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MEASUREMENT OF ART AND CULTURAL CONSUMPTION  
BEHAVIORS FOR DEVELOPING STRATEGIC  
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Doo Syen Kang

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**MEASUREMENT OF ART AND CULTURAL CONSUMPTION  
BEHAVIORS FOR DEVELOPING STRATEGIC  
COMMUNICATIONS**

**By**

**Doo Syen Kang**

**A DISSERTATION**

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## **ABSTRACT**

### **MEASUREMENT OF ART AND CULTURAL CONSUMPTION BEHAVIORS FOR DEVELOPING STRATEGIC COMMUNICATIONS**

**By**

**Doo Syen Kang**

Art and cultural organizations are in dire need of promotion. The two main target audiences include the public at large and legislators at all levels of government. The industry is struggling due to unstable economic conditions, a lack of systematic support from law makers, and a largely apathetic general public. To encourage the economic development of the sector, organizations need to identify how people are engaged in art and cultural consumption, how those behaviors are related, and what affects their behavioral patterns. Information such as this will be useful for developing the efficient and successful messages targeted organizations' primary audiences.

To obtain the valuable and practical data for the creation of successful messages, this research investigates three research questions: 1) Are there any variables which explain patterns in art and cultural consumption behaviors?; 2) Are there any relationships among those variables?; and 3) Can people be categorized by relationships found among the variables? Based on the research questions, this research is informed by two theories that provide the conceptual frame for developing the questionnaires for the survey; Theory of Planned Behavior (TPB) and Social Cognitive Theory (SCT).

The general public in the Great Lakes States was asked to participate in the data-driven Web survey. The survey questions were divided into several sections based on the theories that guided this study. Normal Ogive Harmonic Analysis Robust Method was used to check the validity of using a multiple dimensional analysis. As a next step, Multiple Item Response Theory examined the valid items, determined their associations, and categorized the items as constructs of measurement.

The results indicated that people who attend art performances have a high probability to participate in activities related to the performing arts and vice versa. In addition, once people become exposed to art and culture, regardless of whether they were engaged in voluntarily or not, they seem to have a more positive attitude toward participating in art and cultural activities later. Those who enjoy traveling are more likely to participate in a variety of other cultural activities, such as attendance at different performances and even donation to cultural organizations.

This study identifies how people behave differently and determines which items are valid for segmenting people based on the engagement levels. By interpreting the results in accordance with the goals of campaigns, communication planners can develop more efficient and target-oriented messages and strategies. The persuasive messages targeting a specific group of people will boost more participation in the art and cultural sectors and play a role to enlighten people and policy makers.

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## **Chapter 1. Introduction**

This chapter explains the motivation for the current research. The research problem is identified and the reason this research is important is explained. This preview also contains specific research questions corresponding to the research objectives. The case is made that these research questions address theoretically interesting issues of practical importance. This introduction begins with a problem statement.

### **Problem Statement**

The unstable economic and social environment highlights a critical challenge facing art and cultural organizations: promoting the entire industry to two primary target audiences, the public and policy makers. With the low awareness of the significance of the art and cultural industry, organizations suffer from dwindling engagement from the public and depleted support from legislators. To boost the economic development of the art and cultural sectors, organizations need to collect scientific data for verifying the value of art and culture and for developing efficient messages to get across to both target audiences. Unfortunately it is difficult for art and cultural organizations to work collectively, because they are all struggling to survive and their associations cannot afford extensive research projects.

The art and cultural sector is believed to be an industry with great potential for the development and vibrancy of a society, despite indefinable outcomes that are not seen now, but which might be substantial later (Hall, 2000; Markusen & Schrock, 2006). Without immediate consequences, however, policy makers doubt the importance of the sector in regard to economic development, and the public has a tendency to be less involved in art and culture-related activities than in any other consumption behaviors.

Moreover, the art and cultural sector is often not identified as a top area of concern with respect to resource allocation and community support, as the educational benefits and economic impacts of the industry have been in controversy. One recent example reflecting the underestimated value of the arts, culture and art education is Governor Jennifer Granholm's executive order to close the Michigan Department of History, Arts and Libraries and split its functions among seven other departments and some outside groups, including possibly Michigan State University.

Though it is evident that art and culture are the essence of human history, it is hard to expect both policy makers and consumers to put emphasis on those disciplines when they struggle with a sluggish economy and consider belt-tightening in consumption. What needs to be done is not always identical to what people are doing. Felkins (2001) summarizes several ways to remove these kinds of contradictory and

inconsistent qualities that are called social dilemmas: 1) privatizing to the extent possible; 2) directly tying the return to the cost; 3) depending on small groups; and 4) using coercion and other outside inducements. In the case of art and culture, the fourth one appears most appropriate.

Art and culture-related organizations are in dire need of governmental support as a back up when voluntary public cooperation falls short. For example, when environmental groups expect little chance of aggressive and voluntary environmental action from the population, they try to get protective legislation passed. A similar case can be made in regard to funding of the arts. When art and cultural organizations and educators know that the public will not voluntarily help out, they need to persuade policy makers to move in favor of them for giving the public what they need. Their needs include government subsidies which will help art educators teach art and cultural classes, help art and cultural producers such as artists and business owners keep doing their jobs for a living and help organizations increase public awareness and ultimate sales by planning community events and communication campaigns.

Many types of organizations can play a substantial role in advocating art and cultural producers and encouraging cooperation from the public. News media can provide educational campaigns effective in bringing both the public and policy makers on board with what needs to be done. Strategic communication campaigns can

be operative to enhance the public's awareness of the importance of art and cultural activities and also to encourage policy makers to address the potential of the art and cultural industry in boosting the economy.

To develop persuasive and efficient messages for both audiences, organizations need to collect scientific information on how people behave and think. Persuasion is much easier if the message is compatible with a person's general disposition toward a subject (Wilcox & Cameron, 2009). For example, if legislators are presented with data that supports the theory that art education at an early period of life is closely related to art consumption at a latter period in life, they will be more confident with keeping or even increasing the budget for art education. And if organizations know what target audiences want to hear, they will be better able to establish successful communication plans.

The reality, however, is that public arts organizations are mostly small- and medium-sized organizations that cannot afford to collect massive and systematic data from the public. Each organization spends its effort and limited resources for implementing the limited data collection of its own consumers or artists. These efforts do not help organizations work together for the shared causes. Primarily based on their experience and intuition, organizations claim the connection between art education and art consumption, in addition to the contribution of the art and cultural

industry to economic development. Unfortunately, it is difficult to convince policy makers without supporting data.

Therefore, both organizations and policy makers will benefit from the current research, which will provide data for organizations to use to persuade the public and policy makers. Both will get robust rationale for their stances and important data for developing better messages appealing to the public.

### **Research Objectives**

The most important component for organizations to identify when developing strategic communication plans appealing to target audiences is how people think and behave. Specifically, it is pivotal to know how people are engaged in art and cultural consumption, how those behaviors are related, and what affects their behavioral patterns. The data collected will be conducive to the development of more persuasive and target-oriented messages.

This research aims to help organizations develop and implement strategic communication campaigns that target both policy makers and the general public that will eventually contribute to advocating for art and cultural producers and educators, and the discipline itself, and enhancing cultural economic development. A communicator wants to inform and or persuade; a recipient wants to be entertained,

informed, or alerted to opportunities that can fulfill individual needs. Audiences come to messages for very different reasons: 1) surveillance of the environment to find out what is happening that has some impact on them; 2) entertainment and diversion; 3) reinforcement of their opinions and predispositions; and 4) decision making about buying a product or service (Wilcox & Cameron, 2009). This explains why the communicators must tailor messages that focus on getting the target audiences' attention. It is when messages match target's needs and expectations that messages are most likely to be effective.

Although communication campaigns come in many varieties and cannot always be placed into mutually exclusive categories, the field is increasingly making a distinction between at least two main types of campaigns based on their primary purpose, or what the campaigns are ultimately trying to achieve: individual behavior change versus policy change campaigns (Dorfman, Ervice & Woodruff, 2002; Henry & Rivera, 1998). Individual behavior change campaigns try to promote behaviors that lead to an improved individual or social well-being. Policy change campaigns attempt to mobilize public and decision maker support for policy support or change (Coffman, 2002; Dorfman et al., 2002; Weiss & Tschirhart, 1994). In some ways, campaigns for both purposes look similar, and especially the art- and culture-related campaigns should target both sides at the same time for better performance.

The collection of information assists in shaping these types of campaigns and is similar to the practical marketing research approaches and methods that commercial marketers use (Balch & Sutton, 1997). It aids in defining the scope of the problem, identifies possible campaign strategies, provides information about the target audience, finds what messages work best and how they should be framed, determines the most credible messengers, and identifies the factors that can help or hinder the campaign (Valente, 2001).

Therefore, the current study identifies and understands how the market generally works, which factors have great impact on public consumption behaviors, how those factors are correlated and how the target audience might be segmented by the indexes of their involvement in art and culture-related activities. It will contribute to developing efficient messages for the public and policy makers to be more involved in art and cultural activities and to recognize the importance of the industry from long-term and comprehensive perspectives.

### **Research Scope and Questions**

The research objectives present a clear idea of where and how the research should begin. This research incorporates three questions corresponding to the research objectives: 1) Are there any variables that explain patterns in art and cultural

consumption behaviors?; 2) If those variables exists, are there any relationships among those variables?; and 3) Can people be categorized by relationships found among the variables?

According to Grunig and Repper's (1992) situational theory of publics, people uninterested or uninvolved in a topic will not process messages deeply, but those more interested will be more likely to elaborate and to think more carefully about the message. The most effective campaign will combine various strategies to address the needs and interests possessed by different target publics or to address the challenges presented at different steps in the persuasion process. For example, a campaign might use an affective strategy to pique the public's interest in an issue and follow that with a more logically based message to deepen the public's understanding of issues.

The target population of this research must be the general public without *a priori* segmentation. With the data derived from the research, the campaign planners can categorize and cluster the public by their beliefs, attitudes, and behaviors in the cultural sectors for establishing a customized campaign plan. Their attitudes will be measured and their behavior will be classified to assess meaningful patterns. With this information, the campaign strategy can be more target-oriented and the campaign message will be more target-specific. In addition, the theoretical frame or identified

patterns might be utilized in the future to evaluate the effect of campaigns and to gauge changes in behavior.

Research about how people behave and think in a specific area, so-called audience research, is becoming an increasingly important tool for arts administration and policy making. Audience studies have been used to assess public attitudes towards the arts, to determine the composition of audiences for particular institutions, to provide input into decision making, to provide baseline data for market development programs, and to estimate the economic impact of arts activities on specific communities and states (DiMaggio & Useem, 1979). Information gathered can be further used in identifying marketing opportunities and evaluating the contribution and performance of the cultural economic development strategy over time. It might even be used to articulate the market and non-market values of arts and culture.

To satisfy these purposes of audience research, the following research questions are asked: 1) What kind of factors are valid for measuring public consumption behavior in the art and cultural sectors?; 2) Are there any associations between the valid factors?; and 3) Can those associations be used for distinguishing publics and for explaining their different behavioral patterns and unobserved characteristics?

This study will explore how people are engaged in art and cultural activities, reveal any stereotyped patterns and salient differences in cultural consumption, and analyze them through a valid clustering of audiences. It will contribute to identifying, understanding, interpreting, and predicting audience behaviors in the art and cultural industry, and will enhance planning a more efficient and target-oriented communication campaign. The current research does not include an economic impact study that focuses on obtaining the estimated values, such as the number of employees and sales amount, by plugging some self-administered numbers into the econometrics formulas.

## **Conclusion**

Despite the dire need to boost the art and cultural sectors, organizations suffer from low awareness of the industry from their main audiences, the general public and legislators. To make the industry more vibrant, there is a need for active engagement from the public and solid support from law makers. There is a need to encourage people to participate in art and cultural consumption and pass legislations favorable to the arts.

Given this situation, organizations need reliable data for developing persuasive messages that appeal to the general public and policy makers.

Organizations can move people better with messages developed from the reliable data of people's behavior and interests. Legislators like to have scientific data of how the whole industry works and what is conducive to the vibrancy of the art and cultural sectors as rationale for passing laws designed to support art and cultural organizations. For example, if there is a positive connection between art education in childhood and art consumption as an adult, law makers will be more likely to support the passage of art education-related laws.

In this context, the current research aims to identify how people behave as art and cultural consumers, to determine the factors which influence consumers' attitudes, beliefs and behaviors, and to categorize people based on their behavioral patterns. To obtain these objectives, three research questions are asked about factors that can measure consumption behavior in the art and cultural industry, the associations of the factors, and the usability of the associations as categories to represent different behavioral patterns and unobserved characteristics. The results will help organizations develop successful campaigns, of which the ultimate goal is individual and public behavioral change.

## **Chapter 2. Theoretical Framework and Literature Review**

This section explains the theoretical background for the current research. The rationale for the approach taken by this study comes from audience research and attitude and behavior linkage theories respectively. With respect to audience research, the general focus of the research and how it is developed is introduced, while two specific theories are selected for explaining the linkage between attitude and behavior: Theory of Planned Behavior and Social Cognitive Theory. Even though the survey questions are developed based on both theories, the purpose of this study is not to test any specific theory. The theories in the current undertaking play a role as schemas to account for the findings of this research.

Audience research represents the importance of knowing audience attitude and behavior for customizing messages to the needs of target audiences. The objective of this study is to identify and understand behavioral patterns in art and cultural consumption for developing efficient messages for public and policy makers to be more engaged in the art and cultural activities and recognize the importance of the industry itself. Therefore the history and development of audience research will be helpful for better understanding why the research is important and how the results can be utilized.

Linkage of attitude and behavior is described by the two widely used theories:

the Theory of Planned Behavior (TPB) and the Social Cognitive Theory (SCT). The comparison of the main concepts highlights the similarity and the difference of the two theories and how much researchers are interested in advancing the linkage of attitude and behavior. With this long history and popularity of the two theories, the association between attitude and behavior is regarded as the appropriate theoretical framework for developing the survey questionnaire, as there is no existing study of behavioral patterns in the art and cultural industry.

### **Audience Research**

Knowing your audience and tailoring messages to your audience are twin rules of effective persuasion. Therefore, knowledge of audience characteristics such as beliefs, attitudes, concerns and lifestyles is an essential part of persuasion. The information helps the communicator tailor messages that are salient, answer a felt need, and provide a logical course of action (Wilcox & Cameron, 2009). Analysis data give more information of the target public's buying habits and ways of spending leisure time than demographic information such as age, gender and income.

Campaign organizers execute an audience segment study to ensure the consistency, integration, and proper timing of all campaign activities directed to a given target audience. The messages, tactics, and strategies of the campaign differ

according to the audience and may change over time. Tailoring the campaign's messages to respond to specific audience segments based on their behavioral patterns requires use of a variety of messages and channels. Research must be conducted to ensure that the campaign is properly positioned in the minds of the campaign's diverse target audiences ("Integrated communication plan," 2002). Apart from making it easier to develop more specific, relevant, and appealing messages, segmenting the target audience also helps to choose the appropriate communication tools, determine the best ways to distribute communication products, and develop adequate incentives to effectively promote the desired behavior ("Outreach campaign planning - target audience," n.d.).

According to a national survey of 300 professionals assessing their research, public relations practitioners recognize the values of more fundamental information than media management for achieving their campaign goals and bringing out audience change in their actual behavior (Austin & Pinkleton, 2006). They adopted the easier items to quantify such as media coverage and volume of media pick ups, instead of implementing research to collect more useful information that could be applied for a variety of usage such as measurement of change in attitude, knowledge and ultimately behavior (see Table 1). Without scientific data to compare pre- and post-communication campaigns, it is impossible to implement strategic communication

plans and to claim that audience change is derived from the success of a communication plan and the messages directed to the target audience. Therefore, communicators' frustration appears to lie in the discrepancy between communication practices which focus on getting more messages covered by media and what needs to be done with conducting and applying research.

Table 1 Use and value of research measures among public relations practitioners

|                           | Mean for Use (Rank) | Mean for Perceived Value (Rank) |
|---------------------------|---------------------|---------------------------------|
| Advertising equivalency   | 3.71(9)             | 3.37(9)                         |
| Volume of media pickups   | 5.43(2)             | 4.57(8)                         |
| Favorable media treatment | 5.35(3)             | 4.96(7)                         |
| Media coverage            | 5.47(1)             | 5.19(5)                         |
| Changes in awareness      | 4.95(4)             | 5.64(4)                         |
| Changes in knowledge      | 4.85(5)             | 5.90(2)                         |
| Changes in attitudes      | 4.74(6)             | 5.77(3)                         |
| Changes in sales          | 4.07(8)             | 5.08(6)                         |
| Changes in behavior       | 4.64(7)             | 6.02(1)                         |

*Note. All measures on 7-point scales, with 1 indicating less use or value and 7 indicating more use or value.*

The idea of audience research has been characterized according to its emphasis on message receivers. This concept has been applied to several areas of research including marketing, advertising, and communication under a variety of names, such as consumer, market segment or audience research.

In the field of mass communications, there has been a widespread and enthusiastic call for convergence in theoretical approach and research traditions (Radway, 1984; Seiter, Borchers, Kreutzner & Warth, 1989; Billig, 1991; van Dijk,

1991; Silverstone & Hirsch, 1992). This call for convergence has centered on the audience of mass communication and generated a body of research which drew upon diverse theoretical and methodological traditions (Livingstone, 1993).

A revisionist movement has emerged in media and cultural studies. One of the key notions in the movement was a re-conceptualization of the audience as an active producer of meaning. Meaning was constructed through the interaction between text and the social and discourse positions of audiences (Curran, 1990). Morley (1980) showed that divergent groups responded in very different ways to certain media and that these differences reflected the different discourses and institutions in which people were situated. He illustrated the importance of different sub-cultural formations within the same class in generating different audience responses. From this perspective, one can no longer talk about the effects of a message on a homogeneous mass audience who is expected to be affected in the same way.

Another aspect of the perspective that audiences perceived mass-communicated meanings differently was the tendency of people to seek out media content that reinforces what they think and to avoid content that challenges their beliefs (Curran, 1990). Existing research supported that subcultural formations within the audience influenced the extent to which media representations were accepted or

not (Brigham & Giesbrecht, 1976; Vidmar & Milton, 1974). A study revealed a more complex picture in which groups with different clusters of attitudes – whether ethnocentric, authoritarian or traditionalist – responded to the series in partially different ways (Wilhoit & de Bock, 1976). Meyer (1976) produced an integration of some of the themes of the revisionism that different types of audiences, bringing different beliefs, attitudes, and values to the viewing of the show as a result of different socialization processes, are affected in distinctly different ways. The mass audience has been shown to be significantly heterogeneous, particularly in relation to gender, class, culture, and age, but also in relation to cognitions, involvement, and styles of viewing, as both reception and ethnographic research have demonstrated (Livingstone, 1993).

Katz and Liebes (1985) described exposure to and perception of media content as highly selective, governed by the attempt of the individual to avoid cognitive dissonance. Consequently, the intended or anticipated audience response could be resisted or twisted if the message challenged the preconceived opinions of the audience (Schroder, 1987).

In the field of marketing, which is well known for advanced approaches to the market or audience, the marketing concept is an underlying frame to explain why market research is important. The marketing concept calls for most of the effort to be

spent on discovering the wants of a target market and then creating the goods and services to satisfy them (Kotler & Zaltman, 1971). This concept is the key to achieving organizational goals and consists of determining the needs and wants of target markets (Kotler, 1980). An organization takes the time, effort, and financial expense of gathering information about present or prospective exchange partners. If marketers strive to understand exchange partners and tailor offerings for them, information is a necessary preparatory step to developing that proper blend. Added information can be used to reduce organizations' effort in making exchanges. This value is directly related to the effort required to make exchanges (Houston, 1986).

The marketing concept does not urge marketers to depend solely on marketing research for guidance. Dependence on customers' expressions of their own needs and wants suggests that some marketers fail to take a long-run view of the marketing concept. Consumers are not necessarily good sources of information about their needs. They don't necessarily know how they will react under different environmental conditions. Sometimes consumers have to learn about new technologies, beliefs, and ways of behaving. Anticipating future needs and wants is consistent with the marketing concept (Houston, 1986). This doesn't mean that marketers reject the marketing concept, but customer information must not be limited to the current, expressed needs and wants.

Duncan and Moriarty (1998) found common elements in marketing and communication: relationship exchange, feedback, and information signs/signals. The notion that communication is a central integrative process in marketing is demonstrated in the evolving theories of integrated and relationship marketing. Zinkhan and colleagues, in a special session on Integrated Marketing Communications (IMC) and relationship marketing at Emory University's 1996 relationship marketing conference, argued that these two disciplines are complementary metaphors.

There are also important points of intersection between communication and marketing theories that support the argument for a communication-based model of relationship marketing. Both marketing and communication are in the midst of fundamental changes that are similar in origin, impact, and direction (Duncan & Moriarty, 1998). Parallel paradigm shifts move both fields from a functional, mechanistic, production-oriented model to a more humanistic, relationship-based model. Therefore, comprehensive and various frames to view the target audience or consumers are important.

As researchers advocate that there are interchangeable notions in the two disciplines, marketing and communication/public relations, communication campaign designers are advised to integrate the different, but applicable ideas and practices from

marketing field into communication planning and evaluation. Undeniably, marketing has made a great progress in detecting, measuring, and predicting the public in the name of the consumer. The application of advanced techniques in marketing to the communication field will contribute to finding more accurate and realistic measurement and evaluation methods in communication campaign planning and implementation.

In this context, in-depth audience research should be designed to make an inference of unobserved characteristics from the explicit attitudes and behavior. This research made an effort to find other dynamics to moderate and affect the relationship between the attitude and behavior of the audience participating in arts- and culture-related activities. Categories to segment audience were not limited to consumer demographics examples, like age, gender, occupation, income, marital status, presence of children in the household, and geographic location of residence. Comprehensive study would be conducive to tailor future communication campaigns to the specific target audience, to create a mutual understanding of the importance of that market, and to draw collaborative endeavors from the public.

### **Attitude and Behavior Linkage**

The theoretical structure between attitudes and behavior is a basis for

justifying the goals and strategies for public relations campaigns. McGuire (1989) wrote that successful communication campaigns depend on a good understanding of two types of theories: those that explain “how someone will process and respond to a message” and those that explain “why someone will or will not respond to a message in desirable ways.” The connection between attitudes and behavior is assumed to provide an accountable infrastructure for the “how” and “why” questions mentioned above. Organizers believe they are able to influence, predict, and change people through strategic media campaigns. The media are seen as potential agents of remote control, possessing the ability to persuade individuals to change their attitudes and behavior (Schroder, 1987). This also appears to be applied to establishing the successful marketing plans.

The American Marketing Association defines consumer behavior as the dynamic interaction of affect, cognition, behavior, and the environment (Bennett, 1995). Marketing managers have recognized the importance of consumers and have sophisticated approaches and detailed data from which to develop successful marketing strategies (Peter & Olson, 2005). In order to change or influence consumer behavior, marketers need to understand why people behave the way they do (Fishbein et al., 2001). In other words, their strategies and plans need to be based on underlying dynamics. The conceptual models tell practitioners and managers what to do and in

what sequence.

Frameworks provide a basis for both research and strategy (Andrease, 1995).

Just as theory is important for marketing strategy, it is also important for evaluation of marketing strategy. Providing the strategy with a theoretical base can both support its development and serve as a basis for its implementation and evaluation (Valente, 2001). Strategic marketing planning does not need to rely on just one theory. Theories can be used in combination, and many strategies have integrated more than one of these into their designs and planning.

Since LaPiere's study (1934), which is probably the most widely cited study in attitude-behavior relationship research (Fazio & Roskos-Ewoldsen, 1994), there have been a considerable number of studies executed to investigate the link between attitudes and behaviors. As Campbell (1963) concluded, the degree of correspondence between attitude and behavior is, for the most of part, yet to be discovered. Allan Wicker's conclusion (1969) that it is more likely that attitudes will be unrelated, or only slightly related, to overt behavior than that attitudes will be closely related to actions, led researchers to look at the attitude-behavior relationship from either a methodological or a moderator variable perspective (Berger & Mitchell, 1989). This dichotomous perspective is still predominant in recent studies. Researchers focus on a method-analytic review including meta-analysis (Baggozi & Burnkrant, 1979; Dillon

& Kumar, 1985; Hausenblas, Carron & Mack, 1997; Armitage & Conner, 2001), while others place emphasis on addition or substitution of moderators to increase accountability and predictability (White, Terry & Hogg, 1994; Wiesner & Tesch-Romer, 1996; Van Ryn, Lytle & Kirscht, 1996).

### *Theory of Planned Behavior*

In an effort to find a more accountable relationship between attitudes and behaviors, Ajzen and Fishbein created the Theory of Planned Behavior (Ajzen, 1985; Ajzen, 2001; Ajzen & Fishbein, 2000), which is one of the most popular theories shared in public relations, advertising, and marketing ("Theory clusters," n.d.). The Theory of Planned Behavior (TPB) is extended from the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), which suggests performance of a given behavior is primarily determined by the intention to perform that behavior. Many public relations campaign studies have used the intention factor as a predictor of future behavior. Thus, to predict whether people will be engaged in a specific behavior, researchers measure their intention to do or not to do it.

Two major factors influence those intentions; 1) a person's attitude toward the behavior and 2) a person's subjective norms about the behavior, which is the belief that the people important to the person think he or she should or should not perform the behavior. In turn, attitudes and subjective norms are influenced by behavioral and

normative beliefs (Peter & Olson, 2005). Compared to the theory of reasoned action, the model of planned behavior includes the additional measures of control beliefs (the perceived frequency of occurrence of salient facilitating or inhibiting factors) and perceives behavioral control and the additional causal relationships between the variables (McElreath & Blamphin, 1994).

Studies in tourism, one of the primary sectors in the art and cultural industry, integrated the variable of past behavior in the TPB (Lam & Hsu, 2004, 2006). Ajzen (1991) criticized the use of past behavior on grounds that it offers no explanatory content, but previous empirical tests of this theory found that past behavior can enhance prediction of intention and/or future behavior (Triandis, 1977; Berkowitz, 1982; Doney & Cannon, 1997; Quellette&Wood, 1998; Abraham & Sheeran, 2003). Researchers try to find more applicable variables to predict intention to travel to a specific region, e.g., specific country, wine tourism, and rural tourism.

Lam and Hsu (2004, 2006) tested TPB with potential travelers from Mainland China to Hong Kong. The questions in their study included: Will travelers' past experiences at a destination affect their choice of the destination again in the future? Are travelers influenced by personal expectations and experiences? Will expectations of others affect travelers' choice of a destination? What is the role of social influence on travelers' decisions? Will facilitating or inhibiting factors affect the decisions?

Results showed that data fit the TPB model moderately well and explained respondents' traveling intention. Attitude, perceived behavioral control, and past behavior were found to be related to traveling intention.

Another study in tourism (Sparks, 2007) tested TPB's ability to predict tourist intention to take a wine-based vacation using perceived control with past attitude. Wine/food involvement, normative influences, and the three wine expectancy-value dimensions (core wine experience, destination experience, and personal development) contributed to the intention to take a vacation to a wine region. This study also included past experience with wine and destination in the model.

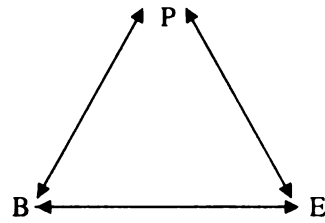
Maestro et al. (2007) examined tourists' attitudes toward rural tourism. The findings confirmed the positive effect of attitude toward rural tourism on perceived quality and the moderating role of familiarity. Experience moderates the relationship between attitude toward rural tourism and satisfaction and perceptions of quality. As a result, the more experienced the tourists, the less altered the evaluation result, i.e., the more accurate the predictive measure. In tourism research, researchers put value on past experience as a powerful moderator to enhance the correspondence between attitudes and behaviors of potential tourists.

#### *Social Cognitive Theory (SCT)*

Another popular theory that is frequently compared to TPB and prevalent in

health communication campaigns research is Social Cognitive Theory (SCT). This theory suggests that self-efficacy – the belief that one has the skills and abilities necessary to perform the behavior under various circumstances – and motivation to perform the behavior, are necessary for behavior change (Bandura, 1997). Many researchers have striven to find the similarity and/or difference between PBC in TPB and self-efficacy in SCT, which is summarized in the later section that compares TPB and SCT. Self-efficacy and PBC are perceived as very similar concepts. And self-efficacy appears closely related to prior behavior, like prior experience, exposure and knowledge, which is found to be one of the most important factors affecting behavioral change in tourism.

Figure 1 provides a graphical explanation of the theory. A person must believe he or she can perform the behavior in various circumstances and have an incentive (positive or negative) to do it (Parraga, 1990). This mostly factors into one of the important public relations campaigns, health-related campaigns and research, such as anti-alcohol, condom use, and anti-drug programs, to have a direct relationship with behavioral intentions for future health-related behaviors. One of the goals of health-related campaigns is to encourage people to do what organizations want people to do. Therefore it appears to be appropriate to take self-efficacy into account for knowing what affects behavioral changes in art and cultural consumption.



P: Personal factors, B: Behavior, E: Environmental

Figure 1 Diagram of Theory (Bandura, 1986)

Bandura's (1997) social cognitive theory explains how people acquire and maintain certain behavioral patterns, while also providing the basis for intervention strategies. He believes the way people perceive their ability to cope with a situation and to control its outcome (perceived self-efficacy) influences how people behave in a given situation.

#### *Comparison between TPB and SCT*

In general, behavior is viewed as the result of a set of beliefs about specific products or services and a set of affective responses to the behavior. The beliefs are represented by behavioral beliefs and outcome evaluations in TPB and by outcome expectations in SCT. Together they are referred to as the net benefits (realized or expected) accruing from use of the system (Seddon, 1997). Affective responses are typically measured by attitudes toward use and an individual's evaluation of the behavior as either positive or negative. These commonalities in the models reflect a belief in the cognitive basis of behavior.

SCT and TPB include other beliefs that might influence behavior independent of perceived outcomes (Compeau, Higgins & Huff, 1999). The TPB model incorporates the notion of perceived behavioral control as an independent influence on behavior, recognizing that there are circumstances in which a behavior might be expected to result in positive consequences (or net benefits) yet not be undertaken due to a perceived lack of ability to control the execution of the behavior (Ditsa, 2002). Perceived behavioral control encompasses facilitating conditions, such as perceptions of resources and technology (Thompson, Higgins & Howell, 1991), as well as perceptions of ability or self-efficacy (Taylor & Todd, 1995). SCT gives prominence to the concept of self-efficacy, defined as beliefs about one's ability to perform a specific behavior, recognizing that our expectations of positive outcomes of a behavior will be meaningless if we doubt our capability to successfully execute the behavior (Compeau et al., 1999).

Since Ajzen (1991) argued that the PBC and self-efficacy constructs were interchangeable, several researchers have suggested that the two variables are different notions and have compared how they work differently in predicting a specific variable. Terry (1993) suggested that self-efficacy and PBC are not entirely synonymous. Researchers advocated the use of measures of self-efficacy, as opposed to PBC, in the prediction of intentions and behavior (Armitage & Conner, 1999). De

Vries, Dijkstra, and Kuhlman (1988) tested the model through attitude and behavior toward smoking. Attitudes and subjective norms were significant predictors of the intention (not) to smoke, but self-efficacy expectations added significantly to the prediction of the intention. Self-efficacy also had a direct effect on behavior after controlling for intention. In this study, self-efficacy highly reflected the actual control or the skills of the adolescents. Furthermore, it appeared that non-smoking adolescents had higher self-efficacy expectations towards non-smoking than smokers.

Dzewaltowski, Noble and Shaw (1990) also found that self-efficacy directly impacted behavior. Social cognitive theory and the theories of reasoned action and planned behavior were examined in the prediction of four weeks of physical activity participation. The social cognitive theory variables significantly predicted physical activity participation, with self-efficacy and self-evaluation of the behavior significantly contributing to this prediction. The greater the confidence in participating in physical activity and the greater the satisfaction with present physical activity, the more physical activity was performed. Perceived control and intentions did not account for any unique variation in physical activity participation over self-efficacy. Therefore, the social cognitive theory constructs were better predictors of physical activity than those from the theories of reasoned action and planned behavior.

On the other hand, there are studies which focus on the conceptual and

empirical distinction between PBC and self-efficacy in the attitude-behavior relationship, instead of obvious opposition to PBC or strong support for self-efficacy. White, Terry and Hogg (1994) reported that perceived behavioral control only affected behavioral measures of discussing the use of condoms with any new partner for safer sex behaviors, while self-efficacy had a strong effect on the intentions to discuss and the intentions to use condoms. A study was undertaken in the context of HIV-preventive behaviors of sexually experienced heterosexual undergraduates. The study employed a longitudinal design, with the proposed predictors of performing the behaviors under consideration assessed (using a condom every time you have sexual intercourse during the next month and discussing whether to use a condom with any new partners during the next month) prior to the measures of reported behavior. A group norm emerged as a distinctive predictor (in addition to attitude and subjective norm) of intentions to practice both safer sex behaviors. The data also revealed some support for the distinction among the different measures of control (self-efficacy, perceived behavioral control, and planning).

In contrast, Terry and O'Leary (1995) found that self-efficacy only predicts intentions, while PBC predicts exercise behavior. Their study was concerned with the prediction of intentions to engage in regular exercise (for at least 20 minutes, three times a week for a fortnight) and actual exercise behavior. Undergraduate subjects

participating in the study revealed support for the view that separate measures of self-efficacy and perceived behavioral control should be employed in the theory of planned behavior. Efficacy expectancies were found to influence behavioral intentions, but not actual behavior. In contrast, levels of perceived behavioral control appeared to have no effect on behavioral intentions, but emerged as a significant (positive) predictor of actual behavior. There was also evidence that the effects of intentions on behavior are moderated by the level of perceived behavioral control.

Povey, Conner, Sparks, James and Shepherd (2000) also examined the application of TPB on two dietary behaviors, particularly focusing on the roles of perceived control and self-efficacy as two components of the perceived behavioral control construct in the TPB. First, the general public was asked whether they eat five portions of fruit and vegetables per day or eat a low-fat diet, and then they were asked for actual eating behavior one month later. In addition, the individual components of perceived behavioral control (perceived control and self-efficacy) and their determinant beliefs were examined. For each behavior, the TPB variables were found to be good predictors of intentions, although less good at predicting behavior, with self-efficacy being consistently more predictive than perceived control.

As a further step, Armitage and Conner (1999) suggested the need for multi-method assessments of behavior. Their study consisted of four parts: (1) to apply TPB

to eating a low-fat diet; (2) to consider differences between self-efficacy and PBC; (3) to examine self-identity as a potential addition to the model; and (4) to identify beliefs which may provide useful targets for interventions. The findings supported the efficacy of the TPB as a predictor of a low-fat diet. Evidence for the distinction between self-efficacy and PBC was provided through the finding that self-identity independently suggested intention and might prove a useful addition to the TPB.

Based on these comparative studies, this research integrates both theories into the conceptual model for developing the questionnaires for the survey. The theoretical background provides a guideline of which items should be asked; attitude, prior experience and behavior. As this is an exploratory study which is not designed to test and/or confirm the model or theory, however, TPB and SCT play a significant role not as theories for comparison to identify which one fits better in explaining art and cultural behaviors, but as a theoretical frame for developing the relevant questions to be asked. The theory-based questions also will be useful for analyzing the findings later based on the assumed connection among the latent characteristics.

### **Chapter 3. Method**

This chapter introduces sampling, survey method, survey questions, and the statistical methods used to collect and analyze the data. The research sampled the general public in the Great Lakes States, using a panel list randomly selected by the professional sampling company. Those sampled were asked to participate in the on-line survey, which was developed by a data-driven system. People can skip, stop or continue to answer the questions based on their previous answers. The survey questions were divided into several sections based on the theories introduced in Chapter 2. To analyze the data, multiple item response theory was used for taking the interaction between people and items into account.

#### **Sampling**

Sampling is a powerful tool that helps researchers obtain accurate information at a reasonable cost (Austin & Pinkleton, 2006), whereas a bad sampling frame results in fatal damage to the generality of the research findings. A perfect sample would be a scaled-down version of the population, mirroring every characteristic of the whole population. Of course, no such perfect sample exists for a complex population. However, a good sample will reproduce the characteristics of interest in the population as closely as possible. Sampling details of the study follow.

*Target population - General Public in Great Lakes States*

An on-line survey used random sampling of households in Michigan and other Great Lakes states including Ohio, Wisconsin, Illinois, Indiana, and Minnesota, who had access to the Internet, specifically e-mail account owners.

*Sampling method – Disproportionate Stratified Random Sampling*

Sampling was conducted based on “Product Multinomial,” which stopped the survey once the response reached the total of at least 6,000; 2,000 from Michigan and 4,000 evenly distributed from other Great Lakes states. It was implemented under the assumption of the homogeneity of multinomial distribution and avoided a cell count under 5 in any category of each multinomial distribution (Rice, 2007). Michigan residents were oversampled for a further comparison study.

*Sampling frame – Panelists*

The professional sampling company, Survey Sampling International (SSI)<sup>1</sup>, recruited panelists through thousands of Web sites, which were designed to optimize the probability that the panel reflected the overall composition of the reachable population online.

*Sampled population*

Through an invitation letter and two reminders sent by e-mail, 6,110 out of

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<sup>1</sup> For more information on sampling process, please visit <http://www.surveysampling.com>

the listed individuals completed the survey. Figure 2 gives a graphical idea of who were sampled for the survey. Demographics of the respondents were compared to those of the Internet users, not the U.S. population, as the study included Internet usage as one of the indicators in the model. Table 2 presents the specific composition of the respondents.

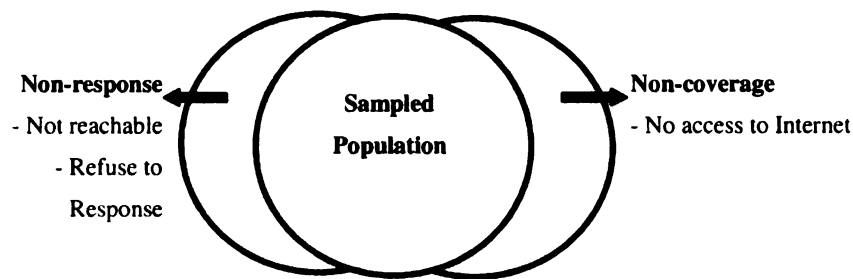


Figure 2 Sampling

The collected data contained more White-Caucasian (90%), more female (63%), more educated (98% had at least high school diploma) and wealthier people (44% got more than \$50,000 a year) than the population as a whole. This is a general phenomenon in academic study-based “volunteers” and “Internet users.” The respondents were somewhat biased from the population standpoint, but were deemed suitable for the purpose of this study, which was to examine variables closely related to the Internet and cultural consumption. The observation unit was the individual Internet-user. The pre-set goal, 6,000 responses was achieved in 10 days, from Nov. 17 to Nov. 27, 2006.

Table 2 Demographics of the respondents

|                                   | All    | Michigan Respondents | Other Great Lakes |
|-----------------------------------|--------|----------------------|-------------------|
| <b>Gender</b>                     |        |                      |                   |
| Male                              | 36.80% | 26.50%               | 42.40%            |
| Female                            | 63.20% | 73.50%               | 57.60%            |
| <b>Family Status</b>              |        |                      |                   |
| Single without children           | 23.00% | 21.20%               | 23.70%            |
| Single with children              | 7.70%  | 9.00%                | 6.80%             |
| Single with children not at home  | 8.10%  | 7.80%                | 8.10%             |
| Married without children          | 12.90% | 11.20%               | 13.90%            |
| Married with children             | 29.50% | 31.00%               | 29.00%            |
| Married with children not at home | 18.90% | 19.70%               | 18.50%            |
| <b>State of Residence</b>         |        |                      |                   |
| Michigan                          | 34.90% |                      |                   |
| Great Lakes                       | 65.10% |                      |                   |
| <b>Education</b>                  |        |                      |                   |
| Less than high school             | 0.40%  | 0.50%                | 0.40%             |
| Completed some high school        | 2.00%  | 2.10%                | 2.00%             |
| Completed high school             | 19.50% | 19.90%               | 19.50%            |
| Some college                      | 33.50% | 34.90%               | 32.80%            |
| 2-year college degree             | 11.40% | 12.20%               | 11.00%            |
| 4-year college degree             | 18.40% | 17.10%               | 19.20%            |
| Completed some graduate courses   | 5.30%  | 4.50%                | 5.50%             |
| Master's degree                   | 7.60%  | 7.30%                | 7.60%             |
| Doctoral degree                   | 1.90%  | 1.60%                | 2.00%             |
| <b>Sexual Orientation</b>         |        |                      |                   |
| Straight/heterosexual             | 94.00% |                      |                   |
| Gay/lesbian                       | 2.50%  |                      |                   |
| Other                             | 3.50%  |                      |                   |
| <b>Age (Mean)</b>                 | 45.4   | 44.9                 | 45.6              |
| <b>Employment</b>                 |        |                      |                   |
| Full time outside the home        | 40.20% | 37.00%               | 42.10%            |
| Part time outside the home        | 14.00% | 15.30%               | 13.30%            |
| Self employed outside the home    | 3.00%  | 2.90%                | 3.10%             |
| Self employed at home             | 6.30%  | 6.40%                | 6.30%             |
| Home maker                        | 13.00% | 15.60%               | 11.90%            |
| Unemployed                        | 9.10%  | 9.70%                | 8.80%             |
| Retired                           | 16.90% | 16.00%               | 17.50%            |
| Student                           | 7.00%  | 8.30%                | 6.30%             |
| <b>Race</b>                       |        |                      |                   |
| Caucasian or White                | 89.80% | 89.80%               | 90.80%            |
| African American or Black         | 5.70%  | 6.20%                | 5.30%             |
| Asian or Pacific Islander         | 1.20%  | 1.00%                | 1.20%             |
| Native American                   | 1.10%  | 1.10%                | 1.20%             |
| <b>Income</b>                     |        |                      |                   |
| Less than \$25,000                | 20.10% | 22.10%               | 19.00%            |
| \$25,000 - \$29,999               | 10.00% | 10.20%               | 9.80%             |
| \$30,000 - \$39,999               | 14.30% | 14.10%               | 14.50%            |
| \$40,000 - \$49,999               | 12.10% | 11.70%               | 12.20%            |
| \$50,000 - \$59,999               | 10.30% | 10.20%               | 10.40%            |
| \$60,000 - \$74,999               | 12.40% | 11.50%               | 13.00%            |
| \$75,000 - \$99,999               | 11.00% | 10.60%               | 11.20%            |
| \$100,000 - \$124,999             | 5.00%  | 5.00%                | 5.00%             |
| \$125,000 - \$149,999             | 2.00%  | 1.80%                | 2.20%             |
| \$150,000 - \$174,999             | 1.10%  | 1.00%                | 1.20%             |
| \$175,000 - \$199,999             | 0.70%  | 0.80%                | 0.70%             |
| \$200,000 or more                 | 1.00%  | 1.10%                | 0.90%             |

### **Survey Method: Web-based survey**

Today's research methods are fast developing and mutually incorporated, in terms of technique and content, in tune with the fast-paced outside environment and its complicated needs. As a result, it is difficult to single out one method that is sure to collect reliable and valid data to explicate, explain, and predict the target audience.

Many people have access to the Internet, and the Internet is fast becoming the communication method of choice for many Americans (Duffy, 2000). With the market growth of user-friendly programming software and an increasing population with access to the Internet, the Web survey is emerging as one of the frequently used research methods (Couper, 2000). Researchers from many disciplines are starting to see the benefits of collecting data using the Internet, and journals are publishing data that have been collected online (Schleyer & Forrest, 2000).

#### *Cost effectiveness*

Given the same number of completed surveys, Web surveys can collect data at dramatically lower costs than traditional methods, such as mail or telephone surveys. The time it takes to collect data from Web surveys is shorter than any other method. In this study, using the professional sampling company cost as high as postage, printing, and stationery costs in mail survey, but when considering the processing cost, like data entry that is extremely expensive and time-consuming, it appears extremely cost

effective and also eliminates potential errors in rekeying data (Granello & Wheaton, 2004).

#### *Great number of respondents*

The power of Web surveys is that they make survey data collection available to the masses. Researchers can get access to numbers of respondents at dramatically lower costs and in shorter time than traditional survey methods (Farmer, 1998; Lazar & Preece, 1999).

#### *Source accessibility*

Any researcher can put survey questions on dedicated sites, offering low-cost services, and collect data from potentially thousands of people. User-friendly programming democratizes the data-collecting process (Couper, 2000).

#### *High-technique*

Unlike on paper, the appearance of a survey can vary according to a researcher's purposes. Design may be much more flexible for Web surveys and increase readability, because there are more tools available to the designer (color, sound, images, animation, etc.; Couper et al., 2001). Design should be used based on survey purpose and target population. The survey necessitates data-driven programming in which respondents had only to answer the questions tailored by their previous answers, due to the multi-layered sets of questionnaires.

With the growing population of Internet users, the Web-based surveys are becoming more frequently used as a method to collect the data. The potential risk of Web surveys is that with the proliferation of such surveys, it will become increasingly difficult for people to distinguish between good and bad surveys. Nowadays, people are so bombarded with survey requests that they either tune out completely or base their participation decisions on the content, topic, entertainment value, or other features of the survey. Four traditional sources of survey error- sampling, coverage, measurement, and non-response-that exist with any other survey methods, including mail and telephone surveys were considered carefully as follows:

#### *Coverage error*

Coverage error is the biggest hindrance of Web surveys due to the limited accessibility (Couper, 2000; Dillman & Bowker, 2001). Yet when researcher try to study the population who uses the Internet when searching for information and purchasing products, the Web survey is a good method for making the research more inclusive of the desired target population (Couper, 2000).

According to statistics updated in June 2009, by Internet World Stats<sup>2</sup>, there are 251,735,500 Internet users in the United States; 73.9 % of the population. In principle, about 27% of the population cannot be reached when researchers use the

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<sup>2</sup> [www.internetworldstats.com/stats2.htm#north](http://www.internetworldstats.com/stats2.htm#north)

Web-based survey (Fig.2). It is still far behind the penetration rate of telephones, 94.5%, but appears large enough to be considered a powerful medium to reach the public. In addition, the error might be mitigated by setting up a clear limit of generalization. The outcome will not be generalized the entire population, but limited to Internet users, who are actually the primary target audience of the communication campaign.

#### *Sampling error*

Before sampling, the researcher sets the target number of the complete sample (N=6,000) to increase the sample size for lower sampling errors and to compensate for coverage and non-response problems that might exist. Statistical simulation as well as mathematical proof shows that an increase in sample sizes contributes to a decrease in sampling errors (Lohr, 1999).

In case N=6,000, the margin of sampling errors is  $\pm 0.013$  for 95% confidence interval by the formula:  $CI = \pm Z(\alpha/2)\sqrt{\{p*(1-p)\}/(N-1)}$  In addition to large numbers, a traditional indicator of a high quality survey, it puts emphasis on the need to define survey populations and to select probability samples by using the directory listing of the professional sampling company.

#### *Measurement error*

Measurement error is the deviation of the answers of respondents from their

true values on the measure. Measurement errors in self-administered surveys can arise from the respondent (lack of motivation, comprehension problems, deliberate distortion, etc.) or from the instrument (poor wording or design, technical flaws, etc.). To minimize measurement error, the survey instrument was made easy to understand and to complete, and poor wording or design, comprehension problems, deliberate distortion (Dillman & Bowker, 2001), and even technical flaws were checked by pre-test to Michigan State University students, staff and professors (N=298) from October 25 to November 10, 2006, by snowballing and convenient sampling.

#### *Non-response errors*

Several studies have compared response rates from Web studies to those from mail surveys of the same populations and have found that the Web surveys did not reach the response rate levels of the mail surveys (Crawford, Couper & Lamias, 2001; Nicholas & Sedivi, 1998; Tse et al., 1995). To compensate, there are findings that Web surveys have significant advantages over mail surveys in terms of response rate (Bachmann, Elfrink & Vazzana, 1999; Cobanoglu, Warde & Moreo, 2001; Kiesler & Sproull, 1986; Parker, 1992). To increase the response rate, this study put credible names (Michigan State University and the Michigan government) on each page of the Web survey, placed confidentiality guidelines survey providers should comply with on the front page, and provided attractive incentives (Singer, Groves, & Corning, 1999;

Singer, 2002), such as a cash lottery.

Blumberg, Davis, Khare and Martinez (2005) examined the effect of extended calling protocols and refusal conversion effort on the data quality. They found that respondents who were converted tended to be more like other cooperators than the entrenched non-responders or non-covered. There will be no valid way to integrate people who do not want to participate in surveys, and these people cannot be captured by any kind of sampling frame into respondents. The additional effort to increase response rates may also cause another question about “randomness,” which means the equal probability to be included in samples. As a result, this study compared the samples’ demographic files to census-based data of population to check non-response error (Couper, Traugott & Lamias, 2001).

The list of the principles (Dillman & Bowker, 2001) includes:

- 1) Introduce the Web questionnaire with a welcome screen that is motivational, emphasizes the ease of responding, and instructs respondents on the action needed for proceeding to the next page.
- 2) Provide a PIN number for limiting access only to people in the sample.
- 3) Choose for the first question an item that is likely to be interesting to most respondents, easily answered, and fully visible on the first screen of the questionnaire.
- 4) Present each question in a conventional format similar to that normally used on

paper, self-administered questionnaires.

**Table 3 Principles for the design of Web surveys and their relationship to traditional sources of survey error**

| List              | Type of Error |          |             |             | Checked in this study |
|-------------------|---------------|----------|-------------|-------------|-----------------------|
|                   | Sampling      | Coverage | Measurement | Nonresponse |                       |
| 1. Introduction   |               |          |             | ✓           | ✓                     |
| 2. PIN number     | ✓             | ✓        |             |             | ✓                     |
| 3. First Question |               |          |             | ✓           | ✓                     |
| 4. Format 1       |               |          | ✓           | ✓           | ✓                     |
| 5. Color/Design   |               |          | ✓           |             | ✓                     |
| 6. Convertibility |               | ✓        | ✓           | ✓           | ✓                     |
| 7. Instruction    |               |          |             | ✓           | ✓                     |
| 8. Format 2       |               |          | ✓           |             | ✓                     |
| 9. Voluntary      |               |          |             | ✓           | ✓                     |
| 10. Skip          |               |          | ✓           |             | ✓                     |
| 11. Combined      |               | ✓        | ✓           | ✓           |                       |
| 12. Programming   |               |          | ✓           |             | ✓                     |
| 13. Process Inf.  |               | ✓        |             | ✓           |                       |
| 14. Restraint     |               |          | ✓           | ✓           | ✓                     |

5) Restrain the use of color so that figure/ground consistency and readability are maintained, navigational flow is unimpeded, and measurement properties of questions are maintained.

6) Avoid differences in the visual appearance of questions that result from different screen configurations, operating systems, browsers, partial screen displays, and wrap-around text.

7) Provide specific instructions on how to take each necessary computer action for responding to the questionnaire and other necessary instructions at the point where

they are needed.

8) Use drop-down boxes sparingly, consider the mode implications, and identify each with a “click here” instruction.

9) Do not require respondents to provide an answer to each question before being allowed to answer any subsequent ones.

10) Provide skip directions in a way that encourages marking of answers and being able to click to the next applicable question.

11) Construct Web questionnaires so respondents scroll from question to question unless order effects are a major concern, and/or telephone and Web survey results are being combined.

12) When the number of answer choices exceeds the number that can be displayed in a single column on one screen, consider double-banking with an appropriate grouping device to link them together.

13) Use graphical symbols or words that convey a sense of where the respondent is in the completion process, but avoid ones that require significant increases in computer memory.

14) Exercise restraint in the use of question structures that have known measurement problems on paper questionnaires, e.g., check-all-that-apply and open-ended questions.

Among the principles shown above, only two suggestions were not met by

this study, # 11 & # 13. In regard to # 11, it was also recommended by other researchers to use a mixed-mode strategy (e.g., mail surveys and Web surveys) (Kaplowitz, Hadlock & Levine, 2004), but the study did not implement the combined data-collecting techniques. Regarding #13, as the survey was designed under the computer adaptive system, in which respondents had different questions next based on their previous answers, the time of completing the survey varied.

## **Measurement**

The pool of the preliminary questions was derived from the objectives of the study, which were to identify how the market generally works, which factors have great impact on public consumption behaviors, how those factors are correlated and how the target audience might be segmented by the indexes of their involvement in art and culture-related activities.

Unfortunately, it was hard to find any population studies in the art and culture-related fields. Few organizations uploaded their annual survey reports, of which samples were limited to their member agencies or artists. Therefore, the survey questions were finalized with the help of significant input from a wide range of Michigan arts and cultural organizations.

The process of designing the survey began in January 2006 with a review of previous arts and cultural surveys, regardless of academic publication and industrial

reports, to identify the shared types of questions. Over the course of one year, there were 59 Cultural Economic Development Online Tool (CEDOT) planning meetings (phone and in-person) between Michigan State University (MSU) and the state of Michigan Department of History, Art and Library (HAL). Eighteen CEDOT public planning meetings also were convened by MSU and HAL staff to engage representatives of Michigan's cultural sector, involving more than 150 participants. In addition, CEDOT presentations were made at two statewide conferences and at a national online e-conference involving state arts agencies representing 39 states.

Some of the participating organizations included ArtServe Michigan, Michigan Libraries Association, Michigan Association of Community Arts Agencies, Michigan Museums Association, Michigan Festivals and Events Association, The Henry Ford Museum, Arts League of Michigan, Wayne State University Center for Art and Public Policy, Michigan Department of Education, State Historic Preservation Office, Michigan Historic Preservation Network, Michigan Council for Arts and Cultural Affairs, Lawrence Technological University, Michigan Humanities Council, National Assembly of State Arts Agencies, National Endowment for the Arts, National Conference of State Legislators and more.

A series of meetings were arranged to determine the nature of the participation and market information available, as well as to learn more about the

information needs of the participating organizations. Drafts of different survey instruments were re-examined by HAL staff. Functionality of the Web survey and understandability of the questions were pre-tested before the survey was implemented in November. The results of the pre-test were used to fashion a final instrument, which was reviewed by Michigan State University's Social Science/Behavioral /Education Institutional Review Board (SIRB) to insure it met all requirements (e.g., confidentiality) for protecting human subjects.

The survey questionnaires were developed through a number of meetings with different organizations which were discretionally selected by the project client, Department of History, Art and Libraries. Despite the seemingly low connection between libraries and art and cultural consumption behaviors, libraries were actively involved in the meetings and decision making processes. As shown in the results, library usage was not closely related to the three dimensions which explicitly created unique characteristics among the items under each dimension and was hard to be labeled as one separate dimension that explained any patterns in art and cultural activities.

In addition, the items for the analyses in this study were selected randomly based on their level of variables, not based on theories. Even if MIRT is a very conservative method which means there is no way to fix the problematic data, the

results might have limitation in generalization and the questions might have difficulties with replication. Yet this would be regarded as a good starting point to develop more research and study in the art and cultural sectors.

The survey was categorized into fourteen sections, which contained multiple item indicators, to make it appropriate for a data-driven type of survey: 1) demographics, 2) art experience in childhood, 3) donation, 4) membership, 5) volunteering, 6) attendance, 7) participation, 8) purchase, 9) cultural tourism, 10) library use, 11) Internet usage, 12) information source, 13) tour-related decision making, and 14) image of Michigan. The questionnaire consisted of screening questions that came first in each part to filter respondents and subsequent questions explicitly measured the specific art-related consumption only for those who answered “yes” to the screening questions. Sub-questions under each category were asked to be used for multidimensional and in-depth analyses when developing more detailed communication campaigns with emphasis on a specific topic.

The survey included over 500 questions, but the data-driven system allowed people to skip questions based on their previous answers. Each section started with a few lead questions, like “have you ever attended any theatrical performances within the last 12 months?” Each section aimed to dig into details of the respondents’ simple and basic answers to “have you” questions by building up the questions to make

inferences to “how” and “why.”

The lead questions, which all of the respondents were asked to answer, included: 1) Demographics: Age, Gender, Education; 2) Art education and exposure to art in childhood and current art education; 3) Donation, membership, & volunteering during the last 12 months; 4) Attendance at theatrical performance, music concerts, and dance performance during the last 12 months; 5) Participation in performing arts, visual arts, and art-related disciplines (for example, genealogy, archaeology and architectural activities) during the last 12 months; 6) Purchase of visual art/craft and CD, DVD, books, and etc. during the last 12 months; 7) Any pleasure trip during the last 12 months, attendance at theatrical performance, visit to museum, festival, historical sites, zoo, and library; and 8) Library card and library visits during the last 12 months.

In total, 107 items were tested by the MIRT method. The following factors were considered in the process of selecting the 107 items for this research.

1) Research type: this research was an explanatory research which aimed at finding reliable measurements to segment people. This was not a confirmatory research, of which objective was to test a specific theory. In this context, this study needed to include items as many as possible to identify the right questions to be used for measuring people in terms of their art and cultural consumption.

2) Variable level: To analyze data with MIRT, dichotomous variables were selected. Unlike the regression analysis, MIRT was developed from logistic formula. Thus, it was necessary to pick one variable level for analysis. As the lead questions were the nominal levels of variables, it appeared to be appropriate to choose "yes" or "no" questions to get statistically meaningful results. Besides the above-mentioned filtering questions, other consumer behaviors were included to gauge the activeness in art-related consumption, for example, "have you purchased tickets?" and "were any of these live theater performances in a different state or country other than where your permanent residence is located?" were selected for analyzing their art and culture-related behavior patterns.

3) Sample size of affirmative answers: as people were asked to answer many questions based on their previous responses, quite a few people said "yes" to the questions which were asked at the last of each section. The survey was data-driven, it was difficult for people to have a chance to see the last parts of each section. This meant that the most of people stopped answering the questions in each section at the very beginning of each section or at most in the middle of each section and moved to next section. Even though those in-depth questions would be useful for further analyses, this study included only the questions, to which at least 10 percent of the total respondents (at least 600 persons) said "yes." This was justified by the objectives

of this study, which were to identify valid items and utilize them for segmentation.

4) Theoretical framework: TPB and SCT played a role as a big frame for selecting the items for analysis. Even though the research was not designed to test a theory, it would be more meaningful to determine the reasonable items to be included and to explain the results from the theoretical perspectives. The path model of the variables represented the rationale of the selection process of the latent variables for analysis and helps provide an understanding of those variables.

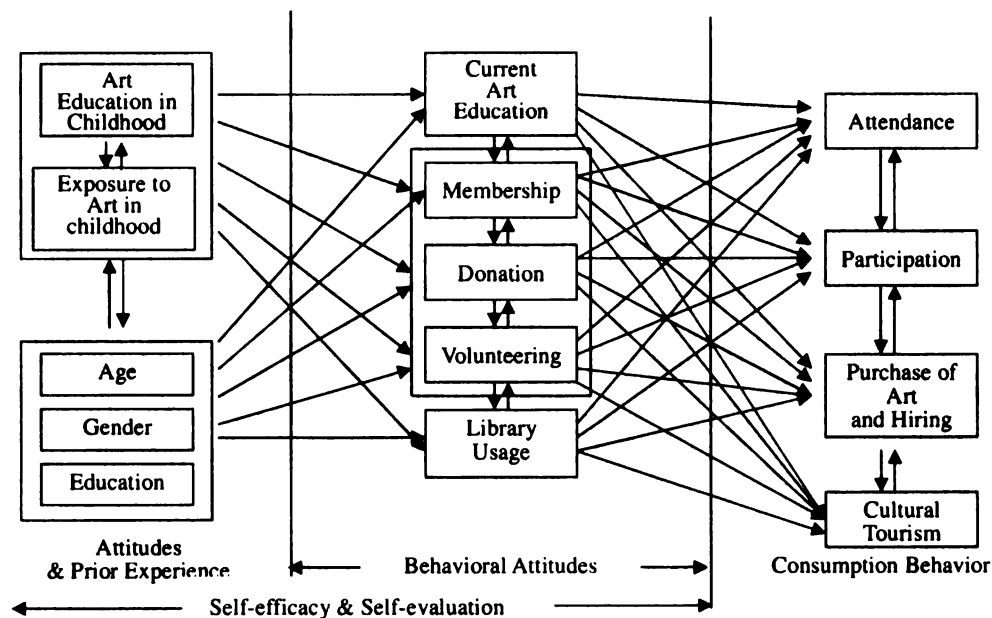


Figure 3 Perceived path model of the variables

As a result, other continuous items, like Internet usage and Michigan's image are excluded. Demographic variables, like age and gender, might play a significant role in finding the differences among the consumers, but for the initial analysis they

are not included. They will be used for future analyses as criteria variables to split people into more specific categories.

The brief summary of the 107 items (see Appendix) are

- Attendance at theatrical performance (4 items)

- 1) Attendance (lead question)
- 2) In a different state or country or not
- 3) Purchase of tickets
- 4) Purchase of subscriptions

- Attendance at dance performance (4 items)

- 5) Attendance (lead question)
- 6) In a different state or country or not
- 7) Purchase of tickets
- 8) Purchase of subscriptions

- Attendance at music performance (4 items)

- 9) Attendance (lead question)
- 10) In a different state or country or not
- 11) Purchase of tickets
- 12) Purchase of subscriptions

- Participation in any performing arts (10 items)

- 13) Engagement (lead question)
- 14) Playing a musical instrument
- 15) Playing in band or orchestra
- 16) Solo singing
- 17) Group or choir singing
- 18) Dance
- 19) Acting
- 20) Comedy, magic and mime
- 21) Storytelling and readings
- 22) Other performances
- Participation in any visual arts (11 items)
  - 23) Engagement (lead question)
  - 24) Drawing
  - 25) Painting
  - 26) Printmaking
  - 27) Sculpture
  - 28) Textile arts
  - 29) Photography
  - 30) Crafts

- 31) Folk or Traditional art
- 32) Media arts
- 33) Writing
- Participation in any art-related or cultural disciplines (10 items)
  - 34) Engagement (lead question)
  - 35) Architecture
  - 36) Landscape architecture
  - 37) Fashion design
  - 38) Graphic design
  - 39) Interior design
  - 40) Industrial design
  - 41) Historic preservation
  - 42) Genealogy
  - 43) Archaeology
- Professional artists (5 items)
  - 44) Considered as a professional artist
  - 45) Formal education
  - 46) Engagement in any art-related professional development activities
  - 47) Member of an art-related guild, union or association/organization

- 48) Financial robustness
- Purchase of Art (2 items)
  - 49) Any visual arts
  - 50) Any books, videotapes, DVDs, CDs, records, tapes or music downloads
- Hiring of artists (22 items)
  - 51) Hiring any performing artists (lead question)
  - 52) Any solo musicians
  - 53) Any musical bands/groups
  - 54) Any solo singers
  - 55) Any singing groups
  - 56) Any actors or theater companies
  - 57) Any comedians, magicians, or mime artists
  - 58) Any performance artists
  - 59) Any dancers or dance companies
  - 60) Any DJs
  - 61) Hiring any architects or designers (lead question)
  - 62) Any architects
  - 63) Any landscape architects
  - 64) Any graphic designers

- 65) Any interior designers
- 66) Any fashion designers
- 67) Any industrial designers
- 68) Hiring any historic preservation/restoration, archaeological, or  
genealogical services (lead question)
- 69) Any historic preservation services
- 70) Any archaeological services
- 71) Any genealogical services
- 72) Any home/building restoration services
- Cultural tourism (8 items)
  - 73) Trip to Michigan
  - 74) Any pleasure trips
  - 75) Attendance at a theatrical performance
  - 76) Visit to a museum: art, history, science, or special topics museum
  - 77) Attendance at a festival: art, crafts, music, food, wine, ethnic, antiques, or  
car show
  - 78) Visit to an historical site, attraction or community: heritage parks,  
lighthouses, monuments, landmarks, archaeological sites, cultural centers  
or historical communities

- 79) Visit to a zoo, aquarium, botanical garden or arboretum
- 80) Visit to a library: national, state, local community, or university/college
- Library use (2 items)
  - 81) Having a library card
  - 82) Visit to a library
- Behavior as a producer (3 items)
  - 83) Any membership
  - 84) Any donation
  - 85) Any volunteering job
- Prior experience (7 items)
  - 86) Exposure to art in childhood: 1 items
  - 87) Having education in childhood
  - 88) Visual arts
  - 89) Performing arts
  - 90) Music (vocal/instruments)
  - 91) Literary arts
  - 92) Crafts
- Art education now (7 items)
  - 93) Having education now

- 94) Visual arts
- 95) History/Appraisal
- 96) Performing arts
- 97) Music (vocal/instrumental)
- 98) Literary arts
- 99) Applied arts (e.g., architecture, design, genealogy and archaeology)
- Art education for children (8 items)
  - 100) Having children take any art classes
  - 101) Visual arts
  - 102) History/Appraisal
  - 103) Performing arts
  - 104) Music (vocal/instruments)
  - 105) Literary arts
  - 106) Applied arts (e.g., architecture, design, and genealogy and archaeology)
  - 107) Crafts

These items initially incorporated in the statistical analysis were dichotomous variables, to which people answered “yes” or “no.” The wide spectrum of the items appeared to play an important role in finding better items to identify how differently people behave and how they can be clustered.

### **Analysis Method: Multidimensional Item Response Theory (MIRT)**

Tukey (1977) describes exploratory data analysis as detective work. A detective investigating a crime needs both tools and understanding. If he has no fingerprint powder, he will fail to find fingerprints on most surfaces. If he does not understand where the criminal is likely to have put his fingers, he will not look in the right places. Similarly, the data analyst or researcher of data needs both tools and understanding. It doesn't seem to be limited only to the case of exploratory data analysis. Despite the ambiguous definition of statistical analysis, Tukey's description can be extended to all statistical analyses. He demonstrates how to affect graphic and numerical analyses of the data at hand so as to understand them and suggests that the emphasis on inference in modern statistics results in a loss of flexibility in data analysis.

With a fast developing statistical approach, researchers seem to put more value on learning something new than on guaranteeing something basic first. They believe confirmatory statistics are more critical for making an inference of the population. Without verifying the basic assumptions and conditions for running software and calculating statistic parameters, the result will not have any meaning academically, practically, and statistically.

In an effort to find a descriptive but comprehensive method,

multidimensional item response theory (MIRT) is employed for analyzing the complex behavioral patterns. Depending on a psychometrician's background, MIRT can be considered either as a special case of factor analysis (FA) or structural equation modeling, or as an extension of unidimensional item response theory (IRT) (Reckase, 1997). Relative to MIRT, however, factor analysis and IRT lack interest in the characteristics of the variables.

There were many researchers who came close to a direct representation of MIRT through factor analysis models. Horst (1965) tried to partial out the effects of variation in item difficulty, but did not take the step of actually estimating item parameters other than factor loading and of modeling probabilities of the correct responses rather than the actual responses. Christofferson (1975) and Muthen (1978) presented the factor loadings and threshold estimates much as they were in MIRT, but focused on modeling the hypothetical continuous items trait rather than the probability of correct response. And the probability of a correct response was not presented as a conditional function of item parameters and vectors of person parameters, but rather the probabilities were modeled as population statistics. The feature that was missing in their formulations was the conditional probability of a correct response to each item as a function of a person's location in the  $\theta$  space (Reckase, 1997).

Additionally, McDonald (1967) indicated the relationship of the regression function to the conditional probability of a correct response, but used a polynomial model that could result in values for the dichotomous variable beyond the 0 to 1 range and did not provide any interpretation for the characteristics of the item variables. Finally, Bock and Aitkin (1981) provided a two-dimensional extension of the two-parameter normal ogive model along with an MIRT-type parameterization of the item characteristics, but still placed emphasis on defining factors rather than investigating the interaction of persons and items.

In short, factor analysis and MIRT share the basic concept of defining hypothetical scales that can be used to reproduce the data and of defining scales that have an arbitrary origin and unit of measurement. Nonetheless, a clear difference exists between two methodologies. The principal component of factor analysis is the resolution of a set of variables linearly in terms of a small number of categories or factors, and this can be accomplished by the analysis of the correlation matrices (Harman, 1976). A correlation matrix is a data source that ignores all differences in the means and standard deviations of the variables. MIRT differs from most factor analysis representations in that the varying characteristics of the input variables are considered to be of importance and worthy of study.

Another method with similarities to MIRT is Item Response Theory (IRT). It

has a number of potential advantages over classical test theory in assessing self-reported attitude and behavior outcomes as psychometrics (Hays, Morales, & Reise, 2000). Lord (1980) summarizes that a test consists of separate items, and the test score is a sum of item scores. In this case, however, statistics describing the test scores of a certain group of examinees can be expressed algebraically in terms of statistics describing the individual item scores for the same group. It cannot predict how individuals will respond to items unless the items have previously been administered to similar individuals. Researchers need to describe the items using item parameters and the examinees using examinee parameters in such a way that they can predict probabilistically the response of any examinee to an item, even if similar examinees have never taken similar items before. This involves making predictions about things beyond the control of the psychometrician-predictions about how people will behave in the real world.

With IRT, individuals' attitudes and behaviors can be scored and used to categorize them by their activeness and responsiveness, according to each measurement. And those outcomes can be grouped under one construct with convergent characteristics. IRT analyzes both attitudes and behaviors toward each item indicator and the relationship between total items under one construct and one item indicator. So the individuals with the same score do not come up with the

conclusion that they are the same in attitude and behavior.

Yet, people are likely to bring more than a single dimension to bear when responding to a particular question that seems to require numerous experiences and abilities to determine their characteristics and behavior. This is especially true for measures of attitudes and behavior in complex areas. Thus, although unidimensional IRT models have proven to be useful under certain conditions, there is a need for more complex IRT models that more accurately reflect the complexity of the interactions between respondents and measured items (Reckase 2009).

Since the early developments of MIRT, many researchers have developed descriptive statistics to assist in the interpretation of MIRT analyses (Reckase, 1985; Reckase & McKinley, 1991), and multiple applications have been made. Miller and Hirsch (1992) identified small but replicable clusters of items with clear substantive meaning. Although the percent of variance accounted for by these items was less than other factor analysis studies, the clustering might be important in identifying subsamples of the respondent population, such as specific target market. The MIRT conception of dimensions of item sensitivity and locations of subgroups in a multidimensional latent space has provided a natural means for describing differential item functioning of test items. Davey and Oshima's study (1994) started to equate method for use on tests that assess multiple skills.

Researchers developed various mathematical expressions for the accuracy of modeling the interaction between a person and a test item. MIRT models for test items with two score categories, for example, yes or no in this study, can be grouped into two categories: compensatory and partially compensatory models. Compensatory models consist of the two-parameter logistic, the three-parameter logistics, the Rasch, and the normal ogive models. These models have a relatively long history in psychometric literature, and there is more experience with their application (Reckase, 2009).

The form of the multidimensional extension of the two-parameter logistic (M2PL) model (Eq.1) has one thing different from the two-parameter logistic (2PL) model (Eq. 2) Birnbaum (1968). The exponent of the form  $a(\theta-b)$  results in  $a\theta-ab$  by multiplication. If  $-ab$  is replaced by  $-d$ , the expression is in what is called slope/intercept form,  $a\theta + d$ . Thus easier items have higher values for  $d$  (DeMars, 2005). M2PL is very similar to the three-parameter logistic model (Eq.3) except for the guessing parameter,  $c$ .

$$P(U_{ij}=1|\theta_j, a_i, d_i) = \frac{e^{a_i\theta_j + d_i}}{1 + e^{a_i\theta_j + d_i}} \quad (1)$$

Where  $u_{ij}$  is the response on Item  $i$  by Person  $j$ ,  $\theta_j$  is the trait level for Person  $j$ ,  $a_i$  is a parameter related to the maximum slope of the item characteristic curve (ICC)

$$P(U_{ij} = 1 | \theta_j, a_i, b_i) = \frac{e^{a_i(\theta_j - b_i)}}{1 + e^{a_i(\theta_j - b_i)}} \quad (2)$$

The M3PL model appears to be appropriate for accounting for observed empirical data such as that provided in Lord (1980) which shows that respondents with low capabilities have a non-zero probability of responding correctly to multiple-choice items (Reckcase, 2009). The probability of selecting a correct response for individuals with low capabilities does not seem to be related to the scores tested by the items and it can be interpreted as a single lower asymptote, or pseudo-guessing, parameter,  $c_i$ .

$$P(U_{ij} = 1 | \theta_j, a_i, c_i, d_i) = c_i + (1 - c_i) \frac{e^{a_i \theta_j + d_i}}{1 + e^{a_i \theta_j + d_i}} \quad (3)$$

The multidimensional extension of the Rasch model is simply the M2PL model with all of the  $a$ -parameters set to 1.0. Rasch (1960) proposed the simplest model that met the required assumptions as follows. The original form is given by

$$P(u_{ij} = 1 | A_j, B_i) = \frac{A_j B_i}{1 + A_j B_i} \quad (4)$$

where  $A_j$  is the single person parameter now generally labeled  $\theta_j$ , and  $B_i$  is the single item parameter now generally labeled  $b_i$ . For the dichotomous case, using the same notation as the other models, the multidimensional Rasch model is

$$P(U_{ij} = 1 | \mathbf{a}_i, d_i, \boldsymbol{\theta}_j) = \frac{e^{\mathbf{a}_i \boldsymbol{\theta}_j' + d_i}}{1 + e^{\mathbf{a}_i \boldsymbol{\theta}_j' + d_i}} \quad (5)$$

where  $\mathbf{a}_i$  is a vector such that  $\mathbf{a}_i = \mathbf{b}_{ik}$ , and  $d_i$  is a scalar value equal to  $\mathbf{a}_{ik}'\boldsymbol{\xi}$  when  $\boldsymbol{\xi}$  is a vector of item difficulty parameters. The multidimensional extension of the normal ogive model (Bock and Schilling 2003; McDonald 1999; Samejima 1974) is expressed in Eq. 6 where  $z_i(\boldsymbol{\theta}_j) = \mathbf{a}_i \boldsymbol{\theta}_j' + d_i$ . If  $c_i = 0$ , the result is the normal ogive version of the two-parameter logistic model. This model defines the probability of correct response for an item as the area under a standard normal distribution from  $-z_i(\boldsymbol{\theta}_j)$ .

$$P(U_{ij} = 1 | \boldsymbol{\theta}_j, \mathbf{a}_i, c_i, d_i) = c_i + (1 - c_i) \frac{1}{\sqrt{2\pi}} \int_{-z_i(\boldsymbol{\theta}_j)}^{\infty} e^{-\frac{t^2}{2}} dt \quad (6)$$

The other category of the multidimensional item response models is the partially compensatory model. The partially compensatory product models are consistent with the hypotheses that test items have different parts related to different skills or knowledge and overall success requires success on each part. It means each construct is independent of one another and the individual probability of selecting a correct response, i.e., “yes,” is the multiplication of the total scores of each construct. Unlike this assumption, the compensatory models are more consistent with a more

holistic view of the interaction of persons and test items. The usefulness of the models will be determined by how accurately they represent the responses from actual test items. Bolt and Lall (2003) found that the compensatory model fit the partially compensatory data almost as well as the partially compensatory model. The partially compensatory model, on the other hand, did not fit the compensatory data very well. Thus this study selected the compensatory models for analysis.

MIRT depends on the quality of parameter estimates that are obtained from the estimation computer software. The programs vary in the types of models that they support and whether they estimate the person parameter vectors. According to some parameter recovery studies (Beguin & Glas, 2001; Gosz & Walker, 2002; Maydeu-Olivares, 2001; Miller, 1991; Stone & Yeh, 2006), Normal Ogive Harmonic Analysis Robust Method (NOHARM) and TESTFACT software have been available much longer than the others and neither of them is clearly superior to the other when considering the recovery of item parameters. There are practical differences in the two software packages.

Normal Ogive Harmonic Analysis Robust Method (NOHARM) (Fraser, 1998) is a program for estimating the item parameters of the normal ogive form of the compensatory MIRT using the person-by-item matrix of item scores. It uses a procedure for estimating the parameters of test items for MIRT models. NOHARM

does not provide an option for estimating the elements of the  $\theta$  -vector. Therefore it is impossible to directly estimate the locations of individuals or the correlation between  $\theta$  -estimates (Reckase, 2009).

TESTFACT is a computer program for performing factor analysis of inter-item tetrachoric correlations based on item response theory (Bock, Gibbons, Schilling, Muraki, Wilson & Wood, 2002). It includes the estimation of the item and person parameters for the multidimensional extension of the two-parameter normal ogive model. The two-parameter normal ogive model contains the same parameter structure as the two-parameter logistic model (Embretson & Reise, 2000). TESTFACT was programmed assuming a standard multivariate normal distribution of coordinates with zero intercorrelations. That assumption places constraints on the estimation of the model parameters.

NOHARM does not provide estimates of the  $\theta$ -vectors, which is a clear limitation. TESTFACT provides estimates of the  $\theta$ -vectors, but it is limited in the number of dimensions that can be estimated because of the way the full information aspect of the program uses computer storage. Both TESTFACT and NOHARM have difficulty separating the dimension when the  $\theta$ s on those dimensions are highly correlated.

In this context, this study uses both NOHARM and TESTFACT, which seem

to be the programs of choice if the data consists of dichotomous item responses (Reckase, 2009). NOHARM is a free program that gives quick estimates of item parameters, and TESTFACT has the advantage of having updated versions and more complete documentation as a paid program.

## **Chapter 4. Analysis of Results**

This chapter recaps the results identified through the statistical analyses. As a preliminary analysis method, Normal Ogive Harmonic Analysis Robust Method (NOHARM) is used to check the validity of using a multiple dimensional analysis. As a next step, Multiple Item Response Theory (MIRT) examines the valid items, determines their associations, and categorizes the items as constructs for measuring unobserved characteristics of art and cultural consumption behaviors.

### **NOHARM**

NOHARM was run in exploratory mode with the 107 items to see whether MIRT was the appropriate analytical method for the data. This program does not estimate the location of individuals, which is the purpose of the study, but can be used to check whether the data can possibly be analyzed by the MIRT method. One of the weaknesses the MIRT method contains is that there is no remedy to make data collected fit in a model, like transformation in regression or bootstrap in structural equation modeling. Once the results indicate erratic statistical estimates, it is impossible to repair.

Three estimations were checked: residual, unique variance, and dimensionality. First, the residual matrix of the items showed all of the values were

smaller than 0.038, which was calculated by the equation, dimensions x square root of one divided by n. Three dimensions were tested and the total number of the responses was 6,110. Sum of squares of residuals (lower off-diagonals) was 0.17 and root mean square of residuals was 0.0055. Second, all of the unique variances indicated plus values as shown in Table 4. Any minus values could not be changed by decreasing dimension or increasing iteration.

**Table 4 Unique variance of 107 items**

| 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.128 | 0.538 | 0.349 | 0.581 | 0.196 | 0.771 | 0.622 | 0.618 | 0.581 |
| 10    | 11    | 12    | 13    | 14    | 15    | 16    | 17    | 18    |
| 0.736 | 0.421 | 0.701 | 0.752 | 0.688 | 0.662 | 0.722 | 0.775 | 0.726 |
| 19    | 20    | 21    | 22    | 23    | 24    | 25    | 26    | 27    |
| 0.707 | 0.612 | 0.654 | 0.637 | 0.432 | 0.568 | 0.603 | 0.633 | 0.646 |
| 28    | 29    | 30    | 31    | 32    | 33    | 34    | 35    | 36    |
| 0.662 | 0.508 | 0.498 | 0.624 | 0.641 | 0.543 | 0.694 | 0.633 | 0.791 |
| 37    | 38    | 39    | 40    | 41    | 42    | 43    | 44    | 45    |
| 0.609 | 0.635 | 0.689 | 0.585 | 0.652 | 0.828 | 0.591 | 0.699 | 0.641 |
| 46    | 47    | 48    | 49    | 50    | 51    | 52    | 53    | 54    |
| 0.571 | 0.581 | 0.582 | 0.614 | 0.686 | 0.681 | 0.591 | 0.603 | 0.575 |
| 55    | 56    | 57    | 58    | 59    | 60    | 61    | 62    | 63    |
| 0.578 | 0.574 | 0.575 | 0.574 | 0.573 | 0.586 | 0.656 | 0.596 | 0.582 |
| 64    | 65    | 66    | 67    | 68    | 69    | 70    | 71    | 72    |
| 0.574 | 0.581 | 0.571 | 0.571 | 0.602 | 0.572 | 0.572 | 0.582 | 0.571 |
| 73    | 74    | 75    | 76    | 77    | 78    | 79    | 80    | 81    |
| 0.907 | 0.562 | 0.501 | 0.470 | 0.574 | 0.540 | 0.646 | 0.645 | 0.858 |
| 82    | 83    | 84    | 85    | 86    | 87    | 88    | 89    | 90    |
| 0.794 | 0.692 | 0.602 | 0.640 | 0.592 | 0.343 | 0.561 | 0.693 | 0.443 |
| 91    | 92    | 93    | 94    | 95    | 96    | 97    | 98    | 99    |
| 0.641 | 0.621 | 0.615 | 0.608 | 0.573 | 0.610 | 0.600 | 0.578 | 0.579 |
| 100   | 101   | 102   | 103   | 104   | 105   | 106   | 107   |       |
| 0.996 | 0.914 | 0.582 | 0.941 | 0.939 | 0.606 | 0.590 | 0.923 |       |

Lastly, the dimensionality was tested by giving a closer look at the factor loadings under the randomly picked three dimensions. Table 5 illustrated that the items could be separable based on the multi-dimensions as each item showed high loadings in different dimensions. There were several items that measured

predominantly along with each factor and a few items that measured an equally weighted combination. As a result, three check points demonstrated there was no explicit problem with using the MIRT method for the analysis of this data.

**Table 5 Factor loadings**

| Item | Factor |       |        | Item | Factor |       |       |
|------|--------|-------|--------|------|--------|-------|-------|
|      | 1      | 2     | 3      |      | 1      | 2     | 3     |
| 1    | 0.934  | 0.000 | 0.000  | 55   | 0.375  | 0.375 | 0.374 |
| 2    | 0.587  | 0.342 | 0.000  | 56   | 0.377  | 0.377 | 0.377 |
| 3    | 0.800  | 0.083 | -0.064 | 57   | 0.377  | 0.377 | 0.376 |
| 4    | 0.613  | 0.173 | 0.117  | 58   | 0.377  | 0.377 | 0.377 |
| 5    | 0.896  | 0.021 | -0.036 | 59   | 0.377  | 0.377 | 0.377 |
| 6    | 0.389  | 0.212 | 0.180  | 60   | 0.371  | 0.372 | 0.372 |
| 7    | 0.381  | 0.353 | 0.330  | 61   | 0.337  | 0.339 | 0.339 |
| 8    | 0.543  | 0.289 | 0.061  | 62   | 0.366  | 0.367 | 0.368 |
| 9    | 0.376  | 0.374 | 0.370  | 63   | 0.373  | 0.373 | 0.373 |
| 10   | 0.491  | 0.135 | 0.074  | 64   | 0.377  | 0.377 | 0.377 |
| 11   | 0.755  | 0.050 | -0.082 | 65   | 0.374  | 0.374 | 0.374 |
| 12   | 0.334  | 0.310 | 0.303  | 66   | 0.378  | 0.378 | 0.378 |
| 13   | 0.274  | 0.316 | 0.271  | 67   | 0.378  | 0.378 | 0.378 |
| 14   | 0.303  | 0.337 | 0.327  | 68   | 0.361  | 0.366 | 0.366 |
| 15   | 0.329  | 0.342 | 0.336  | 69   | 0.377  | 0.378 | 0.378 |
| 16   | 0.276  | 0.318 | 0.318  | 70   | 0.378  | 0.378 | 0.378 |
| 17   | 0.266  | 0.281 | 0.274  | 71   | 0.372  | 0.374 | 0.374 |
| 18   | 0.288  | 0.318 | 0.299  | 72   | 0.378  | 0.378 | 0.378 |
| 19   | 0.315  | 0.318 | 0.303  | 73   | 0.225  | 0.123 | 0.165 |
| 20   | 0.354  | 0.362 | 0.361  | 74   | 0.585  | 0.192 | 0.242 |
| 21   | 0.326  | 0.346 | 0.346  | 75   | 0.650  | 0.213 | 0.176 |
| 22   | 0.347  | 0.350 | 0.346  | 76   | 0.620  | 0.249 | 0.288 |
| 23   | 0.056  | 0.501 | 0.560  | 77   | 0.549  | 0.234 | 0.265 |
| 24   | 0.100  | 0.438 | 0.479  | 78   | 0.571  | 0.222 | 0.290 |
| 25   | 0.137  | 0.418 | 0.451  | 79   | 0.519  | 0.192 | 0.219 |
| 26   | 0.323  | 0.360 | 0.365  | 80   | 0.505  | 0.226 | 0.220 |
| 27   | 0.305  | 0.358 | 0.364  | 81   | 0.269  | 0.209 | 0.161 |
| 28   | 0.266  | 0.356 | 0.374  | 82   | 0.337  | 0.239 | 0.188 |
| 29   | 0.043  | 0.459 | 0.528  | 83   | 0.402  | 0.276 | 0.265 |
| 30   | 0.070  | 0.464 | 0.531  | 84   | 0.522  | 0.254 | 0.246 |
| 31   | 0.310  | 0.369 | 0.378  | 85   | 0.408  | 0.320 | 0.303 |
| 32   | 0.272  | 0.370 | 0.385  | 86   | 0.287  | 0.380 | 0.426 |
| 33   | 0.112  | 0.444 | 0.497  | 87   | 0.010  | 0.497 | 0.641 |
| 34   | 0.234  | 0.342 | 0.366  | 88   | 0.053  | 0.423 | 0.507 |
| 35   | 0.340  | 0.353 | 0.355  | 89   | 0.125  | 0.359 | 0.404 |
| 36   | 0.207  | 0.282 | 0.294  | 90   | -0.056 | 0.442 | 0.599 |
| 37   | 0.351  | 0.365 | 0.367  | 91   | 0.203  | 0.380 | 0.417 |
| 38   | 0.316  | 0.361 | 0.367  | 92   | -0.025 | 0.383 | 0.482 |
| 39   | 0.286  | 0.334 | 0.344  | 93   | 0.357  | 0.363 | 0.354 |
| 40   | 0.370  | 0.373 | 0.373  | 94   | 0.348  | 0.367 | 0.370 |
| 41   | 0.328  | 0.344 | 0.350  | 95   | 0.377  | 0.377 | 0.377 |
| 42   | 0.176  | 0.255 | 0.275  | 96   | 0.361  | 0.363 | 0.358 |
| 43   | 0.367  | 0.370 | 0.371  | 97   | 0.364  | 0.366 | 0.366 |
| 44   | 0.269  | 0.336 | 0.340  | 98   | 0.375  | 0.375 | 0.375 |
| 45   | 0.317  | 0.358 | 0.361  | 99   | 0.374  | 0.375 | 0.375 |
| 46   | 0.375  | 0.380 | 0.379  | 100  | -0.023 | 0.038 | 0.041 |
| 47   | 0.372  | 0.374 | 0.374  | 101  | 0.125  | 0.184 | 0.191 |
| 48   | 0.372  | 0.374 | 0.374  | 102  | 0.373  | 0.374 | 0.374 |
| 49   | 0.448  | 0.313 | 0.295  | 103  | 0.179  | 0.135 | 0.093 |
| 50   | 0.366  | 0.291 | 0.310  | 104  | 0.135  | 0.143 | 0.148 |
| 51   | 0.327  | 0.327 | 0.324  | 105  | 0.357  | 0.365 | 0.366 |
| 52   | 0.369  | 0.369 | 0.369  | 106  | 0.368  | 0.371 | 0.371 |
| 53   | 0.364  | 0.364 | 0.363  | 107  | 0.115  | 0.176 | 0.181 |
| 54   | 0.377  | 0.376 | 0.376  |      |        |       |       |

## TESTFACT

The analysis of NOHARM found it problematic to include all of the 107 items in the model, as the data had quite a few items with almost no information in them, like item 20 with the similar factor loadings under the three different dimensions. Accordingly it appeared to be impossible to extract 6 or even 7 factors from these data due to the lack of convergence. To drop the information items which were not useful for measuring audiences' behavior, basic items statistics were estimated in Table 6.

Table 6 Item statistics of 107 items

| ITEM | N    | MEAN  | S.D. | RMEAN | FACILITY | DIFF  | BIS   |
|------|------|-------|------|-------|----------|-------|-------|
| 1    | 6110 | 12.49 | 8.03 | 18.20 | 0.374    | 14.29 | 0.701 |
| 2    | 6110 | 12.49 | 8.03 | 20.69 | 0.141    | 17.30 | 0.644 |
| 3    | 6110 | 12.49 | 8.03 | 17.03 | 0.442    | 13.58 | 0.633 |
| 4    | 6100 | 12.48 | 8.03 | 21.99 | 0.090    | 18.38 | 0.656 |
| 5    | 6099 | 12.49 | 8.04 | 18.97 | 0.297    | 15.13 | 0.692 |
| 6    | 6110 | 12.49 | 8.03 | 21.33 | 0.042    | 19.90 | 0.513 |
| 7    | 6086 | 12.46 | 8.02 | 26.22 | 0.021    | 21.14 | 0.700 |
| 8    | 6110 | 12.49 | 8.03 | 22.22 | 0.082    | 18.56 | 0.657 |
| 9    | 6110 | 12.49 | 8.03 | 29.60 | 0.007    | 22.68 | 0.734 |
| 10   | 6084 | 12.46 | 8.02 | 19.52 | 0.102    | 18.07 | 0.505 |
| 11   | 6110 | 12.49 | 8.03 | 17.64 | 0.323    | 14.83 | 0.577 |
| 12   | 6110 | 12.49 | 8.03 | 21.74 | 0.022    | 21.04 | 0.474 |
| 13   | 6110 | 12.49 | 8.03 | 21.10 | 0.131    | 17.48 | 0.661 |
| 14   | 6110 | 12.49 | 8.03 | 24.75 | 0.053    | 19.47 | 0.746 |
| 15   | 6110 | 12.49 | 8.03 | 25.43 | 0.028    | 20.59 | 0.697 |
| 16   | 6110 | 12.49 | 8.03 | 24.07 | 0.036    | 20.19 | 0.652 |
| 17   | 6110 | 12.49 | 8.03 | 22.88 | 0.059    | 19.26 | 0.648 |
| 18   | 6110 | 12.49 | 8.03 | 23.85 | 0.034    | 20.29 | 0.632 |
| 19   | 6110 | 12.49 | 8.03 | 24.39 | 0.041    | 19.96 | 0.686 |
| 20   | 6110 | 12.49 | 8.03 | 25.09 | 0.013    | 21.90 | 0.589 |
| 21   | 6110 | 12.49 | 8.03 | 25.17 | 0.023    | 20.92 | 0.659 |
| 22   | 6110 | 12.49 | 8.03 | 25.84 | 0.025    | 20.82 | 0.701 |
| 23   | 6110 | 12.49 | 8.03 | 19.60 | 0.240    | 15.83 | 0.682 |
| 24   | 6110 | 12.49 | 8.03 | 22.43 | 0.095    | 18.25 | 0.695 |
| 25   | 6110 | 12.49 | 8.03 | 22.70 | 0.084    | 18.51 | 0.692 |
| 26   | 6110 | 12.49 | 8.03 | 25.45 | 0.019    | 21.29 | 0.647 |
| 27   | 6110 | 12.49 | 8.03 | 25.11 | 0.022    | 20.99 | 0.651 |
| 28   | 6110 | 12.49 | 8.03 | 24.44 | 0.035    | 20.26 | 0.667 |
| 29   | 6110 | 12.49 | 8.03 | 20.01 | 0.163    | 16.93 | 0.620 |
| 30   | 6110 | 12.49 | 8.03 | 20.86 | 0.141    | 17.30 | 0.657 |
| 31   | 6110 | 12.49 | 8.03 | 26.03 | 0.025    | 20.80 | 0.713 |
| 32   | 6110 | 12.49 | 8.03 | 25.60 | 0.033    | 20.34 | 0.725 |
| 33   | 6110 | 12.49 | 8.03 | 22.06 | 0.110    | 17.91 | 0.697 |
| 34   | 6110 | 12.49 | 8.03 | 21.48 | 0.120    | 17.70 | 0.672 |
| 35   | 6109 | 12.49 | 8.03 | 24.22 | 0.015    | 21.60 | 0.567 |
| 36   | 6109 | 12.49 | 8.03 | 21.85 | 0.037    | 20.13 | 0.530 |
| 37   | 6109 | 12.49 | 8.03 | 26.00 | 0.014    | 21.77 | 0.640 |

Table 6 (cont'd)

| ITEM | N    | MEAN  | S.D. | RMEAN | FACILITY | DIFF  | BIS   |
|------|------|-------|------|-------|----------|-------|-------|
| 38   | 6109 | 12.49 | 8.03 | 26.01 | 0.025    | 20.81 | 0.711 |
| 39   | 6110 | 12.49 | 8.03 | 24.07 | 0.032    | 20.39 | 0.637 |
| 40   | 6109 | 12.49 | 8.03 | 21.43 | 0.005    | 23.32 | 0.356 |
| 41   | 6109 | 12.49 | 8.03 | 25.32 | 0.026    | 20.76 | 0.678 |
| 42   | 6109 | 12.49 | 8.03 | 20.90 | 0.053    | 19.45 | 0.513 |
| 43   | 6109 | 12.49 | 8.03 | 25.68 | 0.008    | 22.62 | 0.569 |
| 44   | 6110 | 12.49 | 8.03 | 24.81 | 0.034    | 20.27 | 0.687 |
| 45   | 6110 | 12.49 | 8.03 | 26.45 | 0.025    | 20.84 | 0.731 |
| 46   | 6106 | 12.49 | 8.03 | 32.54 | 0.013    | 21.88 | 0.940 |
| 47   | 6109 | 12.49 | 8.02 | 30.67 | 0.008    | 22.50 | 0.796 |
| 48   | 6110 | 12.49 | 8.03 | 28.15 | 0.006    | 23.06 | 0.643 |
| 49   | 6110 | 12.49 | 8.03 | 18.66 | 0.281    | 15.32 | 0.640 |
| 50   | 6110 | 12.49 | 8.03 | 14.10 | 0.753    | 10.26 | 0.479 |
| 51   | 6110 | 12.49 | 8.03 | 24.58 | 0.022    | 21.06 | 0.619 |
| 52   | 6110 | 12.49 | 8.03 | 28.70 | 0.008    | 22.53 | 0.707 |
| 53   | 6110 | 12.49 | 8.03 | 27.15 | 0.011    | 22.15 | 0.666 |
| 54   | 6110 | 12.49 | 8.03 | 35.19 | 0.004    | 23.37 | 0.900 |
| 55   | 6110 | 12.49 | 8.03 | 30.28 | 0.004    | 23.47 | 0.698 |
| 56   | 6110 | 12.49 | 8.03 | 34.59 | 0.003    | 23.96 | 0.819 |
| 57   | 6110 | 12.49 | 8.03 | 31.33 | 0.002    | 24.12 | 0.686 |
| 58   | 6110 | 12.49 | 8.03 | 33.93 | 0.002    | 24.12 | 0.780 |
| 59   | 6110 | 12.49 | 8.03 | 35.57 | 0.002    | 24.20 | 0.832 |
| 60   | 6110 | 12.49 | 8.03 | 29.56 | 0.007    | 22.68 | 0.732 |
| 61   | 6110 | 12.49 | 8.03 | 22.06 | 0.014    | 21.70 | 0.457 |
| 62   | 6110 | 12.49 | 8.03 | 23.73 | 0.007    | 22.81 | 0.475 |
| 63   | 6110 | 12.49 | 8.03 | 26.39 | 0.005    | 23.32 | 0.555 |
| 64   | 6110 | 12.49 | 8.03 | 32.71 | 0.002    | 24.20 | 0.729 |
| 65   | 6110 | 12.49 | 8.03 | 26.65 | 0.004    | 23.42 | 0.559 |
| 66   | 6110 | 12.49 | 8.03 | 50.67 | 0.001    | 25.20 | 1.220 |
| 67   | 6110 | 12.49 | 8.03 | 52.50 | 0.001    | 25.65 | 1.210 |
| 68   | 6110 | 12.49 | 8.03 | 24.12 | 0.008    | 22.59 | 0.504 |
| 69   | 6110 | 12.49 | 8.03 | 37.40 | 0.002    | 24.60 | 0.855 |
| 70   | 6110 | 12.49 | 8.03 | 34.67 | 0.000    | 25.96 | 0.645 |
| 71   | 6110 | 12.49 | 8.03 | 26.37 | 0.004    | 23.37 | 0.551 |
| 72   | 6110 | 12.49 | 8.03 | 45.57 | 0.001    | 25.02 | 1.081 |
| 73   | 6110 | 12.49 | 8.03 | 14.04 | 0.629    | 11.69 | 0.321 |
| 74   | 6110 | 12.49 | 8.03 | 15.11 | 0.623    | 11.75 | 0.533 |
| 75   | 6110 | 12.49 | 8.03 | 21.54 | 0.133    | 17.45 | 0.697 |
| 76   | 6110 | 12.49 | 8.03 | 19.53 | 0.247    | 15.73 | 0.686 |
| 77   | 6110 | 12.49 | 8.03 | 18.97 | 0.247    | 15.73 | 0.631 |
| 78   | 6110 | 12.49 | 8.03 | 18.08 | 0.322    | 14.85 | 0.625 |
| 79   | 6110 | 12.49 | 8.03 | 18.49 | 0.225    | 16.02 | 0.560 |
| 80   | 6110 | 12.49 | 8.03 | 20.12 | 0.145    | 17.24 | 0.603 |
| 81   | 6110 | 12.49 | 8.03 | 14.08 | 0.687    | 11.05 | 0.383 |
| 82   | 6110 | 12.49 | 8.03 | 14.77 | 0.611    | 11.87 | 0.451 |
| 83   | 6110 | 12.49 | 8.03 | 22.28 | 0.083    | 18.53 | 0.662 |
| 84   | 6110 | 12.49 | 8.03 | 20.95 | 0.146    | 17.22 | 0.671 |
| 85   | 6110 | 12.49 | 8.03 | 23.47 | 0.082    | 18.58 | 0.739 |
| 86   | 6110 | 12.49 | 8.03 | 14.71 | 0.690    | 11.02 | 0.539 |
| 87   | 6110 | 12.49 | 8.03 | 15.70 | 0.577    | 12.23 | 0.588 |
| 88   | 6110 | 12.49 | 8.03 | 19.27 | 0.190    | 16.51 | 0.591 |
| 89   | 6110 | 12.49 | 8.03 | 18.44 | 0.207    | 16.27 | 0.536 |
| 90   | 6110 | 12.49 | 8.03 | 16.07 | 0.460    | 13.40 | 0.515 |
| 91   | 6110 | 12.49 | 8.03 | 21.89 | 0.088    | 18.40 | 0.645 |
| 92   | 6110 | 12.49 | 8.03 | 17.95 | 0.205    | 16.30 | 0.490 |
| 93   | 6110 | 12.49 | 8.03 | 25.51 | 0.055    | 19.38 | 0.800 |
| 94   | 6110 | 12.49 | 8.03 | 26.80 | 0.024    | 20.86 | 0.749 |
| 95   | 6110 | 12.49 | 8.03 | 33.28 | 0.003    | 23.89 | 0.777 |
| 96   | 6110 | 12.49 | 8.03 | 26.33 | 0.016    | 21.58 | 0.669 |
| 97   | 6110 | 12.49 | 8.03 | 27.28 | 0.014    | 21.70 | 0.707 |
| 98   | 6110 | 12.49 | 8.03 | 27.62 | 0.004    | 23.42 | 0.597 |
| 99   | 6110 | 12.49 | 8.03 | 28.65 | 0.006    | 23.06 | 0.664 |
| 100  | 6110 | 12.49 | 8.03 | 12.72 | 0.605    | 11.93 | 0.044 |
| 101  | 6110 | 12.49 | 8.03 | 18.88 | 0.044    | 19.81 | 0.374 |

Table 6 (cont'd)

| ITEM | N    | MEAN  | S.D. | RMEAN | FACILITY | DIFF  | BIS   |
|------|------|-------|------|-------|----------|-------|-------|
| 102  | 6110 | 12.49 | 8.03 | 25.33 | 0.004    | 23.37 | 0.509 |
| 103  | 6110 | 12.49 | 8.03 | 17.60 | 0.055    | 19.37 | 0.315 |
| 104  | 6110 | 12.49 | 8.03 | 15.91 | 0.095    | 18.23 | 0.240 |
| 105  | 6110 | 12.49 | 8.03 | 24.74 | 0.009    | 22.32 | 0.547 |
| 106  | 6110 | 12.49 | 8.03 | 19.14 | 0.005    | 23.27 | 0.267 |
| 107  | 6110 | 12.49 | 8.03 | 17.10 | 0.033    | 20.33 | 0.255 |

*\*MEAN: the mean score on the survey for the entire group*

*RMEAN: the mean score on the survey for those subjects who get the item correct which means answering yes to the item.*

Table 6 shows how each item contributes to the total scores through a measure of item discriminating power. How much people can be separated by each item is calculated based on the relationships between difficulty (DIFF) and facility (FACILITY), which means the proportion that gets the item “yes.” As shown in Figure 4, they are generically negative-correlated. Intuitively the more difficulty in saying yes to the item, the smaller the proportion of people saying yes to the item.

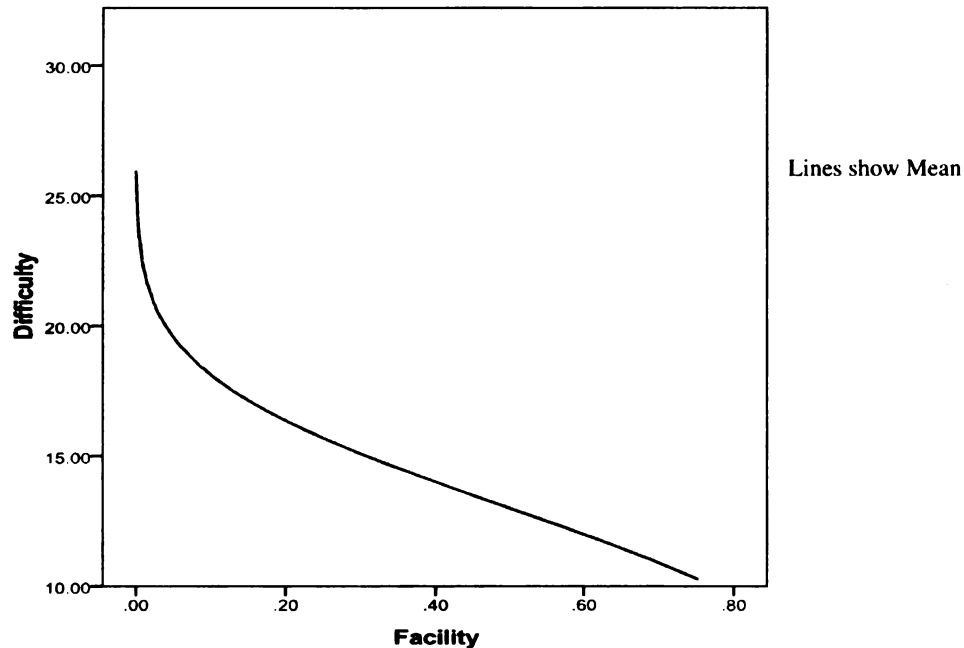


Figure 4 Relationship between difficulty and facility

TESTFACT provides two classical indices, the point biserial (PBIS) and the biserial correlations (BIS). Both are used for the calculation of correlation between the score (1 or 0) on the item and the score on the survey as a whole. The higher the correlation between these two scores, the more effective the item is in separating the scores of the respondents. The biserial correlation has an advantage to the PBIS, as it is a measure of association between response on the item and response on the survey. The formula for calculating the BIS is  $(R_{\text{MEAN}} - \text{MEAN}) / \text{S.D.} \times (\text{FACILITY} / h(\text{FACILITY}))$ . The BIS is less influenced by item difficulty (DIFF) and tends to be invariant from one testing situation to another.

Based on the discriminating power, the items with less than 0.1 (=10% correct answers) of facility and less than 0.5 of BIS were dropped for convergence. Only 30 items which met the two conditions were summarized in Table 7 with basic item statistics. Items were labeled with the subjective classification of survey items by content: "A," Attendance, "P," Participation, "B," Buying, i.e., Purchase, "T," Tourism, "L," Library, "D," Donation, "E," Education. This grouping was based on the similarity of the way in which the survey developers intended and would be used later to check whether it is the same as the way in which survey participants responded to the items.

Table 7 Item statistics of 30 items

| No. | Category | Item No. | N    | MEAN | S.D. | RMEAN | FACILITY | DIFF  | BIS   |
|-----|----------|----------|------|------|------|-------|----------|-------|-------|
| 1   | A        | 1        | 6110 | 9.33 | 5.61 | 13.53 | 0.374    | 14.29 | 0.74  |
| 2   | A        | 2        | 6110 | 9.33 | 5.61 | 14.59 | 0.141    | 17.3  | 0.591 |
| 3   | A        | 3        | 6110 | 9.33 | 5.61 | 12.8  | 0.442    | 13.58 | 0.693 |
| 4   | A        | 5        | 6099 | 9.33 | 5.61 | 14.16 | 0.297    | 15.13 | 0.738 |
| 5   | A        | 10       | 6084 | 9.31 | 5.6  | 14.47 | 0.102    | 18.07 | 0.528 |
| 6   | A        | 11       | 6110 | 9.33 | 5.61 | 13.38 | 0.323    | 14.83 | 0.65  |
| 7   | P        | 13       | 6110 | 9.33 | 5.61 | 13.71 | 0.131    | 17.48 | 0.482 |
| 8   | P        | 23       | 6110 | 9.33 | 5.61 | 14.01 | 0.24     | 15.83 | 0.643 |
| 9   | P        | 29       | 6110 | 9.33 | 5.61 | 14.47 | 0.163    | 16.93 | 0.607 |
| 10  | P        | 30       | 6110 | 9.33 | 5.61 | 14.8  | 0.141    | 17.3  | 0.615 |
| 11  | P        | 33       | 6110 | 9.33 | 5.61 | 15.53 | 0.11     | 17.91 | 0.647 |
| 12  | P        | 34       | 6110 | 9.33 | 5.61 | 14.36 | 0.12     | 17.7  | 0.538 |
| 13  | B        | 49       | 6110 | 9.33 | 5.61 | 13.88 | 0.281    | 15.32 | 0.676 |
| 14  | B        | 50       | 6110 | 9.33 | 5.61 | 10.63 | 0.753    | 10.26 | 0.555 |
| 15  | T        | 74       | 6110 | 9.33 | 5.61 | 11.51 | 0.623    | 11.75 | 0.637 |
| 16  | T        | 75       | 6110 | 9.33 | 5.61 | 15.91 | 0.133    | 17.45 | 0.726 |
| 17  | T        | 76       | 6110 | 9.33 | 5.61 | 14.78 | 0.247    | 15.73 | 0.761 |
| 18  | T        | 77       | 6110 | 9.33 | 5.61 | 14.36 | 0.247    | 15.73 | 0.702 |
| 19  | T        | 78       | 6110 | 9.33 | 5.61 | 13.75 | 0.322    | 14.85 | 0.707 |
| 20  | T        | 79       | 6110 | 9.33 | 5.61 | 14.1  | 0.225    | 16.02 | 0.637 |
| 21  | T        | 80       | 6110 | 9.33 | 5.61 | 15.07 | 0.145    | 17.24 | 0.651 |
| 22  | L        | 81       | 6110 | 9.33 | 5.61 | 10.6  | 0.687    | 11.05 | 0.439 |
| 23  | L        | 82       | 6110 | 9.33 | 5.61 | 11.11 | 0.611    | 11.87 | 0.504 |
| 24  | D        | 84       | 6110 | 9.33 | 5.61 | 15.13 | 0.146    | 17.22 | 0.659 |
| 25  | E        | 86       | 6110 | 9.33 | 5.61 | 11.05 | 0.69     | 11.02 | 0.6   |
| 26  | E        | 87       | 6110 | 9.33 | 5.61 | 11.82 | 0.577    | 12.23 | 0.654 |
| 27  | E        | 88       | 6110 | 9.33 | 5.61 | 14.09 | 0.19     | 16.51 | 0.595 |
| 28  | E        | 89       | 6110 | 9.33 | 5.61 | 13.69 | 0.207    | 16.27 | 0.562 |
| 29  | E        | 90       | 6110 | 9.33 | 5.61 | 12.1  | 0.46     | 13.4  | 0.571 |
| 30  | E        | 92       | 6110 | 9.33 | 5.61 | 13.38 | 0.205    | 16.3  | 0.521 |

By obtaining the histogram plot, the overall distribution of the total score of each respondent was shown in Figure 5. The data had a mean of 9.3 and a standard deviation of 5.6. The proportion of correct responses, 0.311 was smaller than 0.5 of the nominal probability of dichotomous variables. Thus, it can be inferred that the

questions were hard for the respondents to say yes. As the items were related to a special product, i.e., art and culture, this result was predictable. The range of difficulty enhanced this expectation.

The next step was to determine the number of dimensions needed to accurately model the relationships of the item scores. Because of the sample-specific nature of the MIRT methods, it is useful to determine how much the results generalize to other samples of people or other forms of a survey constructed to the same specification. This is particularly important when building a general form to measure audiences' activeness, or to find audiences' behavioral patterns in a certain area.

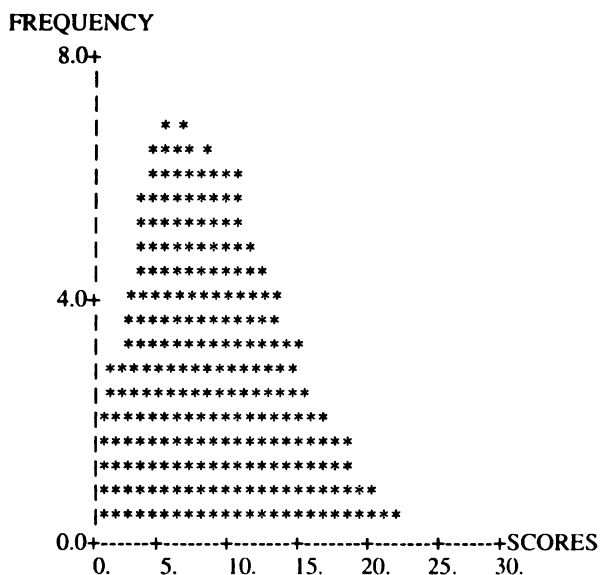


Figure 5 Histogram of 30 items

There is no correct answer to the right number of dimensions problem (Reckcase, 2009). Schilling and Bock (2005) suggest using a chi-square test of the

difference in fit of models with m and m+1 dimensions to determine the number of coordinate axes needed to model the relationships in the item response matrix. Tate (2003) found that these procedures are one of the evaluation methods of research on model fit. The statistical results to test the null hypothesis that the additional dimension gives no improvement in fit are provided in Table 8.

Table 8 Chi-square and degrees of freedom

|            | 1<br>dimension | 2<br>dimensions | 3<br>dimensions | 4<br>dimensions | 5<br>dimensions | 6<br>dimensions |
|------------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Chi-square | 64641.95       | 55693.5         | 52208.51        | 51205.99        | 45846.91        | 45836.56        |
| DF         | 6049           | 6020            | 5992            | 5965            | 5939            | 5914            |
| p value    | <0.0001        | <0.0001         | <0.0001         | <0.0001         | <0.0001         | <0.0001         |

*\*DF: Degrees of freedom = (the number of total responses - 1) - [(dimensions+1) x the number of total items - dimensions (dimensions-1)/2]*

The insignificant difference means that adding a dimension doesn't improve the model fit and suggests that the smaller of the two compared dimensions is appropriate for analysis. From the output in Table 8, the chi-square for a 1-factor versus a 2-factor model is  $64641.95 - 55693.5 = 8748.45$  with  $6049 - 6020 = 29$  degrees of freedom. As this is highly significant, the null hypothesis that the 1-factor model is better than 2-factor model is rejected. With the repeated chi-square difference test, the analysis of the real data suggests that 4 or 5 dimensions will be needed to model the relationships present in the item score matrix.

For back-up of this idea, NROOT=15 in the FACTOR command was

performed. An empirical rule for the selection of the number of factors,  $m$ , was to set  $m$  equal to the number of latent roots larger than 1 (Bock et al., 2002). Table 9 presented that 4 or 5 factors was appropriate. The number of factors should be decided on the basis of both theoretical framework concerning the items and statistical results.

Table 9 NROOT largest latent roots of the correlation matrix

| 1        | 2        | 3        | 4        | 5        | 6        | 7        | 8        |
|----------|----------|----------|----------|----------|----------|----------|----------|
| 8.949588 | 2.462394 | 1.475731 | 1.306745 | 1.032778 | 0.505416 | 0.381034 | 0.323848 |

In the path model, the items were theoretically developed by three big categories; prior experience, behavioral attitude, and consumption, and 30 items selected for analysis were divided into 7 specific categories by content which can be changed into 5 categories by merging the categories with only one or two items. In addition, in the 5-dimension model, item parameter estimates for the data did not converge even in 700 cycles. Therefore, 4-dimensional space appeared to be the best for analyzing the current data.

The output of the 4-dimensional model was summarized in Table 10. The table contains the four a-parameters (m per item) for each item and the d-parameters (one per item) as well as the multidimensional discrimination estimate A, the multidimensional difficulty estimate B, and the angles of the direction of best measurement,  $\alpha$ , for each item with the coordinate axes for the space (Bock, Gibbons

& Muraki, 1988).

Table 10 Item parameters and descriptive statistics in the four dimensions

| No | Item No. | d      | a <sub>1</sub> | a <sub>2</sub> | a <sub>3</sub> | a <sub>4</sub> | A            | B            | α <sub>1</sub> | α <sub>2</sub> | α <sub>3</sub> | α <sub>4</sub> |
|----|----------|--------|----------------|----------------|----------------|----------------|--------------|--------------|----------------|----------------|----------------|----------------|
| 1  | 1        | -0.991 | <b>1.028</b>   | 0.132          | 0.741          | 0.723          | 1.46         | 0.68         | 46             | 85             | 59             | 61             |
| 2  | 2        | -1.460 | <b>0.439</b>   | 0.131          | 0.301          | 0.402          | 0.68         | <b>2.15</b>  | 49             | 79             | 64             | 54             |
| 3  | 3        | -3.007 | <b>4.930</b>   | -0.106         | 1.817          | 1.817          | <b>5.56</b>  | 0.54         | 27             | 89             | 71             | 71             |
| 4  | 5        | -1.382 | <b>1.021</b>   | 0.086          | 0.751          | 0.687          | 1.44         | 0.96         | 45             | 87             | 59             | 61             |
| 5  | 10       | -2.082 | <b>0.849</b>   | -0.043         | 0.322          | 0.219          | 0.94         | <b>2.23</b>  | 24             | 87             | 70             | 77             |
| 6  | 11       | -4.013 | <b>4.324</b>   | -0.197         | 1.532          | 1.390          | <b>4.80</b>  | 0.84         | 26             | 88             | 71             | 73             |
| 7  | 13       | -1.196 | <b>0.259</b>   | 0.228          | 0.093          | 0.133          | 0.38         | <b>3.14</b>  | 47             | 53             | 76             | 70             |
| 8  | 23       | -4.066 | -2.029         | <b>11.829</b>  | 1.041          | 4.832          | <b>12.98</b> | 0.31         | 81             | 24             | 85             | 68             |
| 9  | 29       | -1.889 | -0.474         | <b>2.240</b>   | 0.295          | 0.948          | 2.50         | 0.76         | 80             | 26             | 83             | 68             |
| 10 | 30       | -2.119 | -0.443         | <b>2.175</b>   | 0.292          | 0.963          | 2.44         | 0.87         | 80             | 27             | 83             | 66             |
| 11 | 33       | -2.162 | -0.124         | <b>1.712</b>   | 0.250          | 0.838          | 1.93         | 1.12         | 87             | 27             | 83             | 64             |
| 12 | 34       | -1.244 | 0.120          | <b>0.326</b>   | 0.171          | 0.214          | 0.44         | <b>2.81</b>  | 74             | 42             | 67             | 61             |
| 13 | 49       | -0.785 | 0.286          | 0.353          | <b>0.462</b>   | 0.284          | 0.71         | 1.11         | 66             | 60             | 49             | 66             |
| 14 | 50       | 0.810  | 0.270          | <b>0.325</b>   | 0.296          | 0.130          | 0.53         | <b>-1.52</b> | 59             | 52             | 56             | 76             |
| 15 | 74       | -0.022 | 2.992          | 1.358          | <b>44.288</b>  | -6.546         | <b>44.89</b> | 0.00         | 86             | 88             | 8              | 81             |
| 16 | 75       | -2.039 | 0.442          | 0.133          | <b>0.943</b>   | 0.151          | 1.06         | 1.92         | 65             | 83             | 27             | 82             |
| 17 | 76       | -2.165 | 0.211          | 0.320          | <b>1.902</b>   | -0.045         | 1.94         | 1.12         | 84             | 81             | 11             | 89             |
| 18 | 77       | -1.561 | 0.190          | 0.220          | <b>1.247</b>   | -0.086         | 1.28         | 1.22         | 81             | 80             | 14             | 86             |
| 19 | 78       | -1.618 | 0.133          | 0.276          | <b>1.818</b>   | -0.218         | 1.86         | 0.87         | 86             | 81             | 11             | 83             |
| 20 | 79       | -1.679 | 0.068          | 0.102          | <b>1.250</b>   | -0.068         | 1.26         | 1.33         | 87             | 85             | 8              | 87             |
| 21 | 80       | -1.841 | 0.156          | 0.133          | <b>0.958</b>   | 0.014          | 0.98         | 1.88         | 81             | 82             | 11             | 89             |
| 22 | 81       | 0.614  | 0.094          | 0.230          | 0.185          | <b>0.426</b>   | 0.53         | <b>-1.17</b> | 80             | 64             | 70             | 36             |
| 23 | 82       | 0.361  | 0.134          | 0.256          | 0.263          | <b>0.447</b>   | 0.59         | <b>-0.61</b> | 77             | 65             | 64             | 41             |
| 24 | 84       | -1.440 | 0.318          | 0.222          | <b>0.503</b>   | 0.156          | 0.65         | <b>2.20</b>  | 61             | 70             | 40             | 76             |
| 25 | 86       | 0.720  | 0.453          | <b>0.524</b>   | 0.208          | 0.012          | 0.72         | <b>-1.00</b> | 51             | 44             | 73             | 89             |
| 26 | 87       | 11.144 | 11.046         | <b>18.667</b>  | -2.605         | -8.295         | <b>23.37</b> | <b>-0.48</b> | 62             | 37             | 84             | 70             |
| 27 | 88       | -0.989 | 0.445          | <b>0.907</b>   | -0.034         | -0.199         | 1.03         | 0.96         | 65             | 28             | 88             | 79             |
| 28 | 89       | -0.955 | 0.542          | <b>0.656</b>   | -0.027         | -0.223         | 0.88         | 1.09         | 52             | 41             | 88             | 76             |
| 29 | 90       | 0.353  | 1.734          | <b>3.070</b>   | -0.361         | -1.801         | <b>3.98</b>  | <b>-0.09</b> | 64             | 40             | 85             | 63             |
| 30 | 92       | -0.875 | 0.385          | <b>0.840</b>   | -0.103         | -0.309         | 0.98         | 0.89         | 67             | 31             | 84             | 71             |

The a-parameters and d-parameters are the equivalent of slopes and intercept.

And as explained earlier, the minus d-parameter means harder items than the plus

values. As a result, more respondents answered yes to Items 50, 81, 82, 86, 87 and 90

than any other items. This indicates that more people participated in these activities,

buying books and CDs, having a library card, visiting a library, and having experience

with art and taking an art class in their childhood, especially a music class. The a-

parameters that are sensitive to differences based on dimensions are marked in bold and italics. These values provide a clear sense of which variables are correlated and which patterns are found in that relationship.

The difficulty parameter,  $A$ , indicates the value of  $\theta$  corresponding to the point of steepest slope for the item characteristic curve (ICC). The discrimination parameter,  $B$ , is related to the slope of the ICC where it is steepest. In MIRT case, the slope of a surface is dependent on the direction of movement along the surface so that the point of steepest slope depends on the direction. In this context, the corresponding angles are specified by Eq. 7

$$\cos \alpha_{i\ell} = \frac{a_{i\ell}}{\sqrt{\sum_{k=1}^m a_{ik}^2}} \quad (7)$$

This formula is closely related to  $A$  and  $B$  values as shown in Eq. 8 and Eq. 9.

High positive values of  $B$  explain difficult items, which are the opposite interpretation to  $d$ -parameters, as the equation to calculate  $B$  has a minus sign in the nominator.

$$B_i = \frac{-d_i}{\sqrt{\sum_{k=1}^m a_{ik}^2}} \quad (8)$$

$B$  can be described as  $-d / A$ . Thus the values of the two descriptive statistics have an inverse relationship as shown in Table 10.

$$A_i = \sqrt{\sum_{k=1}^m a_{ik}^2} \quad (9)$$

The variances explained by each dimension are 29.10634, 15.47853, 8.67663, and 5.84328. Four dimensional spaces capture 60% of the population variance in total.

In Table 11, a communality is computed by squaring that variable's factor loadings and then by summing these squares. A communality of 0.5 for a variable means that 50% of the variance for that variable is accounted for by all the retained factors. The negative value of difficulty shows easier items. Item 70 has zero difficulty and 100% communality. Overall communality exceeds 0.5.

**Table 11** Standardized difficulty, communality and factor

| No. | Item No. | Diffi-<br>culty | Commu-<br>nality | Principle Factor |        |        |        | VARIMAX factor |        |        |        |
|-----|----------|-----------------|------------------|------------------|--------|--------|--------|----------------|--------|--------|--------|
|     |          |                 |                  | 1                | 2      | 3      | 4      | 1              | 2      | 3      | 4      |
| 1   | 1        | 0.558           | 0.682            | -0.683           | -0.265 | 0.277  | -0.261 | 0.284          | 0.041  | 0.754  | 0.176  |
| 2   | 2        | 1.207           | 0.316            | -0.470           | -0.110 | 0.168  | -0.235 | 0.152          | 0.029  | 0.502  | 0.202  |
| 3   | 3        | 0.532           | 0.969            | -0.696           | -0.326 | 0.591  | -0.170 | 0.188          | 0.169  | 0.950  | -0.042 |
| 4   | 5        | 0.787           | 0.676            | -0.673           | -0.291 | 0.278  | -0.246 | 0.296          | 0.031  | 0.752  | 0.147  |
| 5   | 10       | 1.520           | 0.467            | -0.475           | -0.248 | 0.421  | -0.054 | 0.155          | 0.143  | 0.644  | -0.086 |
| 6   | 11       | 0.819           | 0.958            | -0.675           | -0.339 | 0.608  | -0.135 | 0.187          | 0.180  | 0.940  | -0.085 |
| 7   | 13       | 1.118           | 0.127            | -0.316           | 0.089  | 0.124  | -0.061 | 0.055          | 0.181  | 0.254  | 0.164  |
| 8   | 23       | 0.312           | 0.994            | -0.544           | 0.709  | -0.343 | -0.279 | 0.055          | 0.354  | -0.041 | 0.929  |
| 9   | 29       | 0.702           | 0.862            | -0.509           | 0.634  | -0.360 | -0.266 | 0.085          | 0.298  | -0.053 | 0.873  |
| 10  | 30       | 0.804           | 0.856            | -0.512           | 0.626  | -0.353 | -0.278 | 0.083          | 0.289  | -0.038 | 0.874  |
| 11  | 33       | 0.996           | 0.788            | -0.554           | 0.577  | -0.253 | -0.289 | 0.074          | 0.303  | 0.070  | 0.828  |
| 12  | 34       | 1.138           | 0.163            | -0.358           | 0.135  | -0.038 | -0.125 | 0.118          | 0.132  | 0.181  | 0.315  |
| 13  | 49       | 0.641           | 0.333            | -0.565           | -0.015 | -0.038 | -0.113 | 0.317          | 0.131  | 0.343  | 0.314  |
| 14  | 50       | -0.715          | 0.220            | -0.466           | 0.052  | 0.023  | -0.017 | 0.230          | 0.211  | 0.267  | 0.226  |
| 15  | 74       | 0.000           | 1.000            | -0.661           | -0.533 | -0.428 | 0.310  | 0.988          | -0.010 | 0.151  | -0.004 |
| 16  | 75       | 1.399           | 0.529            | -0.642           | -0.333 | -0.073 | 0.044  | 0.592          | 0.056  | 0.407  | 0.097  |
| 17  | 76       | 0.992           | 0.790            | -0.690           | -0.381 | -0.368 | 0.184  | 0.853          | 0.035  | 0.204  | 0.139  |
| 18  | 77       | 0.959           | 0.622            | -0.618           | -0.333 | -0.298 | 0.199  | 0.757          | 0.068  | 0.188  | 0.095  |
| 19  | 78       | 0.767           | 0.775            | -0.642           | -0.382 | -0.389 | 0.258  | 0.864          | 0.054  | 0.135  | 0.084  |
| 20  | 79       | 1.045           | 0.613            | -0.553           | -0.388 | -0.353 | 0.176  | 0.766          | -0.023 | 0.142  | 0.074  |
| 21  | 80       | 1.315           | 0.490            | -0.554           | -0.321 | -0.255 | 0.121  | 0.661          | 0.015  | 0.206  | 0.101  |
| 22  | 81       | -0.544          | 0.217            | -0.337           | 0.053  | -0.048 | -0.314 | 0.080          | -0.044 | 0.264  | 0.373  |
| 23  | 82       | -0.310          | 0.261            | -0.404           | 0.027  | -0.054 | -0.306 | 0.138          | -0.031 | 0.303  | 0.386  |
| 24  | 84       | 1.205           | 0.300            | -0.533           | -0.125 | -0.013 | -0.013 | 0.375          | 0.122  | 0.339  | 0.171  |
| 25  | 86       | -0.584          | 0.343            | -0.520           | 0.200  | 0.152  | 0.098  | 0.166          | 0.435  | 0.289  | 0.209  |
| 26  | 87       | -0.476          | 0.998            | -0.512           | 0.657  | 0.310  | 0.456  | -0.007         | 0.978  | 0.096  | 0.182  |
| 27  | 88       | 0.689           | 0.515            | -0.447           | 0.489  | 0.159  | 0.226  | 0.029          | 0.660  | 0.106  | 0.260  |
| 28  | 89       | 0.717           | 0.436            | -0.415           | 0.361  | 0.266  | 0.251  | 0.024          | 0.621  | 0.190  | 0.115  |
| 29  | 90       | -0.086          | 0.940            | -0.458           | 0.613  | 0.266  | 0.533  | 0.035          | 0.963  | 0.022  | 0.110  |
| 30  | 92       | 0.625           | 0.490            | -0.362           | 0.498  | 0.159  | 0.291  | -0.001         | 0.672  | 0.031  | 0.191  |

The most important topic in MIRT will be how many dimensional spaces are needed to accurately represent the differences in persons. In this study, four  $\theta$  vectors are used as examples along with 30 test items about art-related consumption behavior that are sensitive to differences in the persons. It also will be important to check the correlations between factors to evaluate the possibility to merge or separate similar factors. As shown in Table 12, reliability values are over 0.9.

Table 12 PROMAX rotated factor correlations

|             | $\theta_1$ | $\theta_2$ | $\theta_3$ | $\theta_4$ |
|-------------|------------|------------|------------|------------|
| $\theta_1$  | 1.000      | 0.078      | 0.578      | 0.355      |
| $\theta_2$  | 0.078      | 1.000      | 0.249      | 0.442      |
| $\theta_3$  | 0.578      | 0.249      | 1.000      | 0.424      |
| $\theta_4$  | 0.355      | 0.442      | 0.424      | 1.000      |
| Reliability | 0.9475     | 0.9702     | 0.9658     | 0.8803     |

To confirm dimensional structure, a cluster analysis of a measure of the similarity of the constructs is performed. A clustering of items is based on two decisions: the selection of a measure of similarity between items and the algorithm for forming clusters. For the similarity measure, one option is the angle between each pair of item vectors (Miller & Hirsch, 1992). The clustering method that works well when the angle between items is the similarity measure is Ward's method, which recovers the underlying structure of the data more accurately than alternative methods (Child, 2006). This type of analysis does not give conclusive information about the required number of dimensions. When there is a major difference in the solution, it means that

a higher number of dimensions is needed (Reckcase, 2009). In addition, researchers support that the analysis of angular responses improves the ability to characterize the variables. Thus, the clustering analysis of the angular data is implemented (Fonseca & Calder, 2007).

Table 13 Inter-item correlation matrixes

Initial correlation

| No | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13 |
|----|------|------|------|------|------|------|------|------|------|------|------|------|----|
| 1  | 1    | 48   | 51   | 65   | 71   | 58   | 71   | 80   | 81   | 81   | 77   | 76   | 65 |
| 2  | 0.67 | 1    | 60   | 55   | 74   | 70   | 69   | 80   | 82   | 83   | 78   | 78   | 68 |
| 3  | 0.63 | 0.5  | 1    | 53   | 74   | 70   | 73   | 79   | 80   | 81   | 76   | 75   | 68 |
| 4  | 0.42 | 0.57 | 0.6  | 1    | 72   | 55   | 74   | 82   | 84   | 83   | 78   | 78   | 65 |
| 5  | 0.33 | 0.27 | 0.27 | 0.31 | 1    | 47   | 74   | 80   | 81   | 84   | 83   | 80   | 76 |
| 6  | 0.53 | 0.35 | 0.34 | 0.57 | 0.68 | 1    | 80   | 81   | 81   | 84   | 78   | 78   | 70 |
| 7  | 0.33 | 0.36 | 0.3  | 0.27 | 0.27 | 0.18 | 1    | 76   | 81   | 81   | 74   | 77   | 79 |
| 8  | 0.18 | 0.18 | 0.19 | 0.14 | 0.17 | 0.15 | 0.25 | 1    | 76   | 76   | 75   | 64   | 66 |
| 9  | 0.15 | 0.14 | 0.18 | 0.11 | 0.16 | 0.16 | 0.16 | 0.24 | 1    | 36   | 41   | 67   | 69 |
| 10 | 0.15 | 0.13 | 0.15 | 0.13 | 0.1  | 0.11 | 0.16 | 0.24 | 0.81 | 1    | 43   | 67   | 65 |
| 11 | 0.23 | 0.21 | 0.25 | 0.20 | 0.13 | 0.21 | 0.27 | 0.26 | 0.75 | 0.73 | 1    | 67   | 67 |
| 12 | 0.24 | 0.20 | 0.26 | 0.21 | 0.18 | 0.21 | 0.23 | 0.44 | 0.39 | 0.39 | 0.39 | 1    | 71 |
| 13 | 0.43 | 0.37 | 0.38 | 0.43 | 0.24 | 0.35 | 0.19 | 0.40 | 0.36 | 0.42 | 0.39 | 0.32 | 1  |

Smoothed correlation (positive-definite)

| Item | 1    | 2    | 3         | 4    | 5         | 6         | 7    | 8    | 9    | 10   | 11   | 12   | 13 |
|------|------|------|-----------|------|-----------|-----------|------|------|------|------|------|------|----|
| 1    | 1.00 | 63   | 40        | 47   | 59        | 41        | 76   | 81   | 81   | 81   | 77   | 77   | 66 |
| 2    | 0.46 | 1.00 | 60        | 63   | 71        | 61        | 80   | 79   | 80   | 80   | 77   | 80   | 73 |
| 3    | 0.77 | 0.50 | 1.00      | 40   | 48        | 16        | 74   | 89   | 89   | 89   | 84   | 78   | 67 |
| 4    | 0.68 | 0.45 | 0.77      | 1.00 | 59        | 41        | 76   | 83   | 83   | 83   | 78   | 77   | 66 |
| 5    | 0.52 | 0.33 | 0.67      | 0.52 | 1.00      | 48        | 80   | 87   | 87   | 87   | 88   | 83   | 75 |
| 6    | 0.76 | 0.49 | 0.96      | 0.76 | 0.67      | 1.00      | 74   | 88   | 87   | 88   | 87   | 79   | 68 |
| 7    | 0.24 | 0.17 | 0.28      | 0.24 | 0.18      | 0.27      | 1.00 | 78   | 79   | 79   | 78   | 83   | 80 |
| 8    | 0.16 | 0.19 | -<br>0.01 | 0.13 | -<br>0.05 | -<br>0.04 | 0.21 | 1.00 | 23   | 23   | 28   | 70   | 70 |
| 9    | 0.15 | 0.17 | -<br>0.02 | 0.12 | -<br>0.05 | -<br>0.06 | 0.19 | 0.92 | 1.00 | 31   | 35   | 71   | 71 |
| 10   | 0.16 | 0.18 | -<br>0.01 | 0.13 | -<br>0.05 | -<br>0.04 | 0.19 | 0.92 | 0.86 | 1.00 | 35   | 71   | 71 |
| 11   | 0.23 | 0.22 | 0.10      | 0.21 | 0.03      | 0.06      | 0.21 | 0.88 | 0.82 | 0.82 | 1.00 | 71   | 70 |
| 12   | 0.23 | 0.18 | 0.20      | 0.22 | 0.13      | 0.19      | 0.13 | 0.34 | 0.32 | 0.32 | 0.32 | 1.00 | 77 |
| 13   | 0.41 | 0.29 | 0.39      | 0.40 | 0.26      | 0.38      | 0.18 | 0.34 | 0.32 | 0.33 | 0.35 | 0.22 | 1  |

The uncentered version of the Pearson correlation assumes that the mean of the population is zero. This is equivalent to calculating the cosine of the angle. Thus the correlation matrices are used to estimate the angles between vectors. The equation below is similar to the one used for alphas in the descriptive statistics.

$$\cos \alpha_{12} = \frac{a_1'}{\sqrt{\sum_{\ell=1}^m a_{1\ell}^2}} \frac{a_2}{\sqrt{\sum_{\ell=1}^m a_{2\ell}^2}} \quad (10)$$

The lower triangle indicates correlation, and the upper triangle contains the cosine of the angle between two variables. If the cosine of  $0^\circ$  is 1, it means the item vectors are pointing in the same direction, while  $90^\circ$  illustrates a zero correlation between the underlying latent variables. Two different matrices are used. The top table has negative latent roots, but the second one is smoothed and positive definite. The angles between items that are best at measuring different constructs have much larger values. For example, the 3<sup>rd</sup> and 8<sup>th</sup> items, i.e., Items 3 and 27 have very high degrees. These two items are better to be located in the different dimensions. Based on the two correlation matrices, the cluster analyses dendrograms are shown in Figures 6 and 7. The horizontal axes are a function of the sum of the squared distance between the items in one cluster and those in another. The values on the axes cannot

be directly converted into an angle measure (Reckase, 2009). The results show that there is a clear clustering of the items in the test, and even if the clustering does not exactly match well with the subjective classification of test items by content, it provides a useful analysis for understanding the underlying patterns in persons.

The top panel is the output of the initial correlation matrix, and the bottom panel is based on the smoothed positive definite matrix. The two dendrograms seem to illustrate the different results in both the order of the items and the appropriate number of dimensions. However, the items on the clusters are very similar, despite the discrepancy of a few items, like Items 49 and 50.

The big picture of the classification shows that the two dendrograms have four or five categories around 10 on the vertical axes. The number of groups with the clustering analysis is the maximum number of the dimensions to be obtained in MIRT (Reckase, 2009). Thus, these results support the MIRT analysis that four dimensions are needed to determine the location of difference in persons.

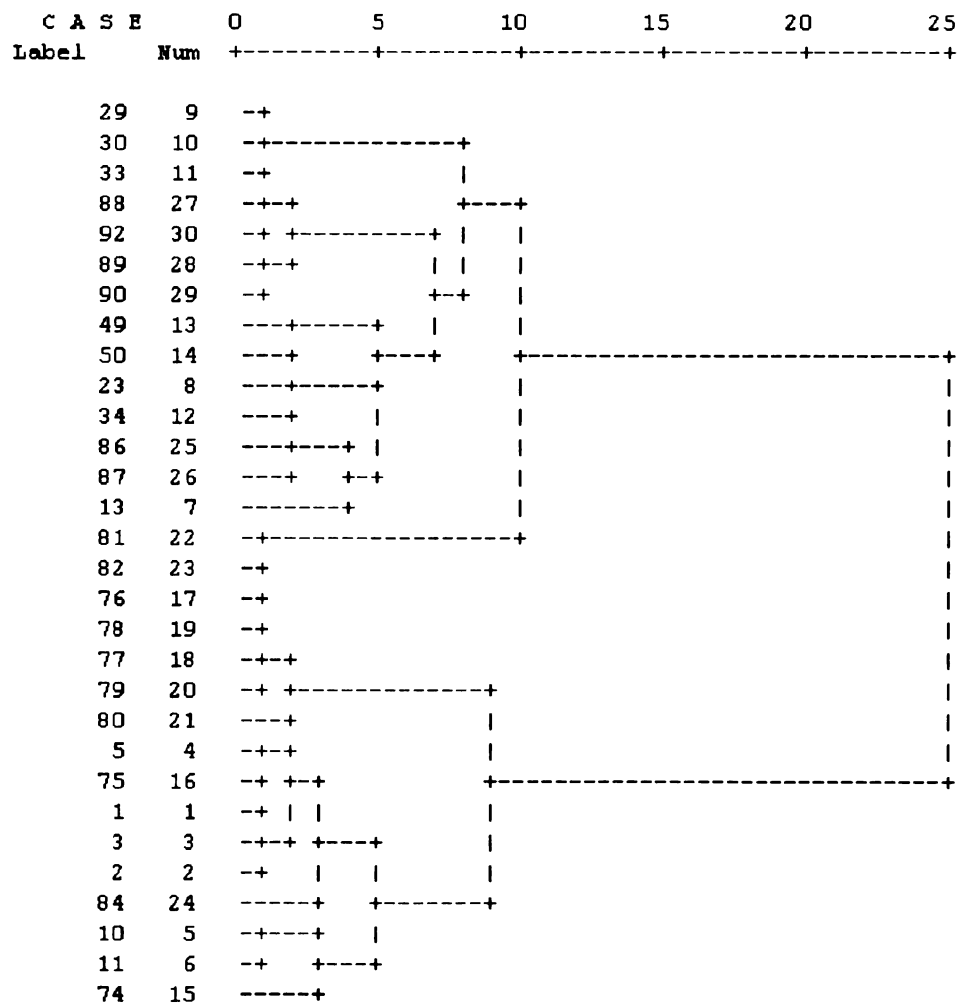


Figure 6 Dendrogram for clustering of 30 items (initial correlation)

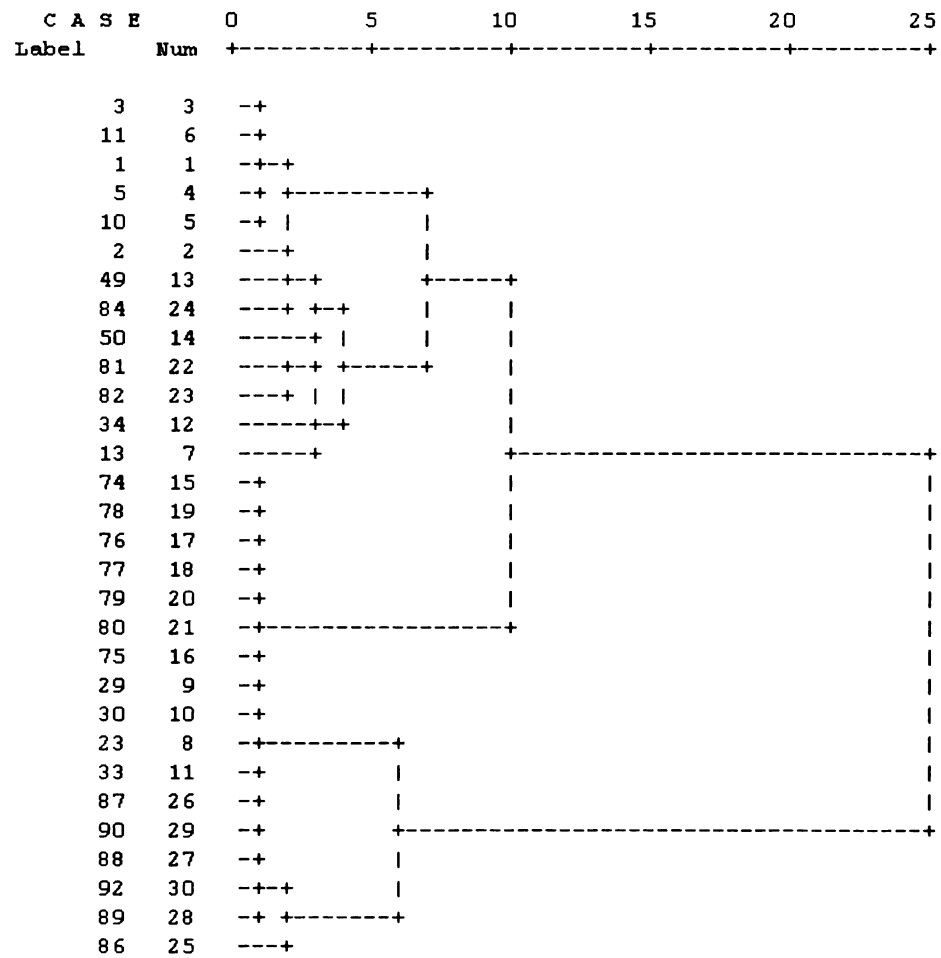


Figure 7 Dendrogram for clustering of 30 items (smoothed correlation)

## **Chapter 5. Findings and Implications**

This section summarizes the statistical findings in accordance with the research questions/objectives which are made explicit in the introduction. It provides explanation of how the results can be interpreted and used for the future development of efficient messages and communications. In addition, it suggests ideas of future studies which will make the study more beneficial to art and cultural organizations, art educators, producers and law makers.

### **Results and Discussion**

The statistical output supports and explains the research questions. The objectives of the study corresponding to the three research questions are: 1) to identify factors for measuring public consumption behavior in the art and cultural sectors; 2) to determine associations between valid factors; and 3) to utilize the associations for segmenting the public and for accounting for their behavioral difference in art-related consumption.

The results support the general intuition related to art and cultural consumption. For example, those who enjoy traveling are more likely to participate in a variety of other cultural activities, such as attendance at different performances and even donation for cultural organizations. While the widely accepted thoughts are

developed from intuitive and empirical suggestions , this study provides scientific and statistically proved instruments to segment people through the insight of how people behave differently and, more importantly, which behaviors are more closely related and influenced by each other.

When trying to persuade publics and legislators, organizations in the art and cultural industry rely on their knowledge of what is conducive to the success of the communication plan in accordance with their experience over a long period of time. It is difficult, however, to regard the empirical generalizations on art and cultural behaviors as scientific data to support their statements. Therefore, these findings will provide them with a robust foundation for establishing more reasonable and trustworthy messages appealing to both target audiences.

The results are categorized by the dimension which represents a construct of items measuring behavioral patterns. The parameter estimates obtained by the MIRT method indicate that the 30 items are classified in four different dimensions. The items under one dimension are closely correlated and define the unique characteristics about how different people are in their art and cultural consumption. Thus, the items can be used to separate and cluster people based on the characteristics each dimension explains. Multidimensionality means people are located in the space of their art and cultural consumption behaviors according to their responses to the items under each

dimension. In short, a person who answers “yes” to most of the items under Dimension 1 has different behavioral patterns from a person who answers “no” to most of the items in terms of the latent characteristic accounted for by Dimension 1. In addition, a person who has a certain pattern in Dimension 1 can show similar or different behavioral dynamics in dimensions 2 and 3. As a result, organizations can apply the differences for implementing more target-oriented communication activities with the analysis of what factors make people behave in a certain way and how the difference in their behaviors can be factored into the development of efficient messages.

*Dimension 1: Activities with intangible output and temporal enjoyment*

Dimension 1 includes attendance at various performances and an area of participation in performing arts. Performing arts cover: 1) Playing a musical instrument, 2) Playing in a band or orchestra, 3) Solo singing, 4) Group or choir singing, 5) Dance, 6) Acting, 7) Comedy, magic and mime, 8) Storytelling and readings, and 9) Other performances. This dimension seems to explain temporal activities. Unfortunately, obtaining tangible outcomes right after implementing performances is difficult when dealing with temporal activities. By playing musical instruments and performing arts, people can enjoy the moment and achieve something in return psychologically, while they cannot touch or see the output.

The following seven items are sensitive to the difference in persons on

Dimension 1: 1) Attendance at theatrical performance, 2) Attendance at theatrical performance in a different state or country, 3) Purchase of tickets of theatrical performance, 4) Attendance at dance performance, 5) Attendance at music performance in a different state or country, 6) Purchase of tickets of music performance, and 7) Participation in any performing arts. According to their responses to the seven items, people appear to be different in their engagement in art and cultural activities. Thus, attendees at performances demonstrate different characteristics as art and cultural consumers, and they can be clustered as different consumers from people who never attended any performances. As a result, communicators should come up with different strategic plans based on where they can find the right target population and what their target prefers doing.

Among the three different categories measuring attendance at performances, such as theatrical, dance and music, people are more likely to attend a dance performance with free tickets. Thus, unlike the other two categories, buying tickets for a dance performance alone is not valid to measure the characteristics of Dimension 1, as the majority of people do not demonstrate the difference. Simple attendance appears to be enough for measuring the level of engagement in art and cultural activities. Based on whether people attend performances, organizations

should treat people differently when developing marketing messages.

Purchase of tickets for attending theatrical and music performances has the highest discriminating power among the items in this dimension. In terms of the discriminating power, the degree to which people can be separated by each item is calculated based on the relationships between difficulty and facility, which means the proportion which gets the item “yes.” Difficulty and facility are negative-correlated. This means that the more difficult saying “yes” to the item is, the smaller the proportion of people saying “yes” to the item is. The reason the items with discriminating power are important is that they consider the relationship between people and items. For example, even if two students have the same scores in a specific examination, their same scores do not indicate that they have uni-dimensionally the equal ability or capability. One of the two students may have higher ability in a specific field, while the other is not in that field. Therefore, people who say “yes” to the item with higher discriminating power are regarded as very different from others who say “no” to the same item.

In terms of difficulty, purchase of tickets for attending theatrical and music performances is identified as comparatively easy questions. They rank first and third respectively, which represents a high probability for people to say “yes” to those items. By considering high discriminating power and high difficulty, these two questions are

useful for measuring the latent characteristics of Dimension 1. Depending on whether people say “yes” or “no,” communicators can treat them as different consumers or audiences.

As fewer people attend dance performances, and music performances in a different state or country, people who say “yes” to either of those questions can be categorized into heavy and active consumers in this dimension. Dimension 1 appears to be a good barometer for determining whether people are more active consumers and highly engaged in art and cultural sectors.

Compared to attendance at performances, participation in the performing arts has a relatively low discriminating power. It can be interpreted that even if people are different in answering this item, it is not enough to determine that people who are not participating in performing arts are totally different from people who are engaged in this discipline. The fact, however, that participation in the performing arts is incorporated into this dimension provides a clear rationale for the connection between the involvement in attendance at the art-related performances and the participation in performing arts. The result demonstrates that people who attend theatrical, musical and dance performances have a high probability to participate in activities related to the performing arts and vice versa.

Overall, Dimension 1 accounts for how people behave different in temporal

activities which do not bring tangible output, such as drawing and photograph.

Playing a musical instrument, singing and dancing, and attendance at various performances, which are identified as the most useful items to separate people, are one-time engagements. One does not have to have long-term devotion or commitment in implementing those activities. If people want to play, they can play. If people want to see any kind of performance, they can buy tickets and go to the places to enjoy performances. All of the activities in this dimension appear to be temporary and relatively impromptu. Even if some of the activities such as mime, comedy, and acting require some skills to execute, the implementation does not last long. Once people perform them, it is hard to find the physical and tangible outcome. People enjoy and appreciate the activities at that moment. And people are satisfied with mental and emotional fulfillment.

*Dimension 2: Activities with tangible output and long-term commitment*

Dimension 2 contains twelve items as follows: 1) Participation in any visual arts, 2) Engagement in Photography, 3) Crafts and 4) Writing, 5) Participation in any art-related or cultural disciplines, 6) Purchase of any books, videotapes, DVDs, CDs, records, tapes or music downloads, 7) Exposure to art in childhood, 8) Having art education in childhood, 9) Taking any visual arts classes, 10) any performing arts classes, 11) any music classes (vocal/instruments), and 12) any crafts classes in

childhood. Visual arts include drawing, painting, printmaking, sculpture, textile arts, photography, crafts, folk or traditional art, media arts, and writing.

The results demonstrate that the three areas, photography, crafts, and writing can be used as a powerful measurement of art and cultural consumption in Dimension 2. Three items indicate the common characteristics that bring out tangible output of pouring time, effort, and finance. People can see, touch, and keep photos, drawings, and books/writings as the results of their endeavors. These activities can be also labeled as tactile art activities.

In addition, compared to attending various performances, taking art and cultural classes included in this dimension requires longer commitment. The precondition to register themselves to those classes will be self-motivation and relatively long-term commitment. Through their early experience with art and cultural education, people appear to develop confidence in devoting themselves to the art and cultural classes when they are grown up.

Purchase of books, CDs, and DVDs, downloading of music, and exposure to art in childhood indicate low difficulty in parameter estimates. This means that they are not the best items to distinguish people in terms of their engagement level, as most of the respondents purchase books, CDs and DVDs, and download music online. The question about exposure to art in childhood is whether parents or other adults took a

person to arts or cultural performances or events when he/she was a child (up to 18 years old).

The fact that most people have experience with purchasing CDs, DVDs and books, downloading music, and exposing themselves to art activities in childhood implies that the two questions are good filtering questions to determine whether a person is actually participating in any kinds of art consumption behaviors or not. It will serve as the basic information for communication planners to recognize the existence of the evidently different audience groups and to sort who will be their focal target population.

The item with the highest discriminating power in this dimension is whether people had ever taken any art-related classes in their childhood. This means that people who took art-related classes in their early period of life demonstrate different consumption behaviors in the art and culture industry. Visual arts, performing arts, music, and crafts classes are identified as especially useful for segmenting people based on their engagement level. People who took those classes within the last 12 months have experience with art education in their childhood. And they can be sorted as a highly involved consumer in Dimension 2. Except for literary classes, all of the other classes mentioned in the questionnaire demonstrate the power to be used when segmenting audiences to develop strategic communication plans. They appear to

explain the unique characteristics in Dimension 2.

As many educators have been claiming the magnitude of art education for children, the results support the widely known connection between early education and future consumption and purchase behavior in a specific area. Once people become exposed and familiar to art and culture, regardless of whether they are engaged in classes voluntarily or not, they seem to have a more positive attitude toward art and culture and are interested in participating in art and cultural activities later.

The items incorporated into this dimension are the activities which people can engage in by themselves. When compared to Dimension 1, these items would be categorized into more self-motivated consumption behaviors. People do not need to have companions or partners to participate in photography or writing. Their final decision on whether they will participate in these activities does not seem to be influenced by outside stimulus. Self-motivation cumulated through prior experience is more likely to be an important factor in making a final decision of participation. People will need more time and effort to decide to enroll in the art and cultural classes in Dimension 2. They are able to obtain the tangible output of their taking classes which does not disappear right away. Therefore, this dimensional space can be used to measure a more long-term art and cultural commitment than Dimension 1.

### *Dimension 3: Socio-psychic investment activities*

Dimension 3 includes the items about cultural tourism, purchase of visual arts, and donation. People are asked about specific activities made on their pleasure trips.

The six activities related to art and cultural consumption are: 1) Attendance at a theatrical performance on a trip, 2) Visit to a museum: art, history, science, or special topics museum, 3) Attendance at a festival: art, crafts, music, food, wine, ethnic, antiques, or car show, 4) Visit to a historical site, attraction or community: heritage parks, lighthouses, monuments, landmarks, archaeological sites, cultural centers or historical communities, 5) Visit to a zoo, aquarium, botanical garden or arboretum, and 6) Visit to a library: national, state, local community, or university/college.

Buying visual arts and giving donations to art organizations have a low discriminating power. This means that communicators cannot segment people by asking two questions in terms of their engagement in art and cultural consumption. The difference in answering the two questions is not a reliable barometer for distinguishing between people.

People who go to libraries and attend theatrical performances when traveling are identified as very heavy cultural consumers. Most people visit cultural touristic attractions in the following order: historical sites, museums, festivals, zoos, libraries, and theatrical performances. People are more likely to visit historical sites and

museum on their trips than a library or a zoo. Thus, a visit to a library and attendance at a theatrical performance can be a measurement to identify the high level of engagement in art and cultural areas.

One more item included in Dimension 3 is donation. It can be interpreted that people who are interested in traveling to cultural tourist attractions are more likely to donate money to art and cultural affiliations. It might be explained by the fact that travelers have a higher possibility to be more affluent, more educated and more flexible than people who do not travel. Traveling to cultural spots requires more money and time compared to engagement in the items included in Dimensions 1 and 2. People who engage in such activities can be regarded as more experienced consumers in the art and cultural industry. First-time travelers will visit tourist sites which are well known to the public, while repeating travelers will try to find more sophisticated activities in terms of art and cultural consumption, like theatrical performances.

As a result, Dimension 3 explains socio-psychic investment in art and culture. When it comes to the purposes for participating in the activities in this dimension, such as traveling, purchase of visual art, and donation, people appear to invest their money and effort to expand their horizons in art and cultural consumption. Traveling psychologically enriches their lives. Interaction with local people and extension of their knowledge related to history and art in the regions that they travel will be a great

asset for their lives. People feel a considerable amount of self-esteem and self-satisfaction when purchasing visual arts. Visual arts are regarded as not only décor for their physical environment, but psychological refreshment as well. Donation makes people think of themselves as responsible and contributing member of a society. It helps people fulfill ethical obligation. People receive something in return: 1) self-esteem, 2) the opportunity to make a contribution to society, 3) recognition from peers and the community, 4) a sense of belonging, and 5) ego gratification (Wilcox & Cameron, 2009). As a result, the fact that people are involved in any of the activities in Dimension 3 reflects that they are socially, economically, sentimentally, and psychologically affluent and they are ready to invest their resources in art and cultural behaviors.

*One final cluster: screening questions*

One more group is identified separately from the three dimensions. It explains library usage and contains only two items: having a library card and visiting a library. A visit to a library appears to measure a different characteristic from a visit to a library during a cultural trip. Most people seem to have at least one library card and visit libraries. This cluster accounts for explicitly different latent characteristics from the other dimensions. It indicates the highest facility, which means the highest percent of affirmative answers, and the highest discriminating power.

High facility and discriminating power can be interpreted that the library usage items are useful to filter people in art consumption, like the item of purchasing CDs, DVDs and books, and downloading music. The basic level of engagement may depend on the answers to these two questions. People who had never visited a library and do not have any library card are unlikely to be considered as active consumers in art and cultural sectors. At the beginning of developing a communication campaign, these groups will be hard to be a focal segment for persuasion.

According to the correlations among dimensions, Dimension 1 is highly related to Dimension 3, and Dimensions 1 and 2 are not much related. This indicates that the contrasting dimensions explain the different latent characteristics. The items included in these dimensions will aid in identifying people with a certain engagement level. It suggests that people who attend art and cultural performances are more likely to participate in art and cultural activities on their trips. Contrary to this, the dissimilarity between Dimensions 1 and 2 represents that the two dimensions measure totally different patterns of the respondents' art and cultural consumption behaviors.

In addition, it is notable that art education in childhood has a great impact on how actively people are engaged in art and cultural classes in the future, and people who are interested in traveling to cultural attractions have more tendencies to donate. This information will be useful for determining where, when, and how

communicators target the right group of people.

As a result, the associations between items are accounted for by audiences' behaviors in art and cultural sectors, and these factors can be used for measuring the unobserved characteristics, like a level of activeness or engagement, and for clustering people to identify where communicators place their campaigns and how they will reach the targeted audiences. Therefore, the coordinates to locate people in the multidimensional spaces can be developed and implied for clustering population as a unique segment when developing specific messages targeting a specific audience group.

Each dimension also can be interpreted by the theories, TPB and SCT, which were primarily used for developing the survey questions. Dimension 1 indicates the relationship between attendance and participation in performing arts. This construct is closely related to subjective norm in TPB, in which people care about what their reference group thinks about their behaviors and how other people's behavior affects their behavioral change. In short, their behavior is influenced by others. People usually attend art-related performances with someone else, unlike going to the movies sometimes alone.

As a result, attendance at a performance is often a collectivistic behavior and sometimes people go see a performance without their voluntary choice. It reflects that

people in this dimension take care of others' interest, and others' norm has an impact on their decision-making. This finding is enhanced by the fact that participation in performing arts is included in this dimension. Performing arts requires audiences, which means that people engaged in performing arts need someone to work with and to appreciate their performance. It has the distinctive difference from participation in writing, craft, and photography, which are incorporated in Dimension 2.

In contrast, Dimension 2 demonstrates that people with earlier experience in art and cultural activities have a tendency to participate in individualistic consumption behavior, including taking pictures, writing, and making crafts. It appears to be connected to self-efficacy in SCT. If people experience art and cultural activities in their childhood and have good memories about the early exposure, they are more likely to think that they have the ability to participate in the same activities when they are grown up. Based on their experience, they can figure out whether they are capable of dealing with the required skills and they feel self-satisfaction through those activities.

Self-efficacy may be multi-faceted. Early exposure and early education appear to be the prominent factors of creating self-efficacy in art and cultural behaviors. They are likely to contribute to creating self confidence when participating in art and cultural activities. Taking visual arts, music, and craft classes in childhood

results in engagement in photography, crafts, and writing. Self-motivated people may actively participate in art and cultural classes with belief in their own capability of performance.

Dimension 3 is related to Dimension 1. Dimension 3 can be explained by PBC in TPB, as perceived behavioral control encompasses resources and technology. The fact that the activities included in this dimension represent that people with a high index in Dimension 3 can be assumed that they have resources to execute their behaviors. Traveling to cultural attractions and attending cultural activities on their trips requires more confidence in controlling their behaviors. They recognize the meaningful role of the arts in their lives and they perceive that they can handle all of the necessities to carry out their plans and intentions.

Therefore the findings can be interpreted by the two theories, TPB and SCT, even though the research was largely explanatory, not intended to test any of the theories. Three concepts, subjective norm, self-efficacy and perceived behavioral control, appear to be the powerful predictors of actual consumption behavior in art and cultural sectors. These concepts also aid in understanding the implication of the results.

How other people behave and think affects engagement in more interactive activities. In contrast, what people know and experience has impact on more self-

motivated behaviors. The results are supported not only by logical reasoning, but also by theoretical explanation. The findings will be conducive to developing better appealing and persuasive messages targeting the general public and law makers, as they provide organizations with information on how people are engaged in different activities differently and what affects and influences their behavioral differences.

### **Future Studies**

The results of this study provide suggestions for future studies. The results showed that early exposure to art and donation to art organizations play a significant role in segmenting people in this area. Future studies, however, need to deal with the relationship between these items and the other items which are clustered in the same dimension. They should include the analyses of which items have impact on the other items and which items work as moderator or mediator. The correlation is analyzed, yet the path or route of influence should be determined to provide a better idea for art and cultural organizations to persuade people toward the desired direction.

In addition, this study presents the simple measurements which can locate people in the different dimensions of the unobserved characteristics. The research includes other questions to be used for further relationship studies among the variables or the constructs, such as age, zip code and sexual orientation. By relating

these meaningful segment variables to the findings obtained in this study, more in-depth and practical results will be explored and employed for better strategic communication plans.

In terms of methodology, the information functions in MIRT are defined independently of any specific group of respondents and represent the standard error of measurement at any given behavioral level (Hambleton & Swaminathan, 1985). Once a construct is identified with items, the measurement characteristics of the resulting scale must be questioned: can the full range of vibration in the population of potential respondents be measured with acceptable precision? Thus it should be examined whether scores obtained at different occasions in time are stable and consistent by replication.

Finally, as the MIRT analysis requires complex procedures, additional graphical analyses may serve several functions. They will provide a visual perspective that can triangulate or cross-validate traditional quantitative item, test, and differential item functioning analyses (Ackerman, 1996). They help gain a better conceptual understanding of the principles of measurement. This study lacks more graphical explanation, like item response surface and item arrows or angles in multidimensional space.

## Implications

The items included in each dimension are summarized in Table 14. The table indicates which items are similar enough to define the results on each dimension. The results suggest ideas for how communicators can identify the right audience and right strategic communication methods including messages, places, and channels. In this section, implication is developed based in two areas: 1) finding who will be the best target population by using the result in each dimension and 2) developing communication plans by combining dimensions and clustering a unique target segment.

Table 14 Items to define the three dimensions

| Dimension                                                               | Items                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dimension 1<br>Activities with intangible output and temporal enjoyment | <ul style="list-style-type: none"><li>• Attendance at theatrical performance</li><li>• Attendance at music concert</li><li>• Attendance at dance performance</li><li>• Participation in performing arts</li></ul>                      |
| Dimension 2<br>Activities with tangible output and long-term commitment | <ul style="list-style-type: none"><li>• Art education in childhood</li><li>• Early exposure to art</li><li>• Taking art-related classes</li></ul>                                                                                      |
| Dimension 3<br>Socio-psychic investment activities                      | <ul style="list-style-type: none"><li>• Visit to historical sites, museum, festival, zoo/garden/aquarium, and library and attendance at theatrical performances on trip</li><li>• Purchase of visual arts</li><li>• Donation</li></ul> |

Grunig and Hunt (1984) suggest that communication strategies should be designed to attract the attention of two kinds of audiences: those who passively process information (active audiences) and those who actively seek information (passive audiences). Unlike two audiences, inactive audiences, who usually answer

“no” to the filtering questions, are difficult to be reached and persuaded by communication campaigns in a short period of time. By considering the items with high discriminating power, communicators can identify their target audience who is regarded as highly involved and active consumers in art and cultural consumption and/or who pay attention to a message only because it is related to self-interest.

Dimension 1 suggests that people who enjoy attending theatrical performances and music concerts that are held in different states are the most active audience. These people are already at the certain level of engagement in the art and cultural industry and seek more sophisticated supplemental information. They will actively seek more information, so marketers sort them and send them more diverse and detailed information on performances. As people provide their personal information, at least their address, when purchasing tickets online or offline, marketers can identify them. For more passive audiences, like people who attend various performances, communicators can make them aware of the messages through brief encounters, such as advertisement on the way to any performances.

According to Dimension 2, children are the best target audiences for the development of future engagement in the sectors. The finding that early education of art-related disciplines leads to more active participation in those areas when people are grown up can be appealing to the policy makers who need to have convincing

evidence and rationale of why educational campaign is ultimately important for vitalizing the art and cultural industry.

Dimension 3 indicates that people who attend theatrical performances on their trips are sufficiently different to be segmented as an active audience. This finding is identical to the findings shown in Dimension 1. To attend performances that are held in different states, people need to stay in those areas over-night and sometimes plan a trip that is longer than two days and one night to the performance-hosting cities.

Dimension 3 even demonstrates that this segment is more likely to donate their money to art and cultural organizations. Performing arts facilities or art and cultural touristic attractions, such as museums and historical sites, will be best place to implement fund-raising campaigns.

Further, communicators can develop strategic communication plans by combining dimensions. With the three dimensions which explain different latent characteristics of art and cultural consumers, eight different groups can be clustered (Table 15). A message is more persuasive if environmental factors support the message or if the message is received within the context of other messages and situations with which people are familiar. These factors are called timing and context (Wilcox & Cameron, 2009).

Group 1, who demonstrates active engagement in the three dimensions, can

be reached and enhanced through a variety of communication campaigns targeting the other six groups with the exception of Group 8, who is an inactive audience. Group 8 can be considered as long-term target audiences for enlightening and educational communication campaigns, but will be hard to be regarded as target audiences for marketing and strategic communication plans which expect comparatively immediate results.

Table 15 Eight groups based on the three dimensions

|             | Group 1 | Group 2 | Group 3 | Group 4 | Group 5 | Group 6 | Group 7 | Group 8 |
|-------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Dimension 1 | H       | H       | H       | H       | L       | L       | L       | L       |
| Dimension 2 | H       | H       | L       | L       | H       | H       | L       | L       |
| Dimension 3 | H       | L       | H       | L       | H       | L       | H       | L       |

\* H: high involvement L: low involvement

People in Group 2 indicate low involvement in the items under Dimension 3. They participate in art and cultural activities with tangible and intangible outcomes, while they do not travel much. To appeal to this segment, communicators can develop conjoint marketing strategies with tourism agencies or tourism bureaus of cities. One suggestion is to select people among attendees at a specific performance and offer them free coupons, which provide accommodation and transportation. As Dimension 1 is closely related to Dimension 3, people will be attracted to messages about traveling to different states to attend performances and will be triggered to consider

trips to other cities. If a theatrical performance is associated with a specific city or state, like “Miss Saigon,” communicators of a specific city or even country’s tourism bureau can invite an organizer or producer of a performance to a joint promotion or vice versa. In addition, performing arts producers and organizers can advertise their performances on pamphlets for each other, when they host performances in different cities or areas. This will work for active information seekers. These strategies can be applied for Groups 4 and 7.

In Group 2, another target population is high-involved people in Dimension 2. They participate actively in photography, writing, and crafts. Thus, communicators can develop programs such as a trip to the setting of a specific novel with the writer and a road trip to take scenic photos with a famous photographer. Another idea would be to host a workshop or small conference to share ideas and exhibit crafts in a place related to crafts.

For Group 5, the results suggest that the better place and more proper target public for marketing theatrical, music, and dance performances can be art and cultural classes and registrants to those classes, especially performing arts classes, such as acting, playing musical instrument, singing and dancing. Therefore, it might be effective to create art classes at performing arts centers to make the audience more loyal and accessible to the products and services they provide.

In addition, performing arts centers or organizers of performances can create more target-specific marketing ideas, such as a group viewing discount for class participants, and use the associations of private and public art class teachers to disseminate the information on performances related to their class. Performing arts facilities can provide places to exhibit their masterpieces or perform their skills for people who are engaged in performing arts and take visual arts classes at a low price or for free in case that small space is needed. The same strategy will also work for Group 6.

For Group 3, art and cultural classes can also be marketed to attendants at various performances. After attending orchestra concerts, people appear to think more about taking musical instrument classes. If people are mesmerized by the skillful gesture and movement of the dancers, their desire to learn dances will be heightened. Even if not directly related to what they saw, people will have more interest in learning something related to play, music, and dance. Marketers can provide discounts on class fees for people who bring specific performance tickets they purchase. This will be a very efficient communication plan at the point of purchase.

Based on dynamics between Dimensions 1 and 2, Dimensions 1 and 3, and Dimensions 2 and 3, organizations can adopt one of the suggested communication strategies or a combined strategy. No matter what kind of strategic plans organizations

and communicators develop, it will be more efficient and successful when they know who the target audience is, who will pay more attention to their messages and how and where they should deliver their messages.

## **Conclusion**

The findings accomplish the objective of this study; to determine the number of dimensions of items that are sufficiently similar to define the results on the dimension. The results will be conducive to the development of more target-oriented and efficient messages and a communication plan. Each dimension contains sets of items that approximate the coherent characteristics of people as consumers in the art and cultural sectors and potential target audiences for future communication messages. Four dimensions are the number of orthogonal coordinate axes that are required to model the locations of persons measured by the 30 items.

In the study of human behavior including psychology, sociology and market research, tests and scales are instrumental in making behavioral phenomena accessible to quantitative analysis (Bock et al., 2002). MIRT method can be used when the instruments have multiple items which must be combined into a score for each person. Responses of survey participants are interpreted as an ability, activeness, or preference for their behaviors in a certain sector.

This study explores how people act in art and cultural areas, demonstrates that evident patterns and salient differences in cultural consumption exist, and segments people in the multi-dimensional spaces. It contributes identifying how people behave differently and determining which items are valid for segmenting people based on the engagement levels. With interpreting and combining the results suggested in Table 15, strategic communication planners can develop more efficient and target-oriented communication campaigns and strategies.

There are the difficulties of establishing a coherent body of knowledge for human behaviors in a specific area. The information on how people create and demand a high degree of devotion and engagement in art and cultural activities will aid communicators in predicting their behaviors and identifying where they can be found and seen and to what kind of messages they will pay more attention. The predictive scenario can be developed from the analytical measurement. The results of segmenting population with the three different dimensions can be utilized as the basic practical foundation for strategic communications.

The results found in this study can be used by any parties involved in art and cultural sectors: performing art organizations, non-profit art associations, festival organizers, schools, educators, galleries, museums, libraries, historic preservation agents and policy makers/government. By combining the simple results with other

category variables, such as gender, age, education, income and residential area, they can enhance the value and application of the findings. The implication of the results will vary depending on who the communicators are, what their focal interests are and who the target audiences are.

Attention to creative activities as a source of urban revitalization and economic diversification has increased as traditional manufacturing cities in the north-eastern US face industrial restructuring (Poon & Lai, 2008). As mentioned above, the main locomotive of art education in childhood and donation can be utilized for incubating more engaged cultural consumers. Appealing and persuasive messages targeting a specific group of people will boost more participation in this cultural sector and play a role to enlighten people and policy makers. How to describe and interpret the content of behaviors will further provide communications with a chance to know what changes have been made in people in the course of time.

As a result, characteristics associated with the potential audience, such as the audiences' attitude towards and experience with specific activities can be used in the design and execution of the communication campaigns. And when decision makers need a database to help them choose the best of several available alternatives or to rationalize their final decisions, these results can be properly utilized.

Good research and measurement provide better information which leads to

better decisions. Well-developed measurements will help people predict the audiences' willingness and future behavioral patterns in decision making of art and cultural consumption.

## **APPENDIX**

### **SURVEY QUESTIONS**

#### **Theatrical Performances**

- 1) Have you attended any live theater performances (e.g., plays, musicals or operas) during the last 12 months?
- 2) Were any of these live theater performances in a different state or country other than where your permanent residence is located?
- 3) Have you purchased tickets (not including subscriptions) to live theater performances during the last 12 months?
- 4) Have you purchased any subscriptions to live theater performances during the last 12 months?

#### **Dance Performances**

- 5) Have you attended any live dance performances (e.g., ballet, jazz or modern) during the last 12 months?
- 6) Were any of these live dance performances in a different state or country than where your permanent residence is located?
- 7) Have you purchased tickets (not including subscriptions) to live dance performances during the last 12 months?
- 8) Have you purchased any subscriptions to live dance performances during the last 12 months?

#### **Music Concerts**

- 9) Have you attended any live music concerts during the last 12 months?
- 10) Were any of these live music concerts in a different state or county than where your permanent residence is located?
- 11) Have you purchased tickets to live music concerts during the last 12 months?
- 12) Have you purchased subscriptions to live music concerts during the last 12 months?

#### **Participation in Performing Arts**

- 13) During the last 3 years, have you been engaged in any performing arts, such as theater, dance, or music?  
Which of these performing arts have you been engaged in during the last 3 years?
- 14) Playing a musical instrument
- 15) Playing in band or orchestra

- 16) Solo singing
- 17) Group or choir singing
- 18) Dance
- 19) Acting
- 20) Comedy, magic and mime
- 21) Storytelling and readings
- 22) Other performances

**Participation in Visual Arts**

23) During the last 3 years, have you been engaged in any visual arts, such as drawing, painting, printmaking, writing, textiles, photography, and/or sculpture?

Which of these visual arts have you been engaged in during the last 3 years?

- 24) Drawing
- 25) Painting
- 26) Printmaking
- 27) Sculpture
- 28) Textile arts
- 29) Photography
- 30) Crafts
- 31) Folk or Traditional art
- 32) Media arts
- 33) Writing

**Participation in Art-related or Cultural Disciplines**

34) During the last 3 years, have you engaged in any art-related or cultural disciplines; architecture; landscape architecture; fashion, graphic, interior or industrial design; historic preservation or restoration; genealogy; or archaeology?

Which of these art-related or cultural disciplines have you engaged in during the last 3 years?

- 35) Architecture
- 36) Landscape architecture
- 37) Fashion design
- 38) Graphic design
- 39) Interior design
- 40) Industrial design
- 41) Historic preservation
- 42) Genealogy
- 43) Archaeology

**Professional Artists**

- 44) Do you consider yourself to be a professional artist?
- 45) Have you received formal education/training in your artistic discipline?
- 46) During the last 12 months, have you been engaged in any art-related professional development activities?
- 47) Are you currently a member of an arts-related guild, union or association/organization ?
- 48) Are you able to support yourself/family financially entirely from the revenues that you earn from your artistic activities?

**Purchases of Art**

- 49) Have you purchased any visual arts including drawings, paintings, writings, prints, graphic designs, crafts or photographs during the last 12 months ?
- 50) Have you purchased or rented any books, videotapes, DVDs, CDs, records, tapes, or music downloads during the last 12 months ?

**Employment of Performing Artists**

- 51) Have you hired any performing artists including musicians/bands, actors, comedians, mimes/performance artists during the last 12 months?
- 52) Have you hired any solo musicians during the last 12 months?
- 53) Have you hired any musical bands/groups during the last 12 months?
- 54) Have you hired any solo singers during the last 12 months?
- 55) Have you hired any singing groups during the last 12 months?
- 56) Have you hired any actors or theater companies during the last 12 months?
- 57) Have you hired any comedians, magicians, or mime artists during the last 12 months?
- 58) Have you hired any performance artists during the last 12 months?
- 59) Have you hired any dancers or dance companies during the last 12 months?
- 60) Have you hired any DJs during the last 12 months?

**Architect & Design Services**

- 61) Have you hired any architects or designers during the last 12 months?
- 62) Have you hired any architects during the last 12 months?
- 63) Have you hired any landscape architects during the last 12 months?
- 64) Have you hired any graphic designers during the last 12 months?
- 65) Have you hired any interior designers during the last 12 months?
- 66) Have you hired any fashion designers during the last 12 months?
- 67) Have you hired any industrial designers during the last 12 months?

**Heritage-related Services**

- 68) Have you hired any historic preservation/restoration, archaeological, or genealogical services during the last 12 months?
- 69) Have you hired any historic preservation services during the last 12 months?
- 70) Have you hired any archaeological services during the last 12 months?
- 71) Have you hired any genealogical services during the last 12 months?
- 72) Have you hired any home/building restoration services during the last 12 months?

**Cultural Tourism**

- 73) Have you ever made any pleasure trips to, or in, Michigan?
- 74) Have you taken any pleasure trips to destinations more than 50 miles from your home during the last 12 months?
- Have you taken any pleasure trips to destinations more than 50 miles from your home during the last 12 months on which you participated in any of the following arts or cultural activities?
- 75) Attended a theatrical performance (e.g., musical, play, or opera), dance performance, or concert
- 76) Visited a museum: art, history, science, or special topics museum
- 77) Attended a festival: art, crafts, music, food, wine, ethnic, antiques, or car show
- Have you taken any pleasure trips to destinations more than 50 miles from your home during the last 12 months on which you participated in any of the following arts or cultural activities?
- 78) Visited an historical site, attraction or community: heritage parks, lighthouses, monuments, landmarks, archaeological sites, cultural centers or historical communities
- 79) Visited a zoo, aquarium, botanical garden or arboretum
- 80) Visited a library: national, state, local community, or university/college

**Use of Library**

- 81) Do you currently have a valid library card?
- 82) Have you visited a library during the last 12 months?

**Cultural Membership, Donation and Volunteering**

- 83) Are you affiliated (e.g., member, officer, and employee) with a national, state or local membership-based organization that supports, sponsors, or implements arts, heritage or cultural activities. This could include artist organizations that fundraise and sponsor cultural activities and facilities (e.g., concerts, art shows, heritage preservation, and community libraries)?

84) During the last 12 months, have you donated any money to an arts, heritage or cultural organization (or cause) including but not limited to organizations that you were/are a member ?

85) During the last 12 months, have you volunteered any time to an arts, heritage or cultural organization (or cause) including but not limited to organizations that you were/are a member ?

#### **Art-related Experience in Your Childhood**

86) When you were a child (up to 18 yrs old) how often did your parents or other adults take you to arts or cultural performances or events ?

87) When you were a child did you take any type of visual (e.g., painting and drawing), performing (e.g., dance, singing, and musical instruments) or literary arts or crafts lessons or classes?

What type of classes did you take when you were a child?

88) Visual arts

89) Performing arts

90) Music (vocal/instruments)

91) Literary arts

92) Crafts

#### **Your Art Lessons and Classes**

93) During the last 12 months have you taken any type of visual (e.g., painting and drawing), performing (e.g., dance, singing, and musical instruments) or literary arts or crafts classes or lessons ?

What type of classes did you take?

94) Visual arts

95) History/Appraisal

96) Performing arts

97) Music (vocal/instrumental)

98) Literary arts

99) Applied arts (e.g., architecture, design, genealogy and archaeology)

#### **Art Lessons and Classes of Your Children**

100) During the last 12 months, have any children residing in your household taken any type of visual (e.g., painting or drawing), performing (e.g., dance, singing, or musical instrument), or literary arts or crafts classes or lessons?

What types of classes did children living in your household take during the last 12 months? Check all that apply.

- 101) Visual arts
- 102) History/Appraisal
- 103) Performing arts
- 104) Music (vocal/instruments)
- 105) Literary arts
- 106) Applied arts (e.g., architecture, design, and genealogy and archaeology)
- 107) Crafts

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