bigger, people were more likely to move their chairs; people thought that chairs are movable was more important were more likely to move their chairs. However, gender, occupation, age, major, select chair by color, day interview, sit with other or alone and surrounding environment were identified as nonsignificant factors for people choosing to move their chair.

Model 2 Summary				
	Cox & Snell R Square	Nagelkerke R Square		
	0.23	0.307		

Variables in the Equation				
			95% CI for EXP(B)	
	B	Sig.	Lower	Upper
Personal Factors				
1. Gender	-0.347	0.355	0.339	1.473
2. Age	0.132	0.489	0.785	1.659
3. Major	NA			
4. Ocuppation				
Subject is Faculty	0.406	0.684	0.212	10.656
Subject is Community Member	-1.336	0.071	0.062	1.122
Social Factors				
5. Group Size	0.22	**0.008**	1.058	1.469
6. Would you like to sit with other or alone				
Sit alone	NA			
Sit with other people	NA			
Environmental Factors				
7. Why they move chair	NA			
8. Importance of chairs are movable	0.548	**0.000**	1.338	2.238
9. Surrouding environment	-0.304	0.13	0.498	1.093
10. Why use the space				
Location	0.752	0.147	0.767	5.862
Sun or Shade	0.53	0.312	0.608	4.747
Relaxing	0.506	0.368	0.552	4.983
Chat	0.323	0.657	0.332	5.746
11. Select Chair by Color	NA			
12. Why select the color	NA			
13. Day Interview	NA			
14. Select Chair for particular view	NA			
Constant	-3.045	0.13		

Table 4.5 Logistic Regression Output 2

In this model, group size become statistically significant.

- Controlling the effect of gender, age, occupation, why use the space, importance of chairs are movable and surrounding environment, the group size is bigger, people are more likely to move their chairs. The unit increase in the group size is associated with 1.247 increase in the odds of moving chairs.
- Controlling the effect of gender, age, occupation, group size, why use the space and surrounding environment, people think that chairs are movable is more important are more likely to move chairs. The unit increase in the importance of chairs are movable is associated with 1.73 increase in the odds of moving chairs.

Table 4.5 shows that between 23% and 30.7% variation in whether people moved chairs are explained by gender, age, occupation, group size, why use the space, importance of chairs are movable and surrounding environment.

4.3.2 Dependent Variable 2: Time people anticipate spending on nomadic chairs

When dependent variable was the time people anticipate spending on nomadic chairs, Table 4.6 showed that age, group size, and importance of chairs are movable were significant factors. Furthermore, people whom was older were less likely to sit more than 20 minutes; the group size was bigger, people were more likely to sit more than 20 minutes; people thought that chairs are movable was more important were more likely to sit more than 20 minutes. On the other hand, gender, occupation, major, select chair by color, day interview, why they move chair, sit with other or alone and surrounding environment were identified as nonsignificant factors for people choosing how long to use the chairs.

Model 3 Summary		
	Cox & Snell R Square	Nagelkerke R Square
	0.178	0.238

Variables in the Equation				
			95% CI for EXP(B)	
	B	Sig.	Lower	Upper
Personal Factors				
1. Gender	-0.081	0.821	0.458	1.858
2. Age	-0.043	**0.032**	0.921	0.996
3. Major	NA			
4. Ocuppation				
Subject is Faculty	NA			
Subject is Community Member	-0.329	0.593	0.216	2.401
Social Factors				
5. Group Size	0.252	**0.006**	1.074	1.543
6. Would you like to sit with other or alone				
Sit alone	NA			
Sit with other people	NA			
Environmental Factors				
7. Why they move chair				
Sit with Friends	0.132	0.821	0.364	3.578
Sit in Sun or Shade	0.014	0.973	0.454	2.267
Sit_Quiet Place	0.195	0.817	0.233	6.333
Sit_Nice Location	1.308	0.225	0.448	30.534
8. Importance of chairs are movable	0.34	**0.003**	1.124	1.757
9. Surrouding environment	NA			
10. Why use the space	NA			
11. Select Chair by Color	NA			
12. Why select the color	NA			
13. Day Interview	NA			
14. Select Chair for particular view	NA			
Constant	-3.757	0.094		

Table 4.6 Logistic Regression Output 3

More specifically, statistical results can be summarized as follow:

- Controlling the effect of gender, occupation, group size, why they move chair, importance of chairs are movable, people whom is older are less likely to sit more than 20 minutes. The unit increase in age is associated with 0.958 decrease in the odds of sitting more than 20 minutes.
- Controlling the effect of gender, occupation, age, why they move chair, importance of chairs are movable, the group size is bigger, people are more likely to sit more than 20 minutes. The unit increase in group size is associated with 1.287 increase in the odds of sitting more than 20 minutes.
- Controlling the effect of gender, occupation, age, group size, why they move chair, people think that chairs are movable is more important are more likely to sit more than 20 minutes. The unit increase in importance of chairs are movable is associated with 1.405 increase in the odds of sitting more than 20 minutes.

Table 4.6 shows that between 17.8% and 23.8% variation in the time people would spend on chairs are explained by gender, age, occupation, group size, why they move chair, importance of chairs are movable.

4.4 Discussion

According to the output of the logistic regression model, group size and importance of chairs are movable were identified as significant factors that influence both whether people moved their chairs and time people anticipate spending on nomadic chairs. Other significant factors such as age, occupation and why they move chair only influenced one of the two dependent variables. However, these significant factors were less convincible compared with the

nonsignificant factors, because they were highly logically connected with dependent variables. For example, people who rated chairs are movable with higher scores were more likely to move their chairs, which was predictable in logical manner. Thus, this study also addressed the nonsignificant factors as the primary finding.

William H. Whyte, as a pioneer in public space studies, has indicated that movable chairs were more favored by users than fixed seats. He explained fixed seats were awkward in public open spaces since they cannot be moved to keep appropriate social distance (Whyte, 1980). However, he did not explain what factors will influence people's willingness to move their chairs. In present study, age, gender, major, color of chairs, day interview, select chair for view, why use the space, sit with other or alone and quality of surrounding environment were identified as factors that will not influence people to move their chairs. However, the study was conducted under a campus setting, the findings may not reflect what happened in urban plazas.

Following Whyte's study, many scholars focused on different design elements that may affect people's behavior and decision making in public space, that were mentioned or not mentioned in Whyte's study (Abdulkarim and Nasar, 2014; Chang, 2002). When studying on the liveness of streets, Mehta (2007) found that people spent more time on the streets with seating than on those without. However, how long people would like to sit and why they spend time on chairs were not explained in Mehta's study. According to Figure 4.3, 48% of the participants in the present study would like to use the nomadic chairs more than 20 minutes. The findings from the study suggested that people like to sit less than 20 minutes when they are older and people like to sit more than 20 minutes when their group size is larger. Besides, gender, occupation, major, color of chairs, day interview, select chair for view, why use the space, willingness of

sitting with other people and quality of surrounding environment were found as factors that will not influence the time people anticipate spending on nomadic chairs.

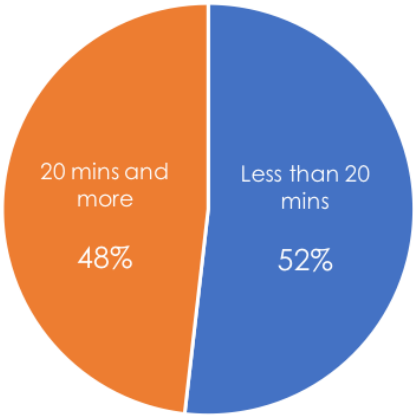

Figure 4.3 Time people anticipate spending on nomadic chairs

Based on the answers from two survey questions "Why did or did you not move your chair?" and "Why did you decide to use the space today?" the study has found that "sun or shade" was the most mentioned answer from the participants (see Figure 4.4). Thus, having both sun exposed and shade area was significant to motivate people using nomadic chairs and moving their chairs.

Figure 4.4 World Cloud using survey response of why people moving their chairs

Therefore, when designing a public space such as plazas, parks and streets, seating was a significant factor that required to be considered by designers as Whyte and Mehta suggested. Additionally, the seating areas that were exposed by sun or shade should be included in design considerations. Although many factors, such as gender, major and sit with other or alone, were identified as nonsignificant in this study, the characteristics of users and social environment may influence how they will use the space when a public space covers different types of users. For example, when users are younger and group size is larger, people would like to stay longer on chairs and move their chairs to stay closer. Therefore, analyzing the user profile in public space design should be recognized by landscape architects and planners.

CHAPTER FIVE
CONCLUSION

Because of the importance of public spaces to people's daily lives, researching of public spaces is meaningful and useful for urban development. Previous studies have researched personal attributes of participants, as well as physical characteristics that significantly impact on the visitability of public spaces and human behavior in those public spaces. However, the effect of movable chairs on people using a space has not been comprehensively explored. As a physical element, chairs play an important role in encouraging people to visit a space. However, fixed benches in study site are typically empty and unused. The present study conducted research on movable chairs to explore how movability of chairs affects people using a space to complement existing research on public spaces. This research also provides recommendations for improving outdoor facilities on the campus in the future. The study covered 160 participants, providing sufficient evidence to support results from this research.

Since this study is an extension of "The Idea Chair" project, which was conducted by the School of Planning, Design, and Construction at Michigan State University, the research site was assigned for surveying people on why they chose to use nomadic chairs. The Infrastructure Planning and Facilities (IPF) department of Michigan State University selected the location of the research site and set up movable chairs on the site. Therefore, the limitation of the study is only focusing on one park, called People's Park on campus. The park has similar facilities with other public spaces on campus, but has a unique location. Furthermore, the survey was conducted in fall, on both week days and a football game day (Saturday), but people may have different sitting behavioral performances throughout the year. Therefore, it is difficult to generalize why people chose to use nomadic chairs on campus since people may have different reasons depending on the time of the year.

Findings from this study support notions reported earlier in Whyte' study in the 1980s. This study further investigated the personal, social/ situational and environmental factors that might be significant or not significant on why people moved their chairs. From the present study, group size, occupation, why they move chair and importance of chairs are movable contributed to participants' decision of whether they will move chairs. Age, gender, major, color of chairs, day interview, select chair for view, why use the space, sit with other or alone and quality of surrounding environment were not significant in this study. Additionally, the study investigated the factors that may influence the time people anticipate spending on nomadic chairs. Age, group size and importance of chairs are movable were identified as significant, the nonsignificant factors included gender, occupation, major, color of chairs, day interview, select chair for view, why use the space, why they move chair, sit with other or alone and quality of surrounding environment. Therefore, the study suggested that when nomadic chairs became optimal seating option in plaza design, the space should be designed to accommodate both small and large group of people in terms of their sitting behaviors.

Implications from this study are useful for future design guidelines for campus planners, and landscape architects in order to understand what factors affect people using nomadic chairs on campus. Understanding what attracts and affects people using nomadic chairs is important to improve outdoor facilities and public space design on campus. Due to the limitations of this study, future studies should be conducted on different public spaces on campuses with different characteristics and facilities. Selecting multiple research sites helps to generalize the results in order to identify specific factors that significantly affect people using chairs on campus. Further research is recommended to see if results of this study apply to other public spaces on different campuses. Are the factors that influenced people's behaviors with nomadic chairs at MSU

similar to the factors that influence people's interactions with nomadic chairs? Expanding the sample size in this way will improve the reliability of study on nomadic chairs, as it will establish whether nomadic chairs cause the same behavioral performances and are as popular as they were at MSU. Additionally, this study was not able to survey all who used the nomadic chairs because it only involved one researcher recording answers. The researcher was not able to survey every user, and so some perspectives on the chairs may have been missed. In order to improve the validity of future studies, having more researchers available to ask all who use nomadic chairs in a given observation period will ensure that all of the perspectives on the nomadic chairs are recorded in a given study.

APPENDIX

#IdeaChair – Movable Chairs in People's Park, MSU Campus

Please take a moment to tell us a bit about yourself.

1. What is your gender?
Male Female I identify as:

2. What is your age?

3. What is your major or area of concentration?

4. Are you a (please circle one):
Student
Faculty or Staff Member
Community Member

5. How many people have come with you to enjoy the chairs today (excluding yourself)?

6. Did you move your chair? Why did or did you not move your chair?

7. Did you pick a chair with any color? Why or why not?

8. Would you like to sit next to other people or alone?

9. How long do you anticipate sitting in here today?
_____ 0-5 Minutes
_____ 6-10 Minutes
_____ 11-15 Minutes
_____ 16-20 Minutes
_____ More than 20 minutes

10. Why did you decide to use this space today?

11. Did you select or move your chair for any particular view? (such as facing the sidewalk, facing the sun, to watch other people sitting in chairs, to watch nature)

12. How important is it that the chairs are moveable?

1 2 3 4 5 6 7 8 9 10
Not at all important Very Important

13. How would you rate the surrounding environment?

1 2 3 4 5 6 7 8 9 10
Not at all enjoyable Very Enjoyable

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