Exploring New Methods in Understanding Visitor Experience: Evaluations of the Citi Money Gallery at the British Museum

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ABSTRACT

The Citi Money Gallery in the British Museum is re-evaluated yearly in order to present the sponsor of the gallery, Citibank, with updates on their investment. Our IQP group set out to complete the required evaluation and use this opportunity to invent new methodologies and create innovative ways present data. Our discoveries can aid gallery evaluations and museum studies in the British Museum and elsewhere as well as provide valuable data and recommendations to the gallery.

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EXECUTIVE SUMMARY

Introduction

The Citi Money Gallery in the British Museum is re-evaluated yearly in order to present the sponsor of the gallery, Citibank, with updates on their investment. Our IQP group set out to complete the required evaluation and use this opportunity to invent new methodologies and create innovative ways to present data. Our discoveries can aid gallery evaluations and museum studies in the British Museum and elsewhere as well as provide valuable data and recommendations on the gallery.

Methodology

Our methodological approach incorporated the basic methodologies of past evaluations with innovations of our own. The basic methodology involves using manual "pen and paper" visitor tracking paired with questionnaires given to those who were tracked. In order to reach the previously inaccessible group of non-English speaking visitors, we translated our questionnaire into 17 languages. This facilitated increased engagement with non-English speaking visitors. We discovered new software, Syntax2D, which enabled us to present visitor paths in a new understandable way. We also went beyond our basic requirements, tracking 360 visitors, instead of 300, and giving 128 questionnaires, instead of 100.

Findings

Our methodology enabled us to make useful findings about the gallery from our data. Some of our findings were guided by specific requests from the museum. We found that the median time spent in the gallery is 131 seconds (2:11) and the mean time spent in the gallery is 207 seconds (3:27). We also found out that 15 % of visitors were able to recognize Citibank as the sponsor of the gallery when presented with logos of various banks as options for naming the sponsor. In addition, the new methodologies we developed allowed us to make new kinds of findings. These findings covered many topics including visitor attendance, the diversity of visitors in language and nationality, as well as visitor travel and tendencies within the gallery.

Visitor counting enabled us to calibrate the electronic visitor counter installed in the gallery. We discovered that the electronic counter has a linear relationship with the number of visitors to the gallery. The counter fairly consistently underestimated the number of visitors by 25%. Since

the combined walkthrough and turnaround rate was 28%, this means that the visitor counter can be used for a rough estimate of engaged visitors in the gallery.

As the British Museum is a major London attraction, the gallery draws many nationalities of visitors. Only 20% of visitors to the Money Gallery were from the UK, followed by 13% from USA, 10% from Spain, and 8% from Italy. Our translated surveys allowed us to reach international visitors, get their opinions of the gallery, and study their interaction with it. Our questionnaire refusal rate for this study was 38%, lower than last year's rate of 48%, primarily due to our multi-lingual survey. We discovered that some visitors opt to take the survey in English rather than their first language even when their language is available.

The new software tool, Syntax 2D, shows the flow of visitors through the gallery, which has not previously been easy to interpret. Syntax 2D's heat map style presentation is familiar and well suited to mapping a gallery and makes it easier to identify trends in paths. For example, we showed that more visitors traveled the north wall than the south wall. Indeed, 35% of visitors turned north upon entering the gallery while 27% turned south.

Recommendations

Our recommendations stem from the findings we made during this study. Some of the recommendations for the gallery included making the new Bitcoin case more attractive by adding more eye-catching pieces, making the wall cases and their info panels more visible, adding translated versions of English texts to cases, and finding ways to encourage visitor flow to follow the gallery flow. For future studies we recommend continuing use of translated surveys to increase response rate and using Syntax 2D to understand visitor flow. The gallery could also benefit from future studies performing a meta-analysis on case content using past data, and developing a more streamlined way to electronically enter visitor tracking data.

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CHAPTER 1: INTRODUCTION

Museums exist with a dual purpose: to educate and entertain their guests. This presents a unique challenge in determining the best way to present artefacts and information to visitors. The British Museum in particular, as the most popular tourist attraction in the UK, attracts a wide array of visitors with many different, sometimes contradictory, opinions and reasons for visiting ("BBC News - British Museum is the most visited UK attraction again," 2014). Obtaining an understanding of the motivations, expectations, and reactions of the museum's visitors and the information they take away is a key part of the constant improvements and updates that the British Museum makes to its galleries. Knowing what visitors feel about the gallery as it is right now is a prerequisite to making future improvements which enhance the visitor's experience.

The Citi Money Gallery, sponsored by Citibank since 2011, is under agreement to be re-evaluated annually, with a copy of the data presented to the sponsor, in order to keep up with the constantly changing visitor flow. An IQP study in 2010 (Peterson, Lybarger, Clinckemaillie, Kazantzis, & Brattin, 2010) found that the demographics of the gallery do change with time, which affects the design of the exhibit. For example, a higher amount of young children and school groups viewing the gallery might indicate a change to a more interactive exhibit style to better serve this population, while an uptick in non-English speaking groups might indicate a need for more foreign language friendly exhibits and information. However, gathering data is not always easy. Past studies show high refusal rates in the gallery for questionnaires. In addition, the types of data gathered in the exhibit, such as visitor path data or qualitative data, are often difficult to display in an understandable way ("British Museum - History of the collection," 2014).

Gallery evaluations are nothing new to museums. Museum studies have existed since the early 20th century. The earliest evaluations simply examined where in the museum visitors walked, but this has evolved over the years into full inquiries of visitor's thoughts and reactions with respect to museum attractions. These inquiries, and the data collected, can be used to tailor the museum to the needs of the visitors such as the interactivity of the museum and the level of in depth content available. Methods such as visitor tracking through observation as well as direct questioning of visitors have been used to gather this type of data (Stephen Bitgood & Shettel, 1996). The British Museum, and more specifically the Money Gallery, is no stranger to these

types of evaluations either. Previous IQP groups have conducted visitor tracking studies inside of the British Museum four of those five groups focused on a study inside the Money Gallery. The data gathered in our study will be presented to Citi Bank by the British Museum for review.

In spite of all the existing methodologies for data collection at the Citi Money Gallery, there were some gaps that required addressing. The rate of questionnaire participation with foreign language visitors has been very low compared to the general response rate. There was an opportunity for us to collect data from these visitors, which may not have been as successful in the past due to language barriers. The 2013 IQP team created questionnaires in multiple languages; however, they were unable to approach visitors in any language other than English, which led to very few foreign visitor responses (Osborn et al., 2013). Additionally, the gallery has recently introduced new paper visitor guides. The effectiveness of these guides has not been studied yet and was of key interest to the Department of Coins and Metals. Finally, representation of visitor flow through the gallery in the past projects was lackluster. The visual representations of the visitors paths produced were confusing and difficult to use. Our project endeavored to devise improved data presentation techniques for such information, making line maps clearer and more visually appealing. Finally, while quantitative data has been collected from visitors in the past, the amount of qualitative data pertaining to topics such as visitor learning from the exhibits has been small. This was also a gap we hoped to address through our project.

This project presents an analysis of the visitor experience in the Citi Money Gallery of the British Museum. The team began by developing a practical methodology to gather data about the visitor experience in the Citi Money Gallery which expanded on the ideas of previous projects with information gathered through a thorough literature review and our own innovations. This methodology was used to observe the visitor's experience in the Money Gallery. We expanded on these observations with in person questionnaires designed to be easily implemented in a wide array of languages. These questionnaires also had an increased focus on qualitative aspects of the visitor experience compared to previous efforts. The newly gathered data was then analyzed and presented to the British Museum in a simple and easy to understand format.

CHAPTER 2: BACKGROUND

2.1. Museum Studies

Museum Studies is a multi-disciplinary field concerned with all aspects of museum history, design, and administration. The field includes the psychology of learning, the science of attention, the sociology of culture, etc. Often the focus of museum studies is the visitor experience; how to quantify, study, and improve the way a visitor interacts with a museum. Visitor experience is composed of all of those factors which influence a person's time in a museum, from the quality of the exhibit labels on the cases to the learning which takes place long after they have left the physical structure. The number of aspects that could be explored in this field is endless, but the exhibit evaluator must find a way to quantify or qualify the experience (Stephen Bitgood & Shettel, 1996).

2.1.1. History of Museum Studies

Museum studies and museums did not always exist side by side. With the growing emergence of learning as the outcome of a museum visit, interest in studying exhibits and visitors has expanded. The emergence of several environment variables and their effects on visitors in the early 20th century led to a resurgence in the field of visitor studies. The five areas of visitor studies as identified by Bitgood were Audience Research and Development, Exhibit Design and Development, Program Design and Development, General Facility Design, and Visitor Services. These categories address how a museum can attract a visitor, interest a visitor, and convince a visitor to come again (Stephen Bitgood & Shettel, 1996).

To understand and improve a visitor's experience museum staff turn to visitor studies. Visitor studies are a good way to improve a patron's visitor experience. For example, a study on how visitors navigate an exhibit and what they look at can inform investigators how to better arrange or fill the exhibit. Many studies have shown that visitors will often follow the right hand wall of an exhibit, so the gallery can be arranged to best use that tendency.

Why Perform Visitor Studies?

Museums are all about attracting more people and bringing in more visitors, both from the UK and abroad. The British Museum is the most popular tourist attraction in the UK, and maintaining and producing stimulating exhibits is part of what keeps the museum at the top of that list. By performing visitor studies the museum can figure out what types of exhibits excite viewers and perpetuate a reputation to attract visitors ("BBC News - British Museum is the most visited UK attraction again," 2014).

At the same time, museums need to appeal to the visitors that come from right around London. The British government's initiative of increasing social inclusion has led to an interest in making museums and other cultural institutions more accessible for visitors of different backgrounds and educations. Museums were once only accessible to those with knowledge and cultural experience. The initiative attempts to give the socially excluded the opportunity to benefit through the consumption of art and culture which understandable to all educational levels, while not making the experience too simple. Visitor studies can give exhibit designers feedback on the exhibit and how to make it more accessible and appealing (Durrer & Miles, 2009).

Qualitative and Quantitative Data

As museum studies have developed, data collection has shifted in many places from the quantitative to the qualitative. Quantitative data, such as stopping time at a case, how many people stop at a certain case, visitor demographics, etc., is factual information on an exhibit. This data is usually numerical and can be displayed and interpreted easily. The use of qualitative data, however, is not as widespread in museum studies. This kind of data could consist of comments from visitors on the exhibit and what they learned. This data is much harder to display and make sense of, but gives more insight into the minds of visitors than quantitative data (Macdonald & Ebrary Academic, 2006).

The use of qualitative data in museum studies is sometimes debated. Analysis of qualitative data is inevitably subjective, able to be interpreted in multiple ways. As such, quantitative data is often preferred, even though it lacks the insight into the mind of the visitor.

Policy makers often prefer quantitative data for its concrete evidence of visitor behavior. In the UK, focus on social inclusion has necessitated the collection and analysis of qualitative data in order to understand how learning is occurring in museums (Macdonald & Ebrary Academic, 2006).

All of these aspects of visitor study end up influencing the visitor experience, which we are being called on to evaluate. The visitor experience can be described by many metrics, both quantitative and qualitative, and data can be collected through any number of research methods including visitor tracking, surveys, and interviews.

Free-Choice Learning

Once primary thought of as research institutions catering to a small number of already educated visitors, museums have grown to recognize a different basis of visitor. Nowadays, visitors do not tend to be experts in a field. In fact, the visitor may have had no intention of visiting a gallery at all. They are visiting the museum to satisfy some desire for knowledge outside of their daily routine (Macdonald & Ebrary Academic, 2006).

Often called "free-choice learning," the learning that takes place in museums is informal, unlike learning which takes place in a classroom. Formal classroom learning is dictated by a teacher, but in a museum, a visitor is under their own direction. They could choose to follow a specified path or tour, or merely wander and gather information on their own. Museum designers may try to influence the path a visitor follows to influence what they learn, but measuring this learning is difficult without an accurate model. One such model is the context model, which holds that visitors add gathered information into the context of their own knowledge and come to their own conclusions (Macdonald & Ebrary Academic, 2006).

As its definition would indicate, free-choice learning is difficult to measure, only its symptoms can be measured quantitatively (Macdonald & Ebrary Academic, 2006). Several metrics in visitor studies can be interpreted to show where learning is likely occurring. Two of these are holding power and attracting power. Holding power is a rating based on the amount of time a visitor could be expected to spend looking at a particular case. Attracting power is a rating based on how likely a visitor is to approach an object to begin with (Donald, 1991). These metrics point to a physical location to which visitors are drawn. It is likely that learning is

occurring there, as attention is a precursor to learning, but it is not guaranteed, so these measures are not so much a measure of learning as an indicator of it (S. Bitgood, 2013).

Another possible way to measure learning is by asking "quiz" questions, such as identifying a term, of museum visitors about the exhibit they just saw. The 2010 IQP on the gallery in the British Museum attempted this tactic, but found that few people were able to correctly answer the question (Peterson et al., 2010). This method is not always foolproof either, as participants may have already known the answer or may have not had time to process the exhibit and contextualize their response.

Instead of measuring learning through quantitative means, learning could be measured qualitatively. Instead of asking hard questions with correct answers, investigators could be more open, engaging in conversation with their visitors by asking questions such as "What was the exhibit about?" While not as easy to process, such data shows how information is being processed into context, especially is the visitor is questioned before and after their experience (Donald, 1991).

Since the last time the exhibit was evaluated, the Department of Coins and Medals has added visitor self-guides to the gallery. Guides are a great way for exhibit designers to show visitors what they mean them to see. Self-guides have also been shown to influence several factors of learning. For at least the first few displays viewed in the exhibit, time spent and label reading increase at each case (S. Bitgood, 2013). As the guides in the Citi Money Gallery are new, we do not yet know how frequently the guides will be picked up or how they will affect the visitors and the amount of learning that occurs in the exhibit.

Visitor categorization

To design an exhibit which will appeal to visitors, it is important to find out what the visitors are expecting from the exhibit and how they will chose to interpret the exhibit. One method used to make sense of these many aspects of visitor experience is modeling; designing a system of finite categories by which to identify visitor's needs, expectations, learning styles, tendencies, etc.

The Morris Hargreaves McIntyre consultancy has developed two models for visitors. The first is the Hierarchy of Visitor Engagement, which classifies visitor motivations and

expectations. Figure 1 below summarizes the four types of visitor motivations. In the figure, the types of visitor engagements are compared to Maslow's Hierarchy of Needs. The higher up the hierarchy a visitor's motivations are, the more deeply engaged he/she is with an object or exhibit (Morris, Hargreaves, & McIntyre, 2005).

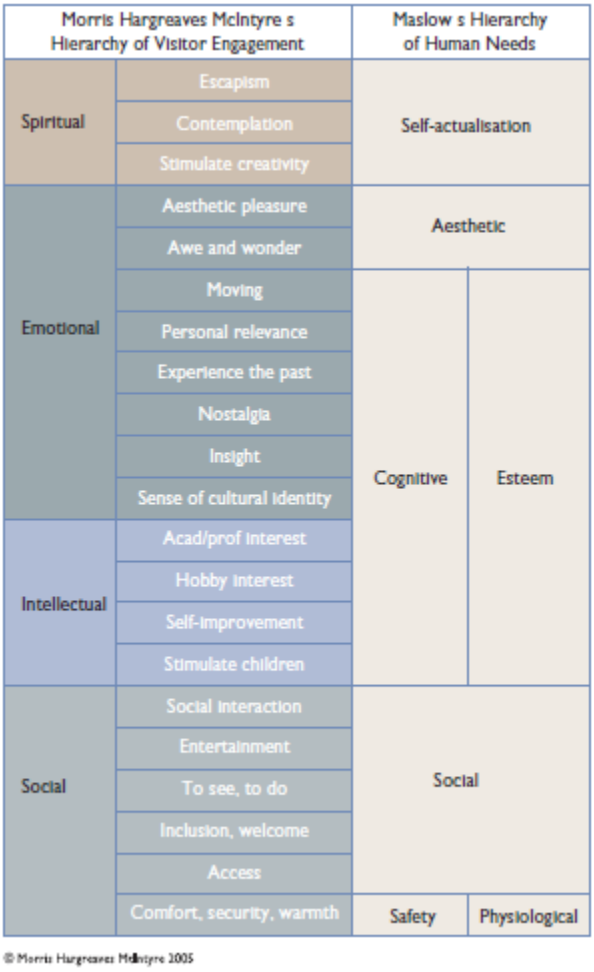

Figure 1 : Hierarchy of Visitor Engagement

The second categorization system is the Hierarchy of Meaning Making, which categorizes visitors according to how they derive meaning from what they see during their visit. A browser will wander about a museum until they find an interesting piece, but they need to be explained the piece in order to make any meaning from it. A Follower desires to follow a theme through the exhibit, making meaning through the museum provided narrative. A Searcher takes an exhaustive path through an exhibit, attempting to learn everything the museum has provided

about a theme. Finally, a Researcher is an already well informed visitor who will likely want to continue studying the topic after leaving the exhibit. Figure 2 shows the four types of meaning making categorized by what they expect from the museum in terms of objects presented and information provided (Morris et al., 2005).

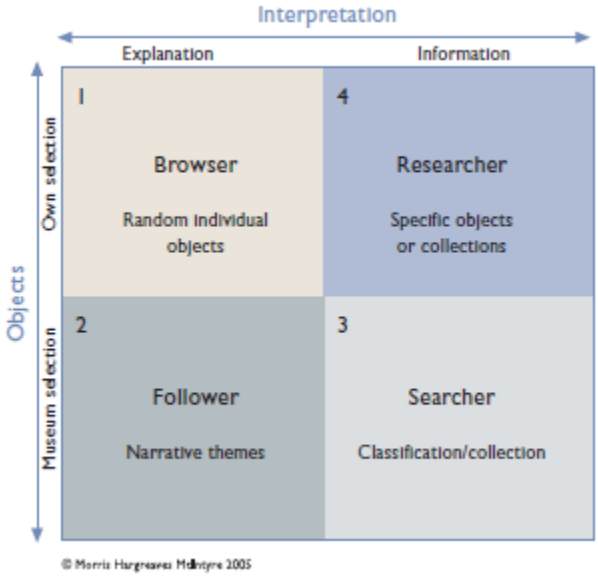

Figure 2: Hierarchy of Meaning Making

The impact of the exhibit can be measured by the movement of visitors within the hierarchy. A gallery can be designed to help visitors reach a deeper engagement with objects or to make more meaning of an exhibit by providing the right gateways (opportunities to follow a course through an exhibit, engaging or inspiring material etc.). A visitor could enter the gallery, for example, as a Social Browser. When presented with a guide or path through the exhibit, they could become a Follower, making more meaning than they would have as a Browser. Similarly, a visitor could enter as a Social Follower but when presented with very engaging material and inspired to learn more, he or she becomes an Emotional Searcher. The Impact Climbing Frame (Figure 13) shows how the depth of engagement can be plotted against the amount of meaning making to come up with a description of a visitor based on motivations and meaning making (Morris et al., 2005).

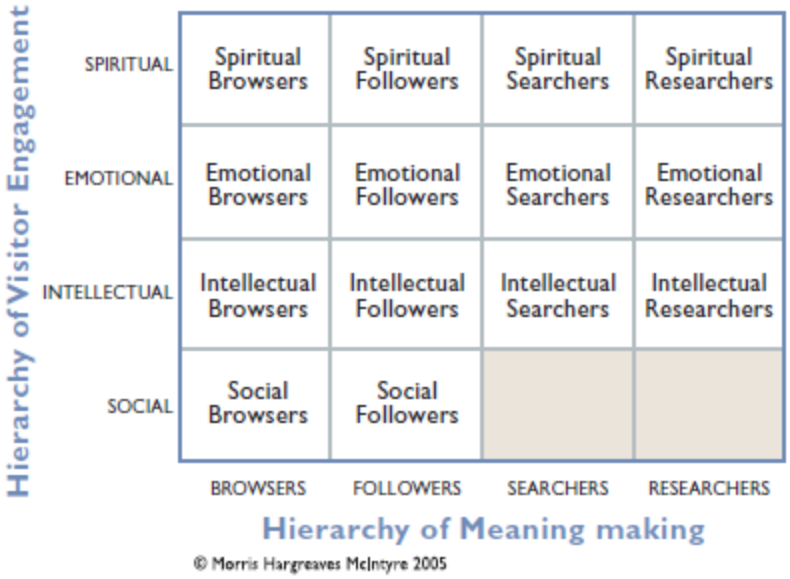

Figure 3: Impact Climbing Frame

2.1.2. Tracking Studies

Visitor Studies have existed since the early 20th century when museums and other institutions started to take a serious interest in the movements and interactions of their guests. These early observations were mainly focused on only the most basic physical movements of guests through exhibits, in part due to the technological limitations of the time. While very useful in the absence of other data, modern techniques combine this information with more detailed study of visitor behavior to provide a clearer picture of visitor opinion and mindset. These techniques are mainly based on observing visitor behavior and manually noting down information about their movements, interests etc. This is called "tracking". While technological solutions to tracking are emerging, due to cost and availability reasons many institutions still use the "pen and paper" method to track visitors (Stephen Bitgood & Shettel, 1996; Yalowitz & Bronnenkant, 2009).

The Pen and Paper Method

Due to its simplicity the "pen and paper" method of tracking visitors has many variations and can be extended in a variety of ways. The basic premise is as follows. Observers choose one

out of a predetermined number of visitors to the exhibit to track. This is to ensure that there is no bias in the determination of those to track. This visitor is then observed for the duration of their stay in the exhibit. Various factors are noted down about their visit such as how long they spend at an exhibit, or dwell time, the order of the exhibit elements they stop at, and their path through the gallery. The path can be noted by writing on a paper map of the exhibit. These factors can be used to determine the holding power and attracting power of a specific display (Yalowitz & Bronnenkant, 2009).

Another interaction of note is the level of interest a visitor has in a gallery. A visitor could just be a "walkthrough", someone using the gallery for a hallway, or a "turnaround", someone who walks in, but is uninterested and leaves right away. The rate at which these two occurrences happen can indicate that the exhibit should be made more visually appealing or more heavily marketed so visitors stay. For visitors who do engage with the exhibit, their path and first case visited can indicate their placement in the hierarchy of visitor engagement (e.g. a follower follows a specified path, a browser is attracted to interesting looking exhibits) (Yalowitz & Bronnenkant, 2009).

Observers could also record demographic data, such as age or race, in order to determine which of these groups the gallery appeals to. Are mostly foreigner visitors visiting the exhibit? Provide translations of important texts near exhibits. Are there a lot of older visitors looking at the gallery? Provide benches or chairs for breaks from walking (Yalowitz & Bronnenkant, 2009).

There are various schools of thought on the specifics of how to measure these values. Even something as simple as what constitutes a "stop" at a display can be debated. This inconsistency is due to the wide variety of sizes, shapes, and other properties of exhibits. A "stop" at an extremely large exhibit could be counted as a slow walk while looking at it, while a small display might require both of the subject's feet being motionless. It is important for these parameters to be calibrated to the exhibit and institution doing the tracking. As a human is doing the measurement there will usually be some subjectivity in the observations. It is important to have all the people doing the tracking "on the same page" about their methodology. This will allow them to accurately compare data collected within the institution (Yalowitz & Bronnenkant, 2009).

All of this data contributes to understanding visitor experience. It can tell the institution which individual displays are the most interesting, which types of displays are the most

interesting, as well as provide a comparison to other exhibits and even other institutions. Sometimes this data must be carefully analyzed to provide these comparisons. For example, comparing the time a visitor spends in one gallery to time spent in another gallery in another institution can be challenging. The size and scope of the gallery and institution it is in can skew the numbers. A small exhibit may be much more interesting and successful than a larger one, but due to its size visitors do not stay very long. Derived metrics must sometimes be created to compensate for this. The total time in the exhibit can be used to determine the Sweep Rate Index (SRI) a normalized value of how fast visitors move through the exhibit area. This takes into account the physical size of the exhibit to give a better way of comparing two very different attractions (Yalowitz & Bronnenkant, 2009). It is measured in square-feet-per-minute, and represents the amount of space-per-time used by the visitors studied as they "visually sweep" the area of the exhibition. The SRI is inversely proportional to the amount of time visitors spend per unit of area (Serrell, 1997).

Another useful metric to use in tracking study analysis is the Diligent Visitors Percentage (%DV). This tracks the amount of visitors who view at least half of the exhibit's items. This allows the analyzer to have a quick number representing the amount of visitors who are intensely interested in the material, and how thoroughly an exhibition was used. Together with the SRI this metric can give a good indication of the mindset of the average visitor. A slight inverse correlation is observed between them; however, they are not dependent. Quick moving visitors with a high %DV may indicate that the high SRI is not due to disinterest, but possibly due to the physical configuration of the gallery or other factors. When comparing data across galleries and institutions it is a good idea to use derived tools such as these to give better insight than less complex metrics would (Serrell, 1997).

Visitor Circulation

Visitor circulation is another important metric in museum exhibit evaluation. The path of a visitor as they navigate an exhibit has a direct effect on what they learn. If a visitor cannot see an exhibit, they cannot learn from it. Many phenomena have been observed among museum patrons regarding their paths, which are sometimes driven by efficiency. The General Value Principle argues that the path a visitor chooses is dictated by its cost and benefit to the visitor. A

path which has a high value (e.g. leads to an interesting looking exhibit) and is relatively short will be travelled more often than a boring looking path to a faraway exhibit. Studying visitor circulation and chosen paths can reveal information about the eye-catching points of an exhibit, as well as information about the efficiency of the setup of the cases (Stephen Bitgood, 2006).

Many visitor path phenomena are results of visitors lowering the cost of visiting an exhibit. For example, visitors often turn right when entering an exhibit because if they are following typical hallway etiquette, they are already closer to the right edge of the doorway than the left. Visitors are also subject to a seemingly inertial force, choosing to follow a straight path as opposed to deviating to walk to an off-course case. There is often an imbalance of visitor attention between sides of an exhibit, as visitors tend to follow only one wall and not cross the empty expanse of the gallery center. The visitor desire for efficiency also leads to a tendency for visitors to not backtrack and continue on to the exit rather than waste steps turning back to visit a case. Sometimes called the "exit gradient," this tendency often is demonstrated by visitors following the shortest path to the exit of the gallery (Stephen Bitgood, 2006).

2.1.3. Surveying Visitors

Questionnaires are a useful tool when evaluating visitor experience. Unlike interviews which can easily introduce bias into visitors' responses, questionnaires can be carefully constructed to be neutral in nearly all respects. In addition, questionnaires can be given at a much higher rate than interviews as the manpower needed to give them is much less. Questionnaires are pre-constructed, so they can also be administered to guests who do not speak the same language as the staff (Diamond, 1999).

Developing a well-constructed questionnaire requires the author to decide on the amount of quantitative and qualitative questions contained therein. While quantitative questions can be very useful when doing statistical analysis of the data, respondents often have difficulty providing accurate information in respect to variables such as time, number of objects seen etc. Respondents can often, however, respond to more open ended qualitative information about their own experiences. Questions such as "What did you like about the exhibit?" provide more accurate data than questions such as "How long did you spend at this exhibit?" The exception to this quantitative/qualitative rule is when simple demographics questions are asked about the respondent (Diamond, 1999).

Qualitative questions however, require more man power to interpret. Each answer must be read and interpreted by a human and recorded or placed in a certain category of answers. While difficult, this can give a very good idea about what visitors really experience, and can illuminate trends which may not be immediately apparent through quantitative data alone.

After the quantitative/qualitative question is answered the questionnaire author must decide on the breadth of the questionnaire. A "lean" survey can often be more effective than one which explores all possible questions the institution might want to ask a visitor. A questionnaire which provides context and theme for the visitor will be less confusing to the visitor than one which is too broad. Individual questions may have context added to them as well through the wording or answer choice selection (Diamond, 1999).

Additional considerations for the author include reducing bias in questions through randomizing answer choices and choosing neutral vocabulary in the questions. In quantitative questioning the "neutral response" rate, the amount of responses which choose the neutral or middle option, can be overrepresented when a respondent does not feel passionately about their opinion. This has a simple fix in that the "middle" option is removed from the answer choices. Questionnaire refusal rate can be reduced through offering even small rewards, such as pencils, to the visitors as well as making the entire process very easy. A respondent might fill out a questionnaire, but neglect to return it if he or she is further inconvenienced by having to walk to another area to hand it in (Diamond, 1999).

2.2. The British Museum

The British Museum was the first national public museum in the world. It is also one of the largest museums in the world, housing over 8 million artifacts ("British Museum - History of the collection," 2014). Over its lifetime, it has grown from having 5,000 visitors per year to nearly 6 million today ("British Museum - General history," 2014). Its founding principles were making the collections publicly accessible and displaying them to the greatest number of people possible. It was meant to be a place where "humane cross-cultural examination" could take place ("British Museum - About us," 2014). The British Museum states:

“The aim of the British Museum is to hold for the benefit of humanity a collection representative of world cultures and ensure that the collection is housed in safety, conserved, curated, researched, exhibited and made available to the widest possible public.

Consistent with this aim is the Museum’s mission to inspire and excite visitors and other users of the Museum, helping them to enjoy the collections to the fullest extent, through well-presented and serviced public galleries and study collections, world class exhibitions, education programmes and publications and imaginative use of media.” ("Report and Accounts for the Year Ended 31 March 2003," 2014)

The museum goes on to state that one of its priorities to achieve its aim and mission is continuous improvement in the quality of the general visitor’s experience. Studying visitor behavior and evaluating visitor experience are important steps in this process of improvement. Additionally, as Britain’s single most popular tourist attraction, it is important for the museum to investigate ways to entertain a high number of visitors ("BBC News - British Museum is the most visited UK attraction again," 2014).

The British Museum was founded through an Act of Parliament in 1753, after Sir Hans Sloane bequeathed his collection of 71,000 objects to King George II. This initial collection consisted mainly of books, manuscripts, natural specimens and some antiquities like coins and medals, and was first housed in a 17th century mansion known as Montagu House. The museum first opened to the public in 1759. Since then, it has been open to all, free of charge. The museum has remained continuously in operation since, except during the two World Wars ("British Museum - General history," 2014).

The 19th century was a period of growth in terms of the illustriousness of artifacts, the number of exhibits and the number of visitors. The museum acquired the Rosetta Stone in 1802 and the Parthenon sculptures in 1816 among other high profile artifacts. The museum also built additions such as the quadrangular building in 1852 and the round Reading Room in 1857. The 20th century saw further expansion, especially in public services offered by the museum. It also went through additional expansions, including the construction of the Duveen Gallery to house the Parthenon sculptures. The museum also branched into the ten divisions that still exist today. While some departments are focused on specific geographic locations, others such as the Department of Coins and Medals focus more on trends throughout history ("British Museum - General history," 2014).

The British Museum is now located on Great Russell Street in Central London. Four new permanent galleries opened in 2008-09. The next major project is the World Conservation and Exhibitions Centre. Restoration work has also been done on existing buildings and exhibits. The permanent exhibit of the Department of Coins and Medals underwent substantial renovation in 2012 ("British Museum - Coins and Medals," 2014; "British Museum - General history," 2014; "Catching up with progress in the Money Gallery," 2014).

2.3. The Department of Coins and Medals

The Department of Coins and Medals is responsible for the British Museum's numismatic collection, comprising about 1 million objects. The department's aim is for its collection to serve as a key reference for scholars and members of the public. The collection was built on the 20,000 coins and medals from Sir Hans Sloane's donation. It has a wide variety of objects, spanning the history of coinage and currency-related material. The collection of paper money comprises 50,000 specimens ("British Museum - History of the collection," 2014).

The Citi Money Gallery is a popular exhibit contained within the Department of Coins and Medals. In 2012, the gallery changed sponsors and entered into a five-year contract with Citi Bank. Substantial renovation work was conducted in the gallery, taking into account existing visitor tracking data while creating the new gallery layout. The contents of display cases were also changed based on data from visitor questionnaires ("Catching up with progress in the Money Gallery," 2014). Our objective is re-evaluating the gallery based on visitor tracking and questionnaires, gauging the effectiveness of the renovations and presenting our findings with recommendations.

2.4. Recent Findings

In the past seven years Worcester Polytechnic Institute students have conducted gallery evaluations for the Department of Coins and Medals at the British Museum a total of five times. The first evaluation was in 2007(Stanford et al., 2007), followed by evaluations in the years 2008 (Klebanov, Glover, Carlyle, Clark, & Ray, 2008), 2009 (White et al., 2009), 2010 (Peterson et al., 2010), and most recently 2013 (Osborn et al., 2013). These reports focused on evaluations of

multiple galleries within the British Museum, namely the Egyptian Sculpture Gallery, the Roman Empire Gallery, North America Gallery, temporary exhibits in Gallery 69a, and finally the Citi Money Gallery or HSBC Money Gallery as it was known prior to 2012. Here, we look at the motivation and objectives behind each of these studies, as well as their findings and how they have changed over time. From their methodologies and findings we can gather valuable data which is useful for the development of our own methodology.

2.4.1. Objectives

- The 2007 IQP group focused specifically on the experience of families in these exhibits rather than all of the galleries' visitors. They evaluated both the HSBC Money gallery and the Egyptian Sculpture gallery to provide information which would be useful for upcoming renovations.
- The 2008 IQP group was focused on updating the visitor study methodologies of the British museum that were already in place at the time. They executed their methodologies on the North America, Roman Empire, and Egyptian Death and Afterlife exhibits.
- The 2009 IQP group focused on specific metrics used in visitor studies, including holding power, attracting power, dwell time, and visitor circulation. This group evaluated the HSBC Money Gallery and the temporary gallery 69a, which then housed an exhibit entitled "The Splendor of Isfahan: Coins from Iran."
- The 2010 IQP group evaluated some specific cases in the HSBC Money Gallery, as well as Gallery 69a, which held temporary exhibits displaying currencies from different cultures that rotated every 6 months, and the effectiveness of the visitor study process the currently museum had in place.
- In 2013, the gallery underwent renovations after entrance into a five year contract with Citi Bank, following some of the recommendations form the 2010 team. As a result, the 2013 IQP group was tasked with evaluating the effectiveness of the renovations that the Citi Money Gallery underwent to improve the visitor experience.

2.4.2. Methodologies

All the aforementioned IQP teams employed strategies of tracking individual visitors as well as providing surveys and questionnaires to visitors as they exited the galleries. When looking at questionnaires there were many common questions asked over the years. These questions focused on demographics of the visitors like nationality, first language, age, and gender. Other common questions were about the person's reason for going to the museum, reason for going to a specific gallery, and the most enjoyable part of the specific gallery for the visitor. These common questions provide our group with a starting point when creating our own questionnaires to be implemented in our own methodologies.

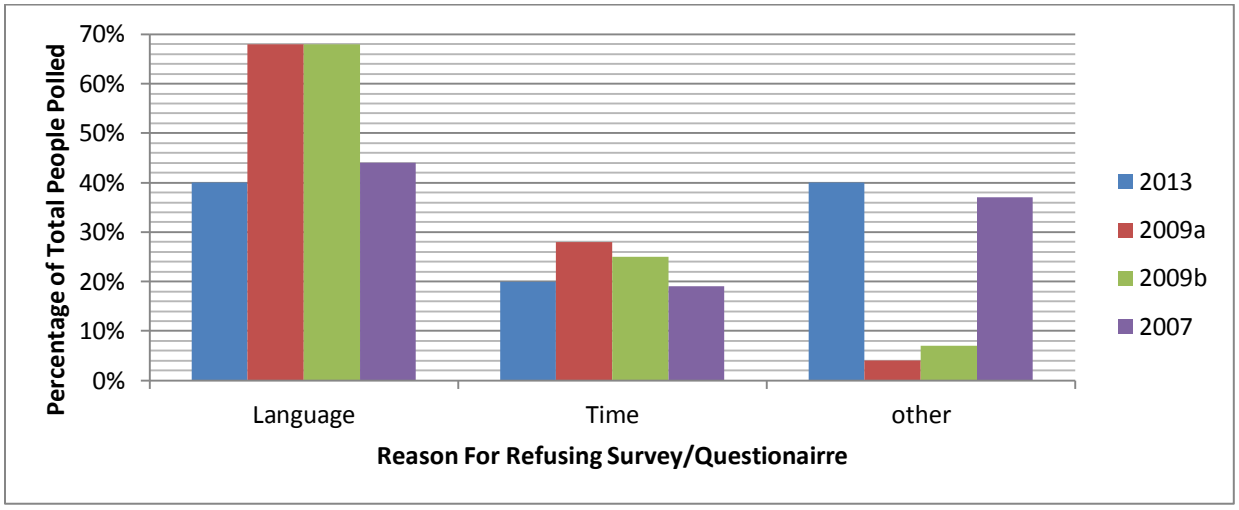

Figure 4: Percentage of Visitor's Responses When Refusing Exit Questionnaires or Survey by Year

A common problem encountered by the previous IQP groups was the refusal rate for the questionnaire. The 2007, 2009, and 2013 IQP groups all posted results of the most common reasons given by visitors for refusing to take the exit surveys which are summarized in Figure 4 above. In addition to the most common problems, language barrier and time constraints, other common reasons for refusal were that the visitor simply "didn't want to" take the questionnaire, or that he/she was a "walkthrough" who wasn't interested in the gallery. This information is useful to our group because it gives us focus points to enhance the success of our own attempts at creating a worthwhile survey for museum visitors.

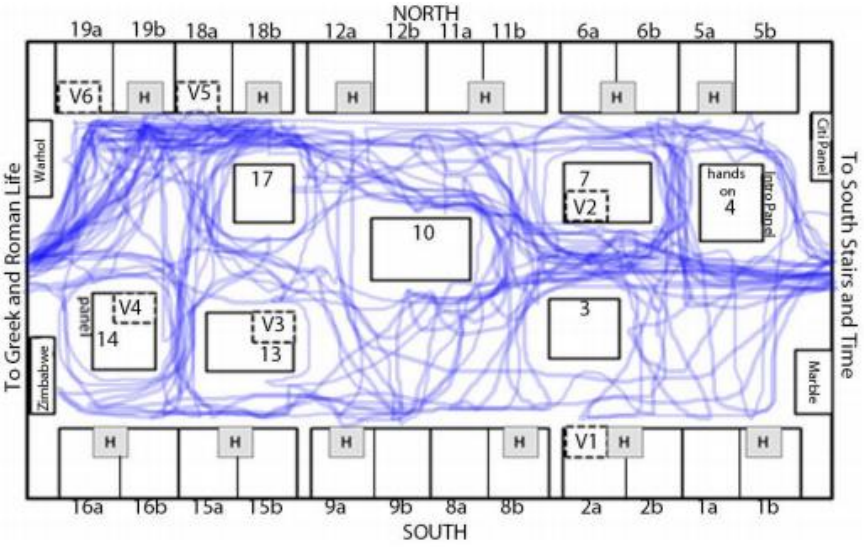

Figure 5: Line Map of Visitor's Paths in the Citi Money Gallery from the 2013 IQP

Another common theme was the use of gallery maps to display information about the attraction of specific items within the galleries as well as the paths taken by visitors to travel throughout the gallery. It was noted in our interview with our liaison that the maps depicting the paths of visitors were confusing and hard to follow. An example of one of these maps can be seen in Figure 5 above. Alternatively, the "heat maps" used to display the attraction and holding power of individual exhibit items were noted to be very useful and easy to understand. An example of a gallery heat map from a previous IQP can also be seen in Figure 6 below.

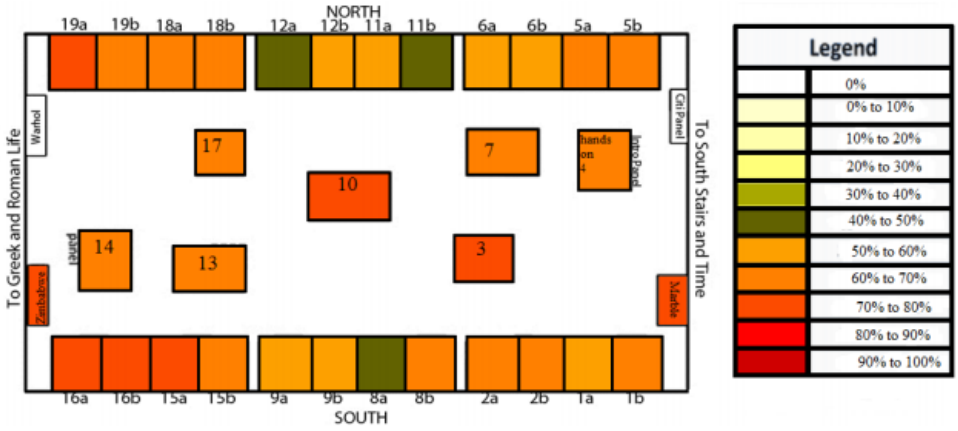

Figure 6: Heat Map of Case Holding Power from the 2010 IQP

2.4.3. Findings

Demographics

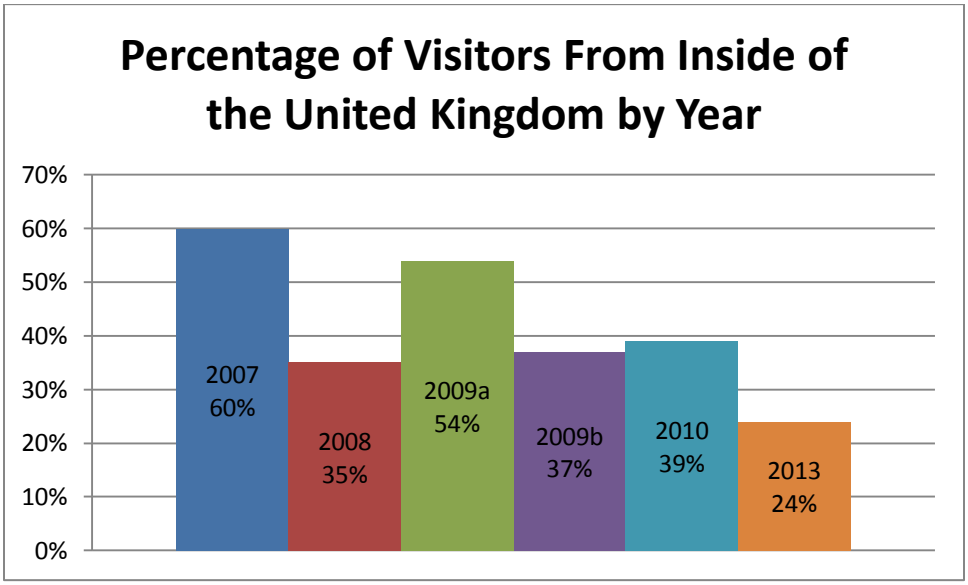

Figure 7: Percentage of Gallery Visitors from the UK as Found by Previous IQPs

Collecting data on the demographics of visitors (age, nationality, language, gender, etc.) has been a key part of previous IQPs. This data helps the designers and maintainers of the exhibit tailor the contents to the interests of the visitors and provide materials to make the gallery accessible. This data is also constantly changing, as a review of the findings of previous groups shows. Figure 7 above shows how drastically the number of visitors to the exhibits has changed since 2007. The 2010 IQP team proposed that they did not need to collect visitor demographics data from Gallery 68, and instead could rely on data provided by the British Museum. The team later noted that that this was a mistake and that demographics-related data should continue to be collected because the demographics of visitors constantly vary.

The second reason for collecting demographic data is that knowing the common languages among visitors could reduce the high number of refusals due to language barriers. The primary reported reason for not completing the survey was a language barrier. Our liaison also noted that the language barrier problem was something that he would like our group to focus on, and the best way for us to develop proper methodologies and a questionnaire for people of varied

languages is to know what languages they speak. Figure 8 shows the primary languages spoken by the people surveyed in all previous IQPs at the British Museum. While only the seven most frequently spoken languages are listed, the "other" category consisted of the following nineteen languages: Afrikaans, Bosnian, Bulgarian, Croatian, Czech, Danish, Dutch, Finnish, Greek, Hindi, Japanese, Korean, Lithuanian, Norwegian, Persian, Polish, Spanish, Swedish, and Vietnamese. In the 2013 IQP, it was interesting to note that while the team had translated the questionnaires to many different languages, they ran into difficulties approaching foreign language speakers and informing them of the availability of foreign language questionnaires. Bridging this communication gap is one of the bigger challenges our team faces.

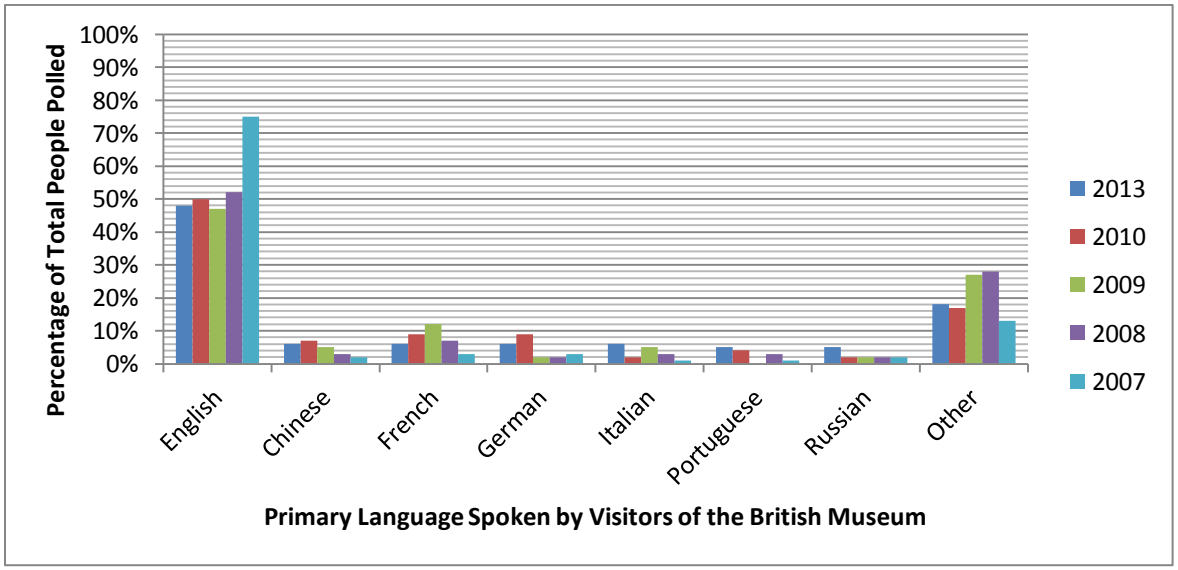

Figure 8: Primary languages spoken by Museum visitors as determined by previous IQPs

Visitor Counting

Another kind of data which the Department of Coins and Medals indicated was useful was the count of visitors through different doors and at different times. The 2013 team found that the highest number visitors came in during 11:00am, and a drop was seen around lunchtime. Of the two entrances of the gallery, the Greek & Roman side received a greater number of visitors than the staircase side, which led the team to conclude that more visitors used the gallery as a

way to get to the stairs and other galleries. The gallery also received greater numbers of visitors during rainy weather.

This data collection goes hand in hand with the line maps which track visitor's paths through the gallery, as previous groups have made these maps much less confusing by separating the paths into separate maps by the entrance the visitor used. Additionally, only every nth is tracked and counted, greatly simplifying the line graphs further and keeping a proportional count on the number of visitor's per hour. These techniques will be useful when our group is developing our own strategies for collecting this data.

Walkthroughs

Walkthroughs rates are valuable for our sponsor since they tell us what percentage of visitors simply walked through the gallery without stopping at any cases. They also provide valuable information about whether the visitors are using the gallery as a hallway to get to the stairs if they entered through the Greek & Roman entrance. Figure 9 below shows the walkthrough rates of various galleries observed in previous IQPs.

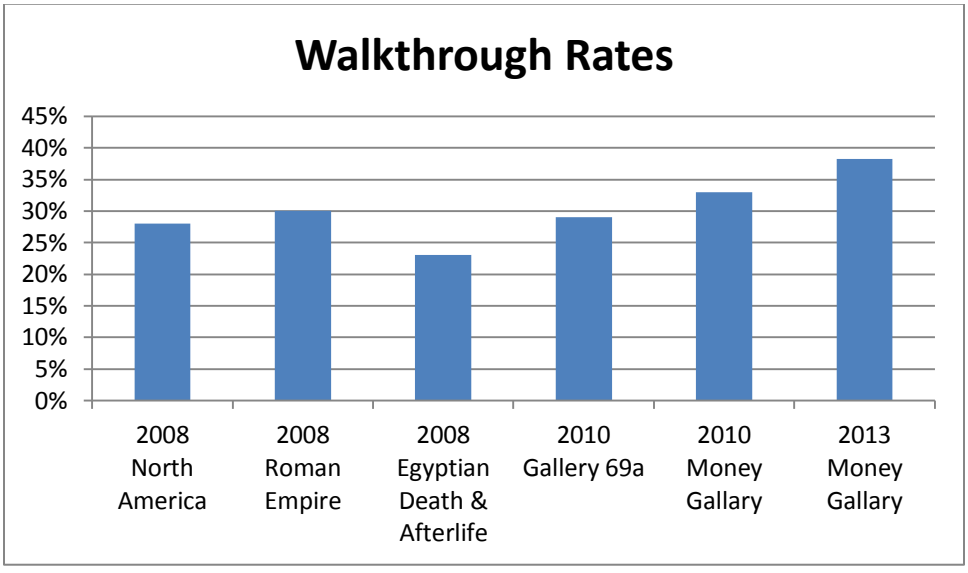

Figure 9: Walkthrough rates of various galleries from previous IQPs

Walkthroughs rates are also considered when simplifying the line charts discussed earlier. The 2013 IQP Group created entirely separate maps to designate the paths taken by people walking through the gallery so that the maps would be overall less confusing. This is an approach which our group could take when depicting data.

Visitor Classification

The 2009 IQP was the first to classify visitors into *Browsers, Followers, Searchers* and *Researchers* based on viewing strategy. The same rubric was used to classify users in the 2010 ans 2013 IQPs. *Social, Intellectual, Emotional* and *Spiritual* were the four categories of visitor motivation and outcomes used in 2009, 2010, and 2013. In 2009 and 2010, but not in the 2013, IQP Visitors were also classified as having four depths of engagement. These classifications were *Orientation*, *Exploration*, *Discovery* and *Immersion*. Information about visitor classification helps formulate recommendations to the Department of Coins and Medals about what sort of visitors they should primarily tailor the gallery's visitor experience to. Our group intends to use the first two of these classifications when we develop our own methodologies for evaluating visitors.

Holding Power, Attracting Power, and First Case Visited

The 2010 IQP group developed a method of displaying holding power and attracting power using heat maps.

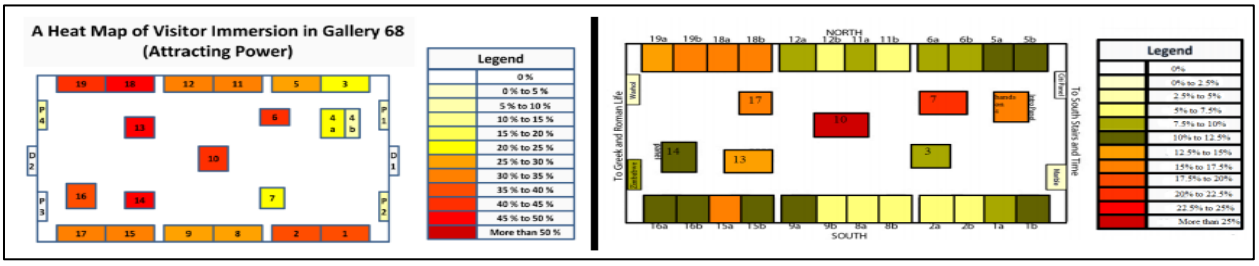

Figure 10: Attracting power of display cases in Money Gallery from previous IQPs

Comparing the heat maps from the 2010 IQP and the 2013 IQP, we can see that the older gallery setup had overall higher attracting power for cases. In comparison, the new setup had a greater holding power. The 2013 team concluded that this indicated "increased involvement with individual cases" post-renovations. Additionally, they also found that key objects did not appear to be more frequently visited, despite being the 'highlights' of the gallery. Both IQPs also found that the cases closest to the doors had the highest number of first visits, and we expect similar results in our study.

Name Recognition

Another notable finding is the recognition of Citi Bank as the sponsor of the money gallery. The 2013 IQP found that a mere 57% of visitors knew the name of the gallery and only 16% knew that Citi Bank sponsored the Gallery. From visitor interviews, they concluded that due to the lack of the Citi Bank logo and the name of the gallery displayed in gold lettering, visitors failed to relate the gold word 'Citi' to Citi Bank.

CHAPTER 3: METHODOLOGY

The ultimate goal of our project is to present an analysis of the visitor experience in the Citi Money Gallery of the British Museum. We updated and refined the methodology of previous groups in an effort to gather more useful data from visitors. We relied on our background research, interviews, past IQPs and creativity to aid the process of achieving our objectives, which are:

1. Assess the current state of the industry regarding museum visitor experience assessment.
2. Determine what information would be useful for the museum and devise practical revisions to the current methodologies for data collection about visitor experience.
3. Collect data from gallery visitors through visitor tracking and questionnaires.
4. Analyze visitor behaviors and attitudes from the newly gathered data and interpret it to formulate recommendations.
5. Present statistical data and recommendations to the Department of Coins and Medals staff.

Objective 1 was met in the Background chapter, objectives 2 and 3 were met by the methodologies described in this chapter, and objectives 4 and 5 will be discussed in the Results and Analysis chapter.

The table below shows the timeline of our project:

	Pre-Departure	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Preparation & Calibration								
Visitor Counting								
Tracking & Questionnaires								
Data Analysis								
Final Report Writing								
Final Presentation								

Table 1: Project Timeline

In order to re-evaluate the Citi Money Gallery we measured multiple qualitative and quantitative aspects of the visitor experience in the gallery. Table 2 below contains the definitions, importance and data collection strategy of some major aspects we will be studying:

Term	Definition (What)	Significance (Why)	Methodology (How)
Walkthrough Rate	The percentage of visitors that walk into or through a gallery but do not stop at any exhibits	Indicates how many visitors use the gallery only as a hallway	Tracking; simple observation
Visit Order	The stage of their visit at which visitors come to the gallery in question	Could indicate whether visitors come specifically to visit the gallery, and whether the location of the gallery within the museum affects when in their visit they come to the gallery	Questionnaire: What galleries have you visited prior to this one, if any?
First Case Visited	The object /case visitors stop at first	Indicates immediate attracting power of an exhibit	Tracking; simple observation
Dwell Time	The median number of seconds visitors spend in the gallery (discounting walkthroughs)	Indicates the overall holding power of the gallery and how engaged the visitors are with the exhibits	Tracking; stopwatch used
Attracting Power	The percentage of visitors that stop at each panel and case	Indicates the ability of an individual case to attract visitors	Tracking; simple observation
Holding Power	The median number of seconds that visitors stop at each panel and case	Indicates how invested visitors are in a particular case	Tracking; stopwatch used
Name Recognition	The percentage of visitors that are accurately able to name the gallery's sponsor	Indicates whether the sponsor has been successful in getting recognized	Questionnaire: Who is the sponsor of the Money Gallery?
Visitor Count	The number of visitors visiting the gallery	Indicates whether the gallery is attracting enough people, and when more people tend to visit	Tracking; observation
Stops at Exhibit Elements	The median number of stops at exhibits expressed as a number and a percentage	Indicates how many exhibit elements successfully attract visitors overall	Tracking; observation
Guide Usage	The percentage of visitors that utilize a guide	Indicates whether the introduction of paper guides was successful	Questionnaire: How have you used the paper guide provided for the gallery, if at all?
Level of Engagement	Percentage of visitors that successfully engage with exhibits they stop at	Indicates the extent to which visitors get involved with the exhibits overall	Tracking; close observation of visitor interaction with exhibit(s)
Motivation	The visitors' motivation to visit the gallery	Helps with visitor classification and tailoring the visitor experience to users with specific motivations (eg: social)	Questionnaire: Why did you visit the British Museum today?
Demographic	Various visitor demographics such as first language, nationality etc.	Helps with basic visitor categorization and tailoring visitor experience in the gallery	Questionnaire: What is your first language? What is your age? etc.

Term	Definition (What)	Significance (Why)	Methodology (How)
Visitor Behavior	Percentage of browsers, followers, searchers and researchers	Helps with basic visitor categorization and tailoring visitor experience in the gallery	Tracking (viewing strategy), questionnaire: Why did you visit the British Museum today?
Visitor Response	Categorizing visitors as social, intellectual, emotional and spiritual based on their responses to the gallery as a whole, as well as to individual objects	Helps with basic visitor categorization and tailoring visitor experience in the gallery	Questionnaire: Why did you visit the British Museum today? What did you take away from the Money gallery?

Table 2: Important Aspects of Visitor Experience

3.1. Visitor Counting

In order to determine the accuracy of the electronic visitor counter on the east entrance, we performed visitor counting. Two observers stood at each of the two doors, one counting the number of visitors entering and one counting the number of exits. Each observer used either a piece of paper and pencil or a smartphone app to count visitors. The electronic counter was reset to zero at the beginning of the study and was not reset again. The number was checked at the beginning and end of each time interval and recorded for later analysis with the manual count.

3.2. Visitor Tracking

In order to collect much of the information we wished to present to The British Museum at the end of our project, we took time to observe the behaviours of visitors' inside of the Citi Money Gallery. This was accomplished by tracking individual visitors throughout the entirety of their time inside of the gallery and making notes of all of their actions. The information we collected by tracking these individuals included walkthrough rate of the gallery, exhibit visit order, first case visited, exhibit dwell times, attracting power of cases, holding power of cases, guide usage, levels of engagement, and visitor viewing strategy.

3.2.1. The Tracking Process

In order to streamline the process and make it repeatable our group has created a tracking sheet with an overhead blueprint of the gallery to trace the visitors path and mark locations where the visitor stopped and observed individual gallery items, as well as a stopwatch to record how long the visitor take to perform actions in the gallery. We have set up the following procedures so that we are consistently collecting the same data for every visitor we observe. The procedure is as follows and is also described in more detail in Appendix B: Visitor Approach Protocol.

We worked in two person teams, Tracker A using the tracking sheet and stopwatch, while Tracker B accompanied Tracker A and approached the visitor with the questionnaire after tracking is complete. Each team has started by observing a doorway into the gallery while standing off to the side in one of the alcoves along the wall between display cases. The team then counted every third person to cross the plane of the doorway and enter the gallery and begin to track them. At this point Tracker A started the stopwatch and noted the following in the designated areas of the tracking sheet (Appendix A: Tracking Sheet):

- What number subject are they? (1st, 2nd, 23rd, etc)
- Are they in a group or alone? (Group/Alone)
- If yes, what type of group? (Students, Family, Other____)
- Are they using a guide? (Y/N)
- If yes, what type of guide? (Large Print, Braille, Auditory)
- Is the visitor a walkthrough? (Y/N)
- Is the visitor a turnaround? (Y/N)

As the visitor moves through the gallery, Tracker A traced their walking route and marked significant events on the tracking sheet.

- The first case which the visitor stops at was marked “1”, the second case was marked “2” and so on until the visitor exited the gallery.
- If at any point the visitor stopped and was not at a gallery exhibit, Tracker A marked an “S” at that point on the tracking sheet.

- If the visitor photographed any part of the gallery Tracker A marked "P" on the object that is photographed on the tracking sheet.
- If the visitor glanced at an exhibit but did not stop, Tracker A marked "G" on that exhibit glanced at on the tracking sheet.
- If the visitor held a discussion with another visitor, Tracker A marked "D" where the discussion took place on the tracking sheet.

Any time a stop occurred, at an exhibit or otherwise, Tracker A used the "lap " function of the stopwatch to record the point at which the visitor stopped moving and the point at which they started to walk again. As the visitor moved through the gallery, the team moved between alcoves to follow the visitor, and Tracker B moved to whatever exit the visitor is heading towards.

When the person moves to exit the gallery, Tracker B approached the visitor with a questionnaire. Tracker A made note of the exit being used on the tracking sheet. If the questionnaire was refused, the reason for refusal was marked on the tracking sheet by Tracker A. Tracker A also recorded the overall lap times in the table on the back of the tracking sheet. When the questionnaire was completed, the team moved back to their starting position and repeated this process again.

3.2.2. Tracking Analysis

For the entirety of the visitor's path through the gallery Tracker A records any notes they might have on visitor behaviour to be used in determining visitors' meaning making and viewing strategies. At a later date the tracking sheet along with its paired questionnaire response was analysed using the rubric developed for the hierarchy of meaning making and the hierarchy of visitor engagement to classify the visitor by their viewing strategy the as well as their level of engagement with the gallery.

3.2.3. Tracking Calibration

We practiced the tracking procedures during our first few days working at the British Museum to make sure that everyone was performing the study on the same way, to test our

equipment, and to see which pairs worked best together for maximum efficiency and the best results. We prepared a list of people we did not track and give questionnaires to (such as people under the age of 18, people in tour groups etc.). We also decided where in the gallery we should stand while tracking visitors so as not to disrupt the flow of the gallery or draw attention to ourselves.

The most important prerequisite for collecting reliable data is making sure all the team members are performing consistently when it comes to what information they are gathering. This was achieved by studying the list of definitions of key aspects being studied followed by practicing data collection. We practiced visitor tracking by having all team members track the same visitors simultaneously. We then compared the data collected to ensure it was the same, and repeated the process until we were satisfied with the results.

3.3. Questionnaires

In order to begin to understand the visitor experience in the Citi Money Gallery with real depth it is necessary to move beyond simple observation. We are interested in the thoughts that are going through visitors' heads as they transit the gallery, what they like and dislike, and it is only possible to get a base sense of what those are with passive techniques. Using a questionnaire to directly access this information is a good way of evaluating visitor experience. The questionnaire we have composed can be seen in Appendix C: Questionnaire.

There are several categories of information we wanted to obtain with a questionnaire:

3.3.1. Demographics

To place visitor responses in the right context it is a good idea to get demographic information from them. If a certain segment of population corresponds to a certain type of visitor, that information can be used by the museum to increase the impact of the gallery. Table 3 below shows the types of demographic data have collected as part of our questionnaire as well as some of the reasons why.

Information Type	Why?
Age	A visitor's age will let us know if interest in the gallery comes from one specific age group, or is spread throughout all groups. The gallery could be tailored to the most common age group to increase their enjoyment of it, or changed to attract a different audience.
Nationality	This statistic will tell us if there is any specific country of origin the gallery may want to tailor their exhibits to in the future.
First Language	Foreign language support is an important factor that is missing in the gallery and gallery evaluations. Knowing which languages to support will be very important in rectifying that.

Table 3: Demographic Categories

3.3.2. Exhibit Preferences

Understanding which exhibits the visitor liked or disliked, and correlating these with the tracking data can give an idea of which exhibits are most popular, and why. Some example questions are below.

- Which exhibits were your favorites?
- Which exhibits were your least favorites?
- What attracted your attention the most?

3.3.3. Learning Information

As the goal of a museum is to educate visitors, the amount of information visitors learn from the gallery is also important. Questions about the individual exhibits, especially the ones they like the most, can give information about what the visitors are taking away from the gallery. Some example questions are below.

- What is one thing that you learned from this gallery as a whole?
- What did you learn from your favorite exhibit?
- Is there anything you would like to learn more about?

3.3.4. Sponsor Recognition

As it is the sponsor of the Money Gallery, Citibank would like to know how well the gallery advertises them. In previous studies, this has been found by asking visitors if they know the sponsor or to name the sponsor of the gallery. For our study we asked visitors to pick from

three banks logos (Citi, HSBC, and JPMorgan) to see if they could recognize the sponsor of the gallery.

3.3.5. Visitor Guides

Finally, in our questionnaire we asked visitors about their use of the large print and tactile guides available in the gallery near either door. If they did not use the guide, we asked for their reasons why in order to determine how the gallery can encourage visitors to use the guides. If they did use the guide, we asked them to rate the guides' usefulness.

3.4. Methodological Innovations

There are two factors of the visitor study which we have improved at the British Museum: the way in which data is gathered, and the way in which data is presented. Visitor studies have been performed for years, but there is always room for improvement in all methodologies. Gathering a new type of data or gathering the data in another way has yielded better insight into the minds of visitors. However, this data is useless if it cannot be interpreted and learned from. For this reason, we have also found new ways to present data to our liaison, sponsors, and the rest of the British Museum community.

3.4.1. Survey Translations

An important focus of our project which distinguishes us from past IQP groups is our intent to gather data from foreign language visitors. While the 2013 IQP group created foreign language questionnaires, they were only able to get data from a small number of foreign visitors as they had difficulty approaching them in any language except English (Osborn et al., 2013). We have overcome this difficulty by translating the questionnaire into 17 different languages and created an approach protocol which we think will be suitable for presenting visitors with questionnaires. While approaching these visitors was more difficult than English speaking visitors, the increase in data gathered in this large demographic is valued very highly. Offing the survey in multiple languages also has an effect on questionnaire refusal rate, as more people are able to take the survey.

There is no currently accepted protocol for approaching visitors, and as part of our project we have tried to find an effective and friendly way to give surveys to the foreign language speakers in the British Museum. This procedure includes the language in which the visitors are approached. We will also consider how to explain the project to both native English speakers and those who can't speak English.

To facilitate the use of multiple language surveys Apple iPad tablets were used to deliver the surveys. This eliminated the need for multiple copies of the questionnaires in each language. One issue this raises is that this use of technology in conjunction with our qualitative question philosophy is that data input into the tablet may bias the responses we get. Lower income respondents with less experience with tablets may produce shorter and/or less informative responses than those with previous experience typing on tablets.

In order to ensure that our data collection is accurate and efficient, we undertook a number of pre-testing procedures completed both in Worcester and at the British Museum. First, we choose an iOS app that helped us administer the questionnaire to tracked visitors. We chose the Qualtrics® software which offers survey services on both iOS and Android devices, and is currently used by WPI. Later in pretesting we tested the questionnaire on the chosen application to make sure it could be taken correctly every time.

3.4.2. Visitor Guides

We are the first group to study the effectiveness of the paper gallery guides offered by the Citi Money Gallery. In order to do so, we have utilized both tracking methodologies as well as the questionnaire. We have recorded the percentage of visitors tracked that pick up a guide as well as the percentage of visitors that appear to actively follow the guide and base their viewing strategy on it. The questionnaire also contains questions such as whether the visitors found the guide helpful, etc.

3.4.3. Interactive Methods

We wanted to make the visitor feedback process more interactive and enjoyable for visitors than simply answering a plain text questionnaire. We aimed to achieve this by including

interactive pictures in the questionnaire and considered presenting the visitors with a poster board displaying pictures of exhibits from the gallery and asking them to mark their favorite exhibits with stickers. We are also experimenting with the idea of incorporating QR codes for users who are interested in knowing more about the exhibits. While we did include interactive pictures in the questionnaire, we did not have time to implement the poster and upon arrival found QR codes already in some use in the gallery.

Another way we considered trying to improve data was making our questionnaire have some sort of incentive for visitors, which would increase their overall satisfaction in taking the survey and make them feel more contractually obligated to provide good information. While we did not implement this, we would suggest it as a consideration for future projects. The incentive could be in the form of interaction, such as putting a sticker on a board to mark their favorite exhibit. Incentive could also be in the form of a souvenir like a pencil or sticker for the participant.

3.4.4. Improved Data Presentation

Our liaison has indicated that they are interested in seeing new ways of presenting certain data, especially the line maps depicting visitor paths through the gallery. We are experimenting with various methods of presenting such data, including color coding and varying the thicknesses/densities of the lines followed by visitors to indicate varying concentrations of people, average dwell times, etc.

We first considered writing our own Android based app to use in tracking. The app would record the path of a visitor entered by the tracker on the device's touchscreen. This goal was outside of our time constraints once we arrived in London, so we began looking at existing software to perform a similar function. We looked into Geographical Information System (GIS) software, but were informed that this software might have more capabilities than we needed and had a steep learning curve. We found another piece of software, Syntax 2D, developed by the University of Michigan, which we intend to use for data presentation.

Syntax 2D can be used to calculate a myriad of things, including a Path Count, which shows a heat map of paths. Where many people walk, the map is red. Where very few people walk the map is dark blue. It also includes a labelled color scale so the viewer can see what the

max number of visitor paths in a grid. Appendix F: Syntax 2D Instructions contains instructions to generate a Path Count in Syntax 2D.

3.4.5. Focus on Learning and Qualitative Feedback

Instead of collecting largely quantitative data from visitors, we focused on the more qualitative aspects of visitor experience, such as visitor learning through exhibits. Questions pertaining to the visitors' favorite exhibits, such as what attracted them to an exhibit first, and what they would like to know more about were presented in "free response" manner in an attempt to obtain more accurate, in depth, and visitor specific information than a multiple choice format might generate.

The types of questions being asked on our questionnaire are slightly different from the ones asked in previous efforts. We want to get a more qualitative view of the visitor experience in the gallery. Thus we included more "free response" questions that forced the respondent to jog their memory and write down information about their experience. In addition to this we included a more graphical questionnaire than previous groups. Graphics, as opposed to text, will set the respondent more at ease and can result in a higher rate of completion as well as better responses (Diamond, 1999).

CHAPTER 4: RESULTS AND ANALYSIS

This chapter outlines the findings that we made while analyzing and interpreting the data gathered during the course of our study. Findings are organized according to the headings at the beginnings of sections 4.1 and 4.2. Section 4.1 describes results relating to the gallery, its contents and set up, as well as visitor data. Section 4.2 contains findings on our methodologies, specifically our questionnaire innovations and new methods of presenting data.

4.1. Results

Reaching More Visitors

- Visitors by First Language and Country of Origin
- Visitor Age Distribution and Group Size

Visitor Movements

- Visitors travel along the north wall more than the south wall
- Visitors are most likely to be drawn in during the first third of the gallery
- Visitors entering from different directions tend to behave differently
- The mean time spent in the gallery is longer than in previous years

Case Analysis

- Reworking of Case 19 changed the behavior of viewers
- Case 3 is not well set up to attract attention
- Case 17 is good at pulling visitors in
- Wall Displays receive less attention than other cases
- Free standing cases have higher attracting power than other cases
- Case Content Analysis

Visitor Experience

- The gallery attracts many nationalities of visitors
- Visitors do not usually intend to visit the Money Gallery
- Learning in the gallery
- Citibank sponsorship recognition is low

- Visitor language affects dwell time
- Gallery attracts mainly Browsers and Followers
- Gallery Attracts mainly SESI
- No visitors tracked used the large print or tactile guides

Visitor Counter

- The electronic visitor counter has a linear relationship with the number of visitors to the gallery

4.1.1. Reaching More Visitors

- Visitors by First Language and Country of Origin

The Citi Money Gallery, as a part of the globally popular British Museum, attracts visitors from all over the globe. One of the objectives of our study was to increase the amount of these visitors which we reach with our data collection. One of the largest barriers to this is language. Figure 11 below shows the distribution of primary languages of visitors we surveyed.

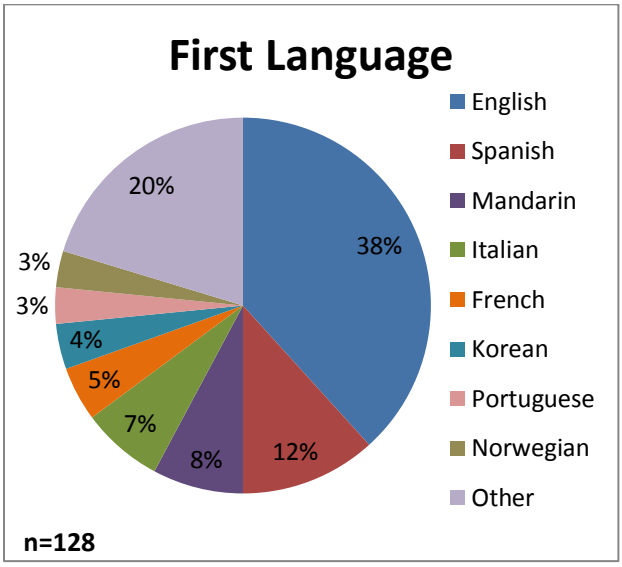

Figure 11: Visitor First Langauge

A plurality of visitors speaks English as a first language, which is not surprising. Figure 12 shows that this matches fairly closely with the combined total of visitors who reside in the UK and the USA. Spanish is the second largest language group, with 12% of the sample. This data will be very useful when designing a future study of the gallery. Focus on the top languages spoken will make excessive translations unnecessary. The languages chosen for this study were partially based on the languages identified in previous efforts, however the poor engagement with Non-English speaking visitors in these efforts make our improved data on this very valuable.

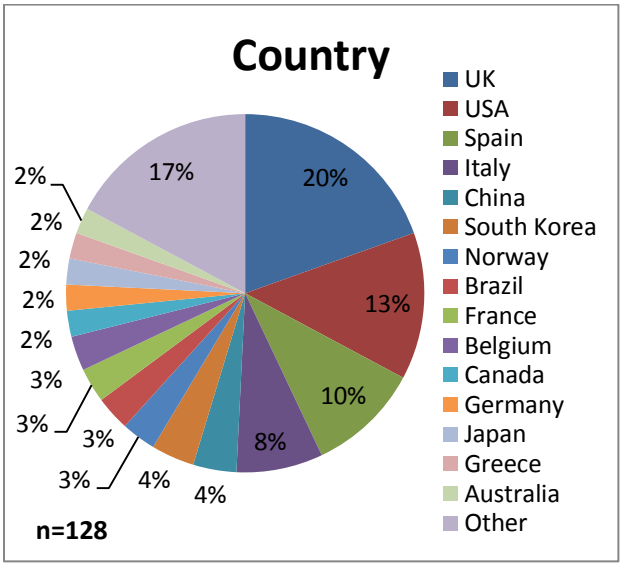

Figure 12: Visitor Country

It is interesting to note that many visitors chose to take the questionnaire in English when they had a different primary language. Figure 13 shows that 64% of respondents took the survey in English which leaves 26% of visitors responding in English as a second language.

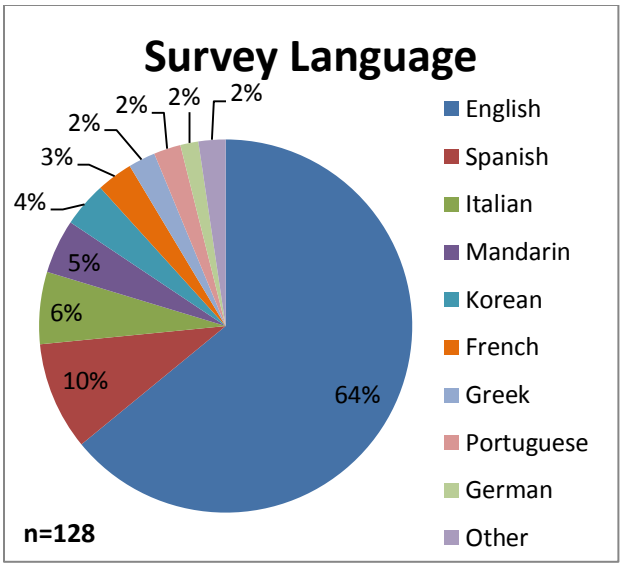

Figure 13: Language the Survey was Taken In

- Visitor Age Distribution and Group Size

Another interesting fact to consider is the distribution of ages in the gallery. We found that the most common age range to come to the gallery is the 25-34 years of age group. It is important to note that this age information does not represent visitors under the age of 18, as those visitors were excluded from the tracking and questionnaire data collection due to ethical reasons. This may skew the data somewhat.

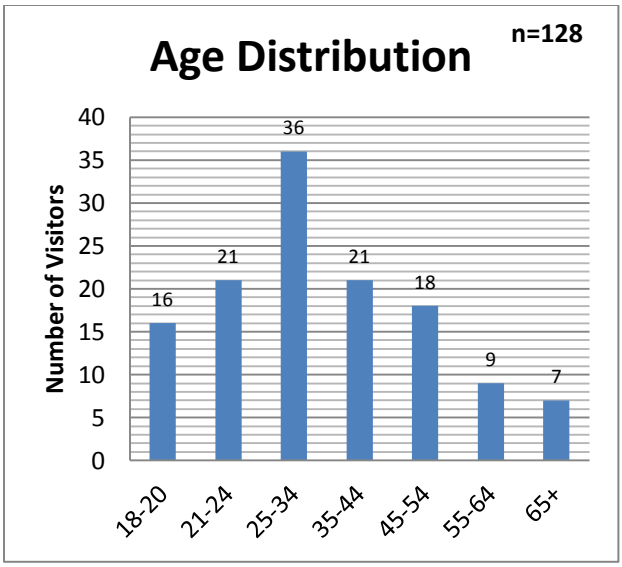

Figure 14: Visitor Age Distribution

Future studies may begin a comparison of this and other demographic data with the data from the rest of the museum. These studies may measure the number of the underage visitors who they skip over for tracking in order to estimate the appropriate age distribution. This may reveal trends in how the money gallery appeals to or is marketed to visitors of different ages. These additional studies may look into how the gallery appeals to groups. The mean group size of the gallery was 7 people; however this is skewed by a few very large groups. The median and mode of the gallery is 2 people.

4.1.2. Visitor Movements

- More visitors travel along the north wall more than the south wall.

The visitor path heat map in Figure 15 shows that there are more visitor paths along the north cases in the gallery. This is consistent with the attracting power heat map, shown combined with the visitor path map in Figure 16.

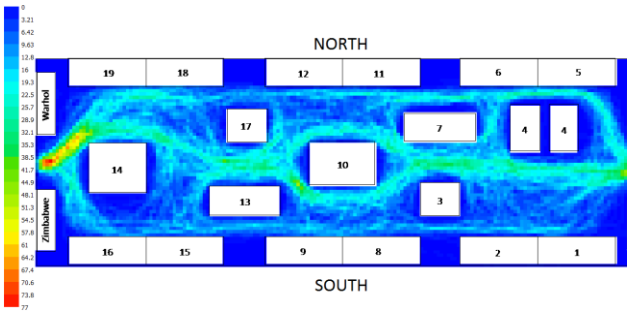

Figure 15: All Visitor Paths through Gallery (n=233)

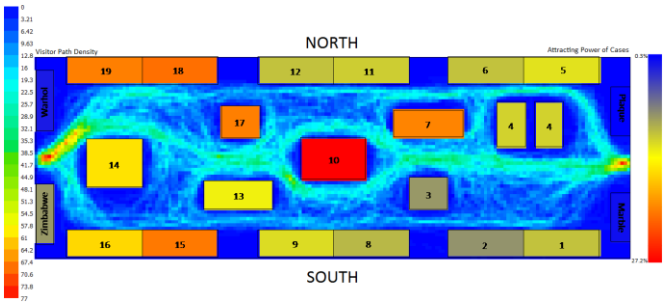

Figure 16: All Visitor Paths through Gallery, with Attracting Power Heat Map (n=233

These patterns are likely due to the setup of the gallery. At the East entrance, visitors follow the commonly observed tendency to turn to the right, or North, after entering the gallery (Bitgood 2006) or to continue straight towards the opposite end of the gallery (inertia) (Bitgood 2006). From the West entrance there is a panel right inside the door on the back of Case 14 as shown in Figure 18 of the gallery from the west entrance. This panel partially blocks a visitor's view of the exhibits along that side as well as causing some congestion in the narrow passage created between Case 17 and the Zimbabwe poster and Case 16. The congestion and restricted view could be causing visitors to prefer the left turn towards the north which guides them either to Case 19 or straight through the gallery.

Another possible factor that influences a visitor's direction after entry is the appearance of the cases near the door. When entering through the East door from the stairs, the visitor is presented with the view in Figure 17. Looking to the left (South side of the gallery), the visitor primarily sees the rectangles of the explanation cards. On the right (North side of the gallery), they see a range of different colored objects of variable size. Similarly, when entering through the West door, the visitor sees the view in Figure 18. On the right (South side of the gallery), there is a lot of paper money and explanation cards of similar shape and appearance. On the left (North side of the gallery), there is a case of items of various size, type, color, and shape. It is possible that these cases on the North side which are more variable in content appearance draw in visitors more than the neatly organized evenly laid out cases on the South side.

Figure 17: View of Gallery from East Entrance

Figure 18: View of Gallery from West Entrance

- Visitors are most likely to be drawn in during the first third of the gallery

Figure 19 and Figure 20 show the first case stopped at by visitors coming through the east and west doors respectively. The visitors entering through the west door are most likely to stop

first at case 19, 16, or the Zimbabwe Poster, as shown by the warmer colors in these cases on the heat map. Visitors entering through the east door are most likely going to stop at 5, 1, 7, or 4 as shown by the lighter colors in these cases in the heat map. Both of these trends show that visitors are most likely going to be attracted in the first third of the gallery they see, except in the case of case 17 which often catches east walking visitors.

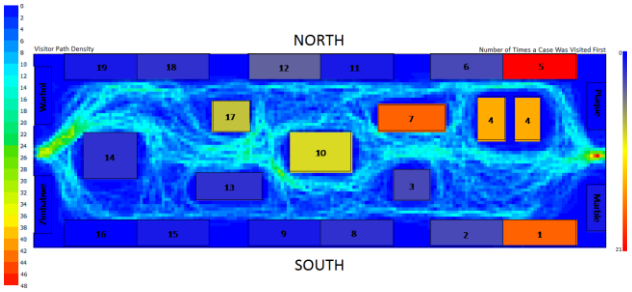

Figure 19: East Entrances and Their First Case Visited

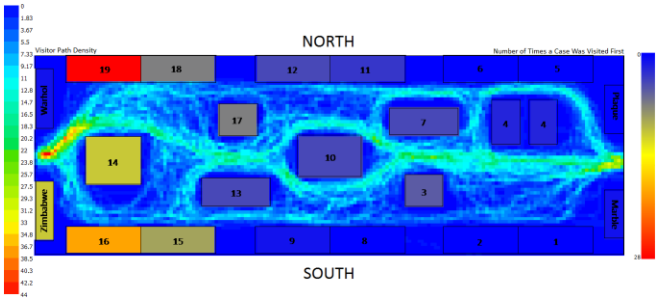

Figure 20: West Entrances and Their First Case Visited

- Visitors entering from different directions tend to behave differently.

Table 4 shows that we sampled nearly the same number of visitors through each of the doors to the gallery (48% through the East door and 52% through the West). The heat maps of visitor paths through these doors show that visitors tend to behave differently depending on which door they enter. The paths for the east entrance tend to be more diffuse than those for the west entrance which follow one central path through the gallery and splitting around Case 10.

Entrance Used	Direction	Visitors	% of Total for Entrance	% of Total
East	North	36	32%	15%
	Center	43	38%	18%
	South	33	29%	14%
	Total	112	100%	48%
West	North	47	39%	20%
	Center	43	36%	18%
	South	31	26%	13%
	Total	121	100%	52%

Table 4: Door Usage in the Gallery and Direction of Travel

- The mean time spent in the gallery is longer than in previous years

In previous years the mean dwell time in the gallery was determined to be 174.44 seconds. We found that in this study the mean dwell time was 207 seconds. The median dwell time, which is preferred by the gallery, was 131 seconds. Figure 21 below shows a histogram of visitor dwell times in the gallery which shows the median and mean dwell times.

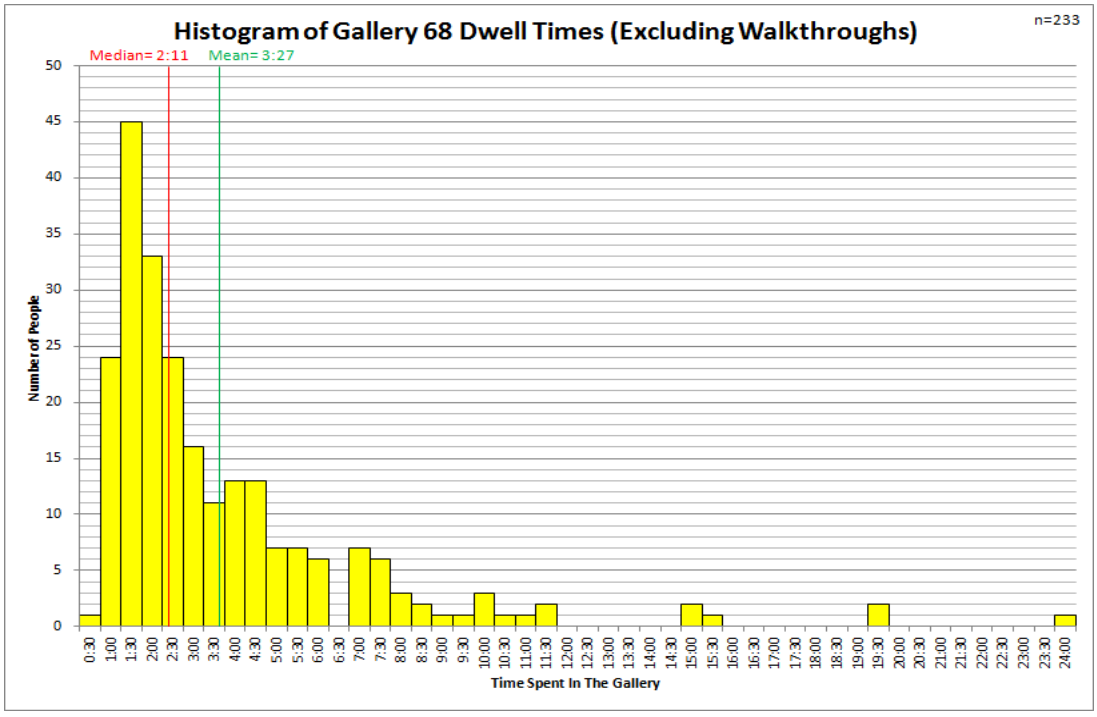

Figure 21: Histogram of Dwell Times

This graph excludes walkthroughs and turnarounds and as such only considers visitors who engage with the gallery. The most common visitor time is between 60 and 90 seconds in the gallery.

4.1.3. Case Analysis

- Reworking of Case 19 changed the behavior of viewers.

During our tracking and questionnaire study the display in Case 19 changed from a display about mobile money to a display about Bitcoin. This new display contains much more text than the previous display. This leads to visitors staying at Case 19 for longer than in the past. This is shown in the increased holding power. Unfortunately the increased reading material comes at the expense of visually interesting items which can capture visitor's attention from a distance. This lowers the attracting power of the case compared to the previous display. These changes are shown in the below graph.

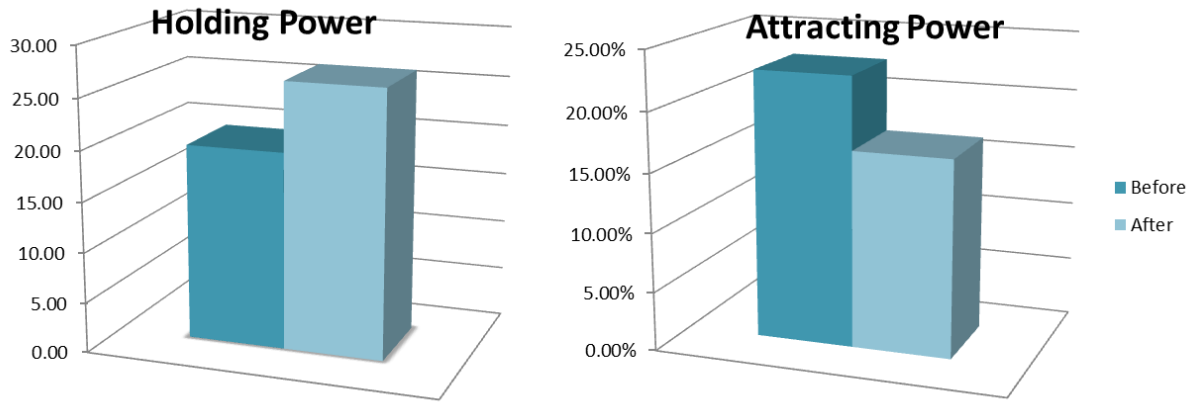

Figure 22: Holding and Attracting Power Before and After the Case 19 Changes

We can corroborate the assumption that the text-heavy nature of the display is having this effect by looking at the holding power of non-English speaking visitors before and after the change. As you can see from the graph below there is a marked decrease in holding power from these visitors, as these visitors cannot read the English text in the display.

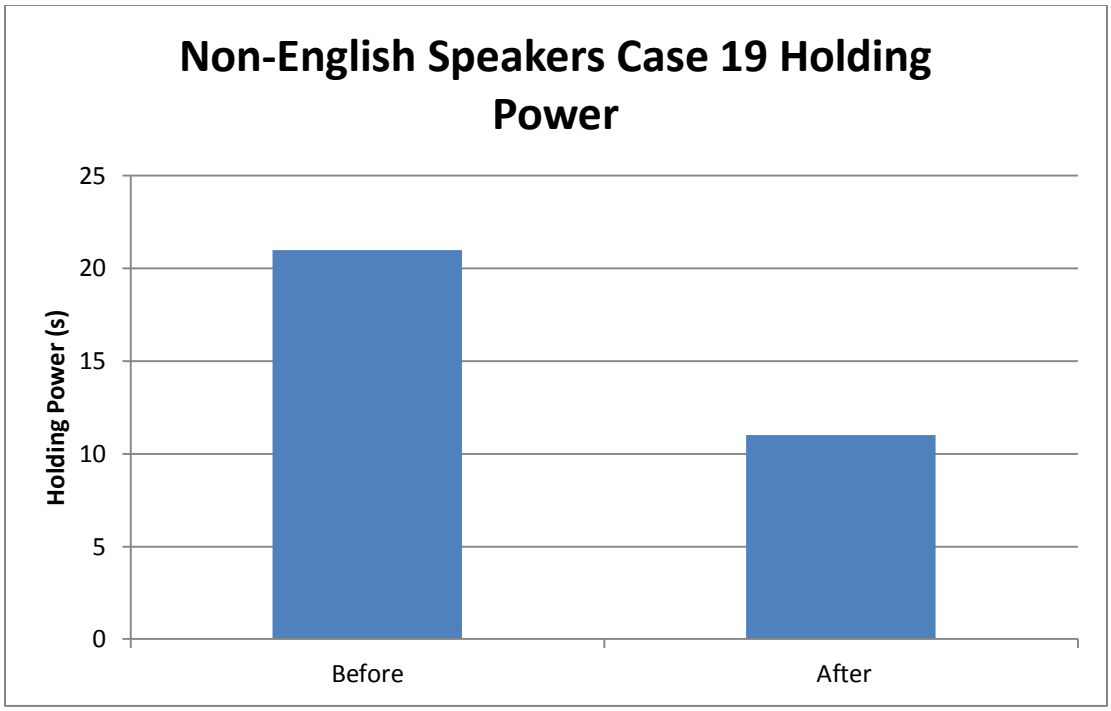

Figure 23: Holding Power of Case 19 for Non-English Speaking Visitors Before and After Changes

- Case 3 does not attract attention

Case 3 has a very low attracting power in the gallery as can be seen in Figure 24. This is likely due to the way the case is set up. The case is see-through, like many other cases, and the objects at eye level do not stand out in color. Mounting an object in the eye catching raspberry color in this case might make the whole case more attractive.

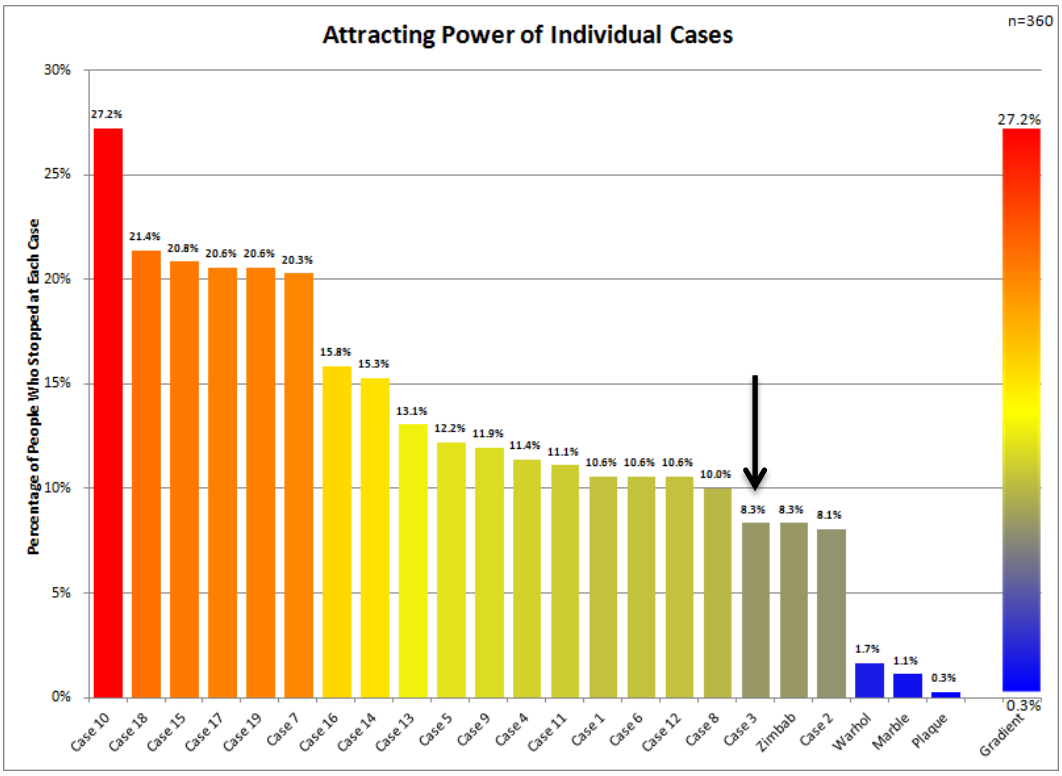

Figure 24: Bar Graph of Attracting Power for All Cases

- Case 17 is good at pulling visitors in.

Case 17 has one of the highest attracting powers in the gallery, as can be seen in Figure 24. 65% of the stops at this case are from the east door, which can also be observed by comparing the east and west door path heat maps in Figure 25 and Figure 26. Looking at the heat map for all paths in Figure 15, the west side of case 17 actually has few paths running by it, while the east side of the case, which contains the Tiffany cash register, has a high number of paths forming a crescent in front of it, which is not expected in the general flow of the gallery. Case 17 is also one of the most common first stops for east door visitors as can be seen in Figure 25. All of these facts point to Case 17 being a good gateway object to catch the attention of visitors who might otherwise be walkthroughs.

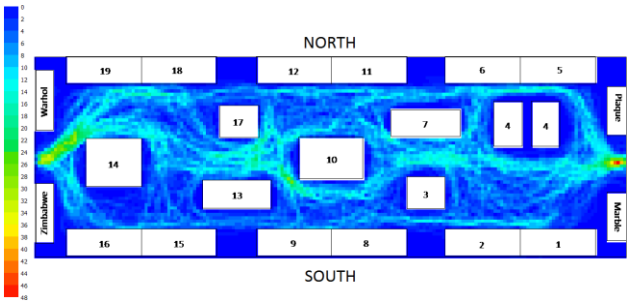

Figure 25: Visitor Paths through East Entrance (n=112)

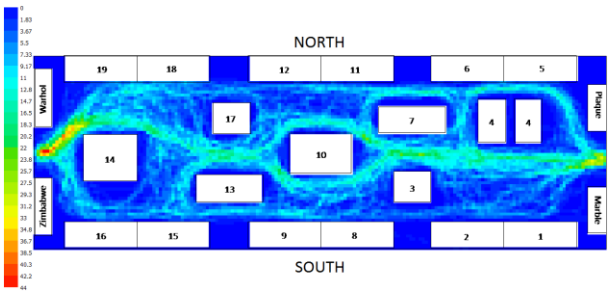

Figure 26: Visitor Paths through West Entrance (n=121)

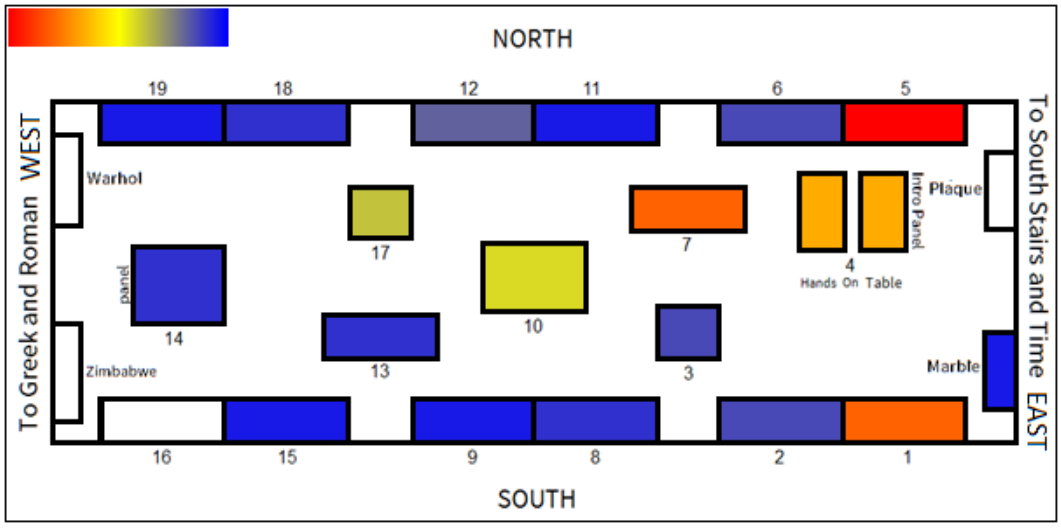

Figure 27: First Case Visited by Visitors from the East Door

- Wall Displays receive less attention than other cases

The four wall display cases near the entrances to the gallery attract less attention than other cases. The wall cases have very low attracting power as indicated by the blue color of the wall cases in Figure 28: Heat Map and Bar Graph of Attracting Power, and receive the least number of glances from visitors as well (Figure 30: Heat map and Bar Graph of Glances). As seen in Figure 29: Heat Map and Bar Graph for Holding Power three of the four wall cases have a holding power more in line with the rest of the gallery as seen by the warmer colors of the cases.

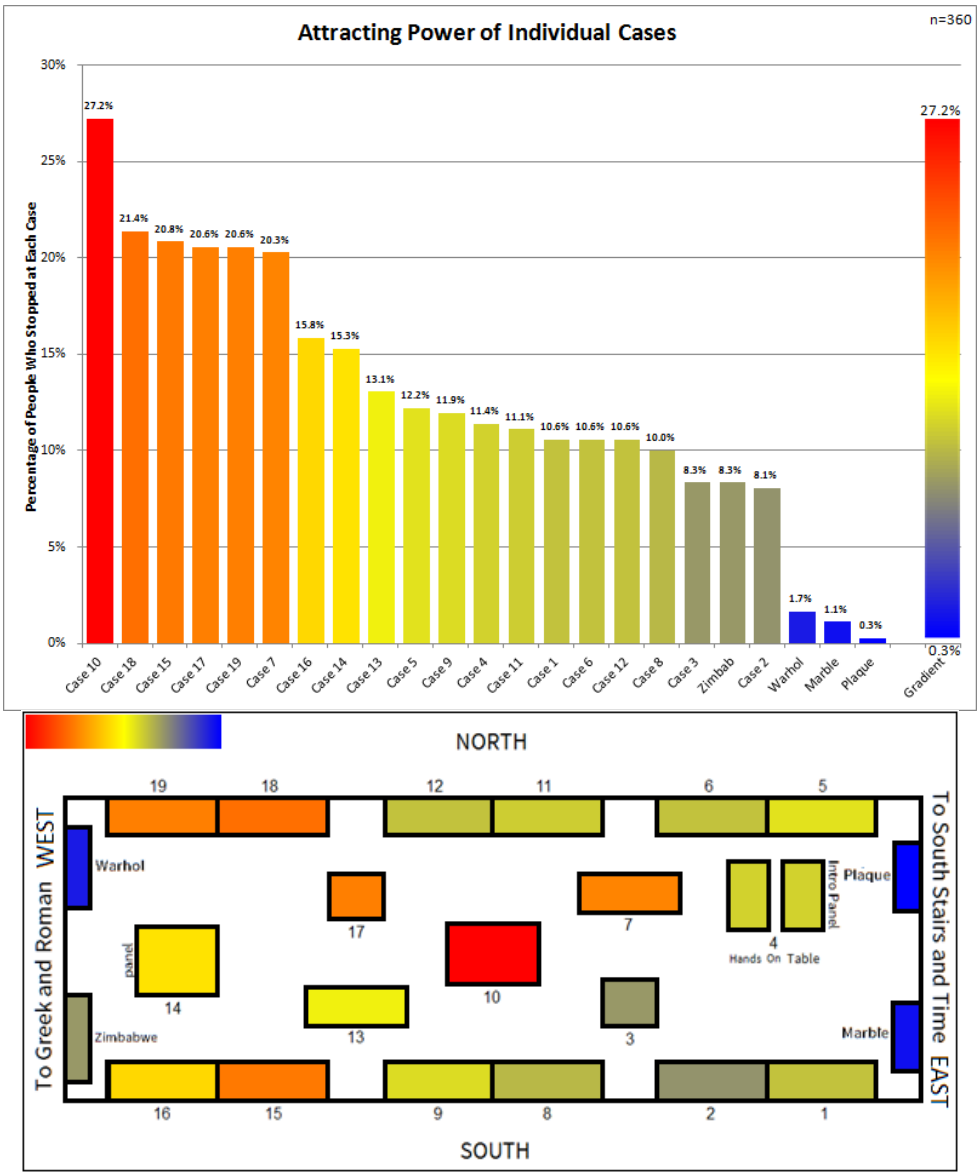

Figure 28: Heat Map and Bar Graph of Attracting Power

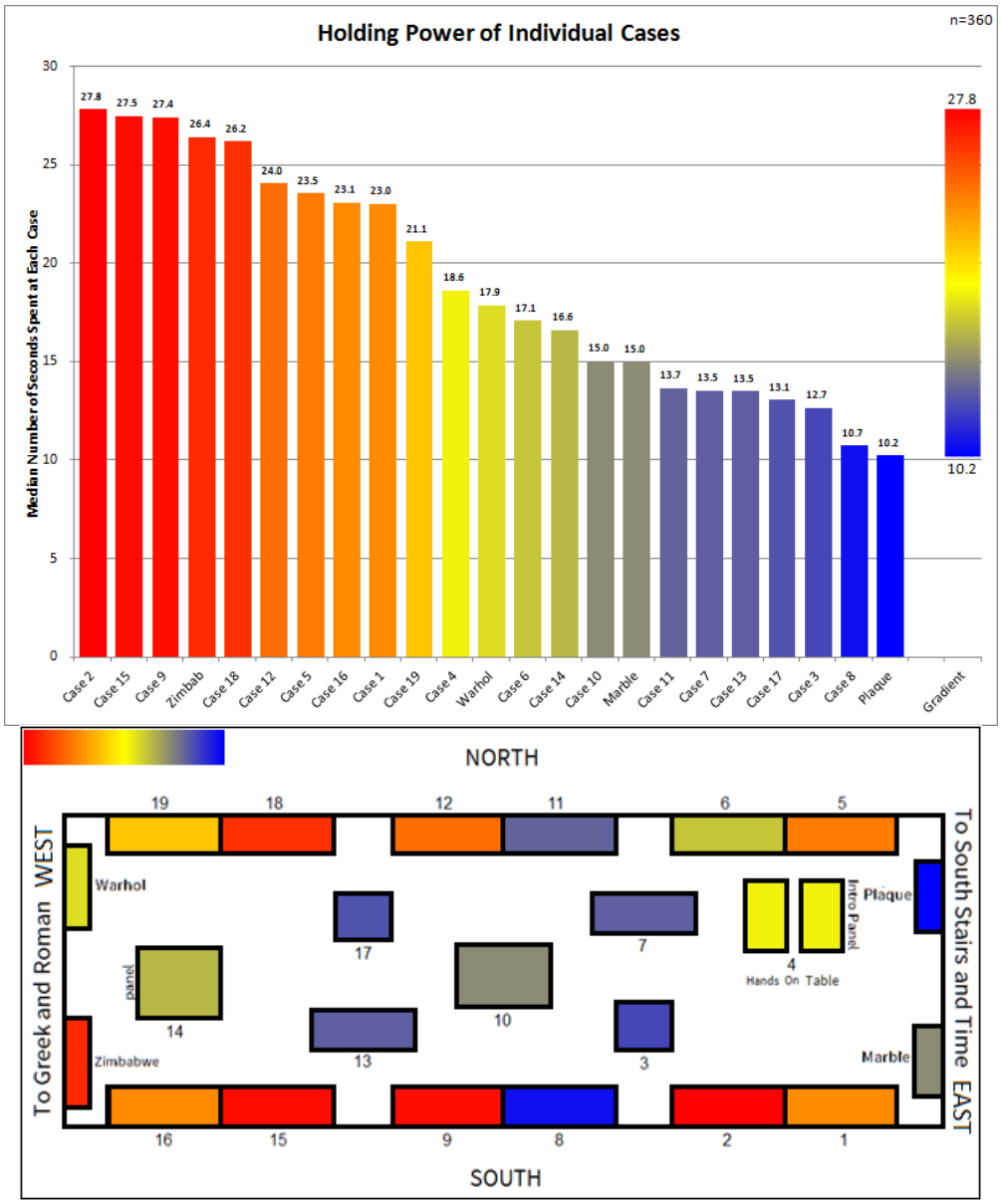

Figure 29: Heat Map and Bar Graph for Holding Power

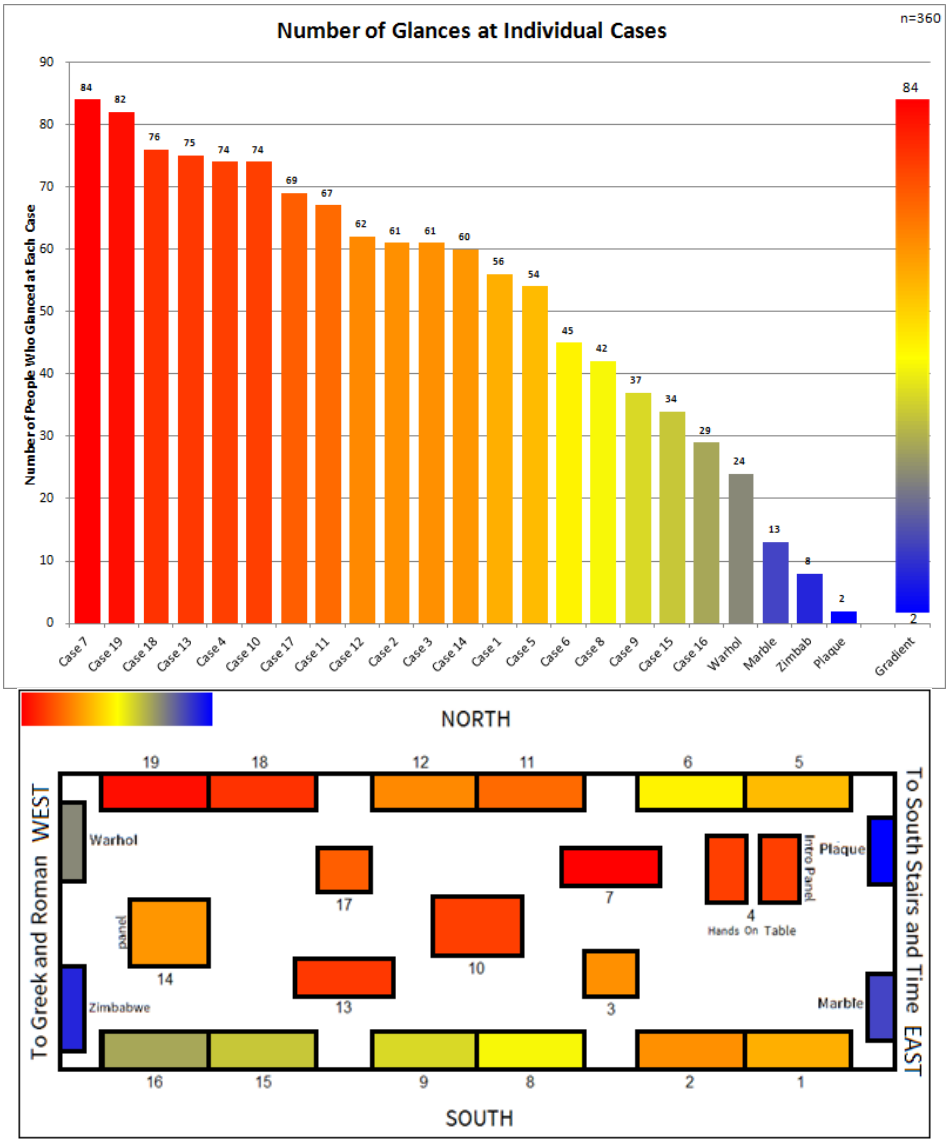

Figure 30: Heat map and Bar Graph of Glances

This indicates that while visitors find the content of these cases interesting they are not initially attracted to them. Their low attracting power is likely caused by their out of the way placement in the gallery, and the lack of effective lighting to highlight their existence. When a visitor enters they are not very likely to immediately see these cases. This is supported by the first case visited by visitors as shown in Figure 31 and Figure 32. Again, cool colors indicate few visits while warm colors indicate many visits.

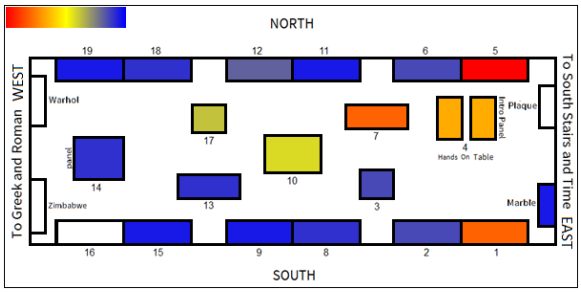

Figure 31: First Case visited through the East Door

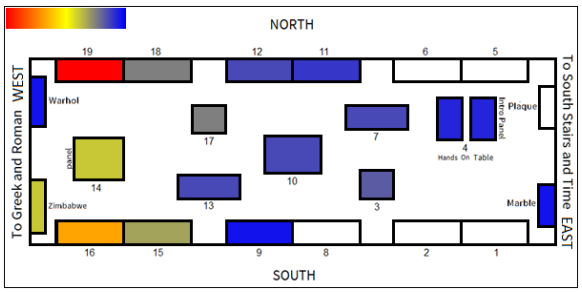

Figure 32: First Case visited through the West Door

More attractive lighting is the primary method that we recommend to increases these cases' attracting power. This lighting would highlight these cases to visitors who are about to exit the gallery. In addition more eye catching description plaques may increase these cases attracting power.

- Free standing cases have higher attracting power than other cases.

Figure 15 shows the visitor path map for all non-walkthrough visitors tracked. When overlaid with the attracting power heat map (Figure 16), the free standing cases are shown to have higher attracting power in general than wall cases or regular cases. In fact, all of the free standing cases are in the top 50% of cases for attracting power.

- Case Content Analysis

When we look at the attracting and holding power of certain cases (Figure 28 and Figure 29) and compare them to the content of the cases, some interesting observations can be made. Of all cases, Case 10 (Faking and Counterfeiting) has the highest attracting power. It stands in the center of the gallery, and contains two swirls consisting respectively of counterfeit pound coins and counterfeit ancient Roman coins. The swirls are very eye-catching, however, due to the sparse text and small variety of items in the case, the case has a low attracting power. On the other hand, Case 18 (Money and society), attracts a lot of people due to its proximity to the West door and an array of familiar items such as coins from Harry Potter, a Nirvana record and a Doctor Who pound note, but also has a high holding power. There are many other familiar and

eye-catching objects in the case such as displays about circulating messages through coins and notes, counterfeit dollar bills, credit cards, a wedding necklace made of coins, other marriage tokens, a Barbie cash register, a video screen playing a scene from the Doctor Who episode, The Runaway Bride and a Japanese bean-shaped red lacquer purse, which the visitors stay on to look at. Similarly, Case 15 has a high attracting as well as holding power. Large and attractive displays such as the spiral of coins from every modern country draw visitors in, and they often spend a large amount of time looking for coins from their country and then at other objects such a shell necklace and a large round stone coin.

Case 17 (Counting and accounting) has a high attracting power. The East-facing side of the case contains a large and shiny Tiffany cash register and receives far more views than the West-facing side, which contains tools for counting coins from around the world. Since the case only contains 3-4 objects of which one stands out to visitors, the case has a low holding power. Similarly, Case 7 (Hoarding and storing), which contains a large number of gold coins and a chest, has a high attracting power, but a low holding power. Shiny objects are generally successful in attracting a majority of visitors, however, they do not hold visitors' attention for very long. Familiar objects on the other hand, are successful at both attracting visitors and holding their attention for a considerable amount of time, as seen in Cases 18 and 15.

Case 2 (Communicating through coins) has the highest holding power of all cases. It contains small objects such as a spiral of ancient coins from Gandhara, and a display of 6 Roman coins and a video clip showing how Nero's portrait changed over time to reflect his changing appearance from a young boy to an old man. While exhibits in the case have interesting stories behind them, Case 2 has a low attracting power, due to the lack of any very eye-catching objects in the case. Therefore, fewer viewers get pulled into the case, but stay on for a very long time to read about the exhibits and how coins were used for communication purposes. Similarly, the Zimbabwe poster, which is printed on Zimbabwean dollar bills and says "It is cheaper to print this on money than paper" has a lower attracting power than most other cases primarily due to its placement. However, visitors who stop at it stay for a long time to look at the large number of thousand and million dollar bills that make up the poster. Overall, cases with absorbing stories to tell appear to have high holding powers.

4.1.4. Visitor Experience

- The gallery attracts many nationalities of visitors

The Money Gallery, as a part of the British Museum, attracts visitors from all over the globe. Figure 33 below shows the distribution of nationalities of visitors who took the questionnaire.

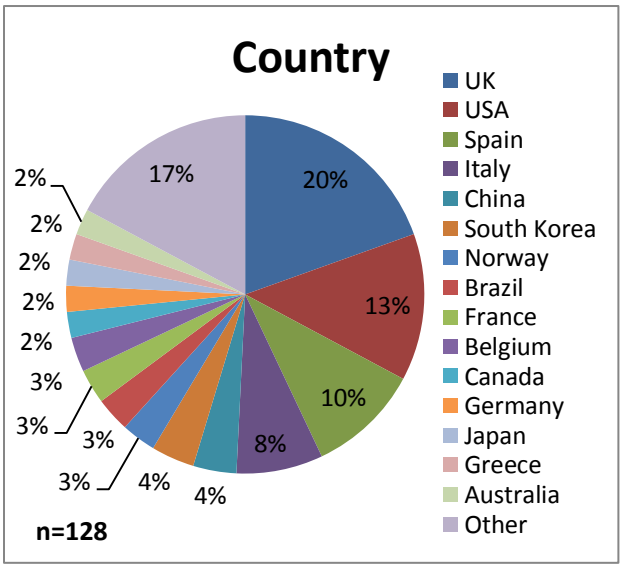

Figure 33: Country of Residence for Surveyed Visitors

Only 20% of visitors are from the United Kingdom. Of the countries shown in Figure 33 only 39% of visitors come from English speaking countries. This has implications for the labelling of exhibits, especially text heavy cases such as the bitcoin display in Case 19.

In our study, since we used many translations of the questionnaire, we were able to gather previously unavailable data on visitors who do not speak English. This has effects on our statistics for first language and country of origin because our sample pool was different than in previous years. Figure 34 below shows the breakdown of respondents to last year's survey by country.

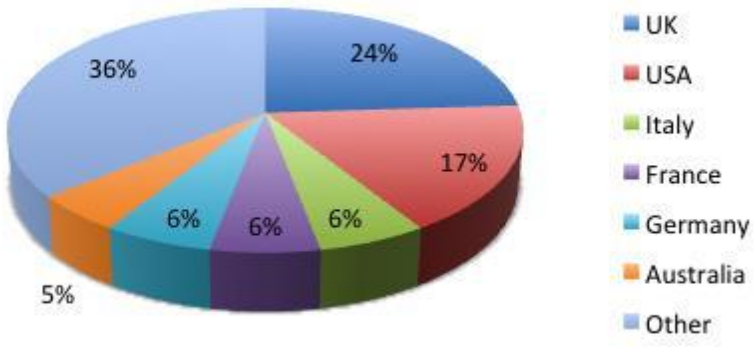

Figure 34: Country of Origin of Surveyed Visitors

Table 5 shows the differences between the reported countries of origin for the 2013 study and our 2014 study. In the 2013 study, English speaking countries (UK, USA, and Australia) represented a larger percentage of visitors surveyed. This is due to our ability to get information from non-English speaking visitors. This phenomenon likely has an effect on many of the metrics used in both studies.

Country	2014 Data (%)	2013 Data (%)
UK	20	24
USA	13	17
Italy	8	6
France	10	6
Germany	4	6
Australia	2	5
Other	43	36

Table 5: Country of Origin for the 2013 Study and the Current Study

- Visitors do not usually intend to visit the Money Gallery

Of the visitors surveyed, 40% reported that they had intended to visit the Money Gallery, and of those, 27% had heard of the gallery through leaflets, 24% had heard of the gallery through word-of-mouth and another 24% through the museum website. Others had heard of the gallery through their professors or from traveller books.

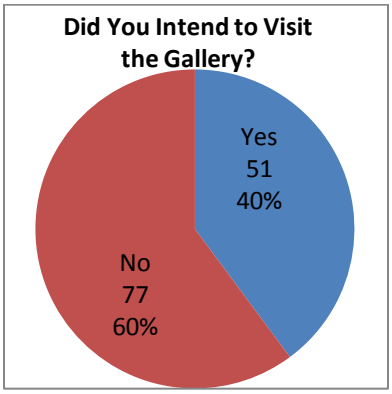

Figure 35: Intent to Visit the Money Gallery

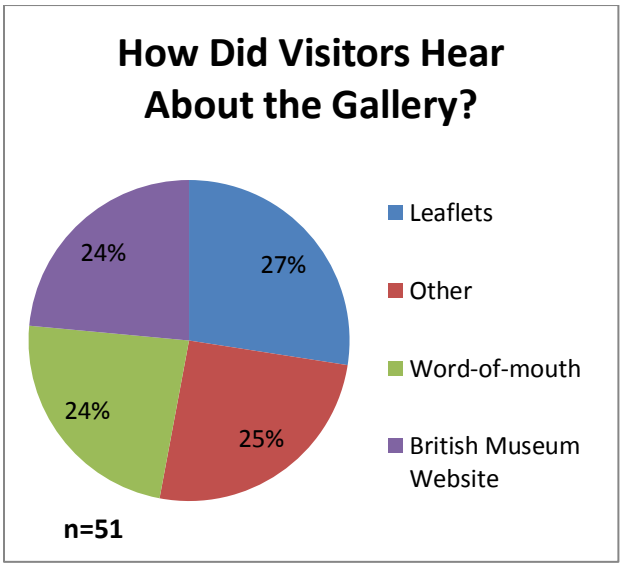

Figure 36: How Visitors heard about the gallery

- Learning in the gallery

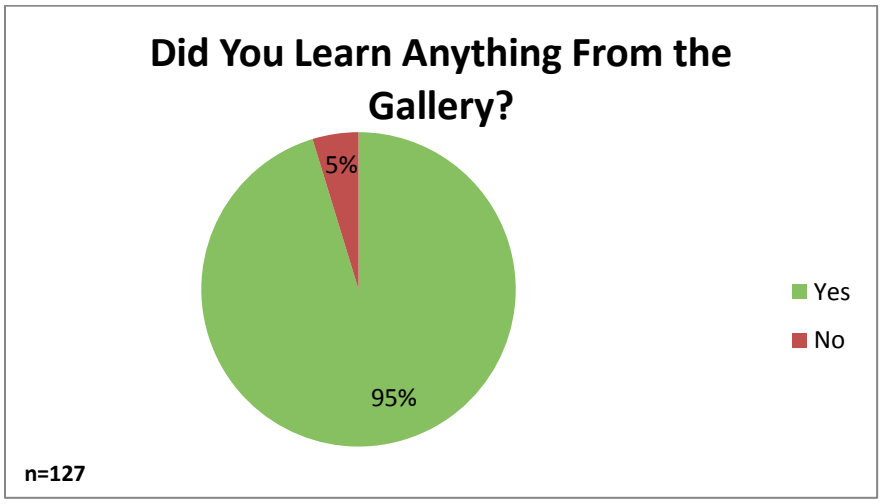

Figure 37: Visitors Who Reported Learning Something

An interesting aspect of visitor experience that we looked into was visitor learning that occurred in the gallery. Of the people surveyed, a vast majority, 95%, reported to have learned something after viewing the gallery. When visitors were asked what topics they learned about in the gallery, 35 visitors responded, and some interesting responses were observed. Several responses were along the lines of 'History', 'History of Money', 'Coins', and 'Cultures', likely due to our survey question carrying key words like 'Coins', 'History' and 'Different Cultures' as possible answers to the question. However, other more specific responses that would have required deeper thought were related to the values of different currencies, manufacturing coins and currency, coins used in rituals and as symbols of authority.

Figure 38: "What are some topics you learned about (e.g., coins, history, different cultures)?"

When visitors were asked about what themes they observed in the gallery, a greater number and variety of responses was observed. 56 visitors responded, and some interesting responses pertained to mechanization, power and politics, manufacturing of money, religion, power and money, the unreliable value of currency, economic status in society, and the continuity of currency. Overall, this question received a greater number of thoughtful responses than the previous one, indicating that, of the visitors who chose to respond to this question, at least 18 visitors, or 32%, were able to pick up on the deeper themes in the gallery.

Figure 39: "What are some themes you noticed while viewing the gallery?"

When asked if the visitors would like to learn about anything more, 52 visitors responded, of which 24 (45%) responded 'No' and 2 responded 'Yes'. Other responses included learning about how the engraving machine works, counterfeit money, the gold standard, Asian and South American money, Communist and Socialist money, Bitcoin, Central banking and fractional reserve system, treasure, biblical currencies and the effects of inflation on making money.

Figure 40: "Is there anything you would like to learn more about?"

An interesting thing to note here is the fact that the above three questions were the only text input-type questions on our questionnaire. This contributed to the significantly lower response rate on these in comparison to questions in multiple choice, slider or hotspot formats, which can be answered far more promptly. Additionally, we also received irrelevant responses to all three of these questions from certain visitors, such as 'Mummies' and 'Rosetta Stone' as themes observed in the gallery. While the question pertaining to themes specifically mentions 'this gallery', the other two questions do not, and visitors could mistakenly perceive that the questions are about their museum visit as a whole, and not the gallery in particular.

- Citibank sponsorship recognition is low

Only 22% of visitors surveyed recognized Citibank as the sponsor of the Money Gallery. As shown in Figure 41below only 15% of visitors chose Citibank correctly on their first try, with the remaining 8% recognizing Citibank as the sponsor after being reminded of this fact.

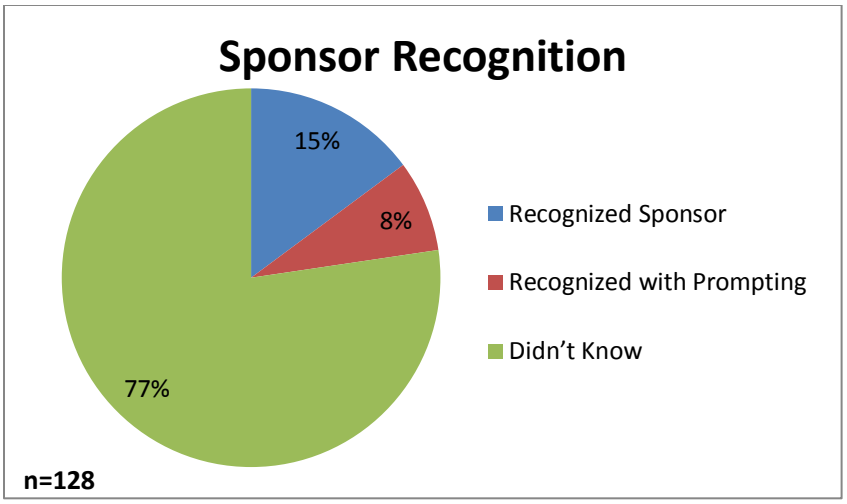

Figure 41: Breakdown of Sponsor Recognition

While higher than recognition seen in previous studies, 22% is still lower than ideal. We attribute this low number to the placement and visibility of the Citibank logo in the gallery. The logo is located on a plaque on a wall display near the East entrance. As shown in the heat maps in Figure 28 these wall displays have a very low attracting power compared to the other displays in the gallery.

Apart from this logo the only other places for visitors to recognize Citibank's involvement are the "Citi Money Gallery" titles above the entrances, and a brief mention on the info panel on case four. Neither of these mentions has Citibank's eye catching logo. Without the logo visitors are less likely to remember Citibank and associate the sponsor with the gallery.

To increase sponsor recognition the Citibank logo should be made more visible. A larger or more eye catching display of the logo on the plaque could increase sponsor recognition among visitors. In addition increasing the number and repetition of Citibank's logo would be beneficial to visitor recognition. Key locations to place this logo include the gallery title above the doorways. From observation we have found that many visitors read aloud the title of the gallery but do not associate it with Citibank later in their stay.

- Visitor language affects dwell time

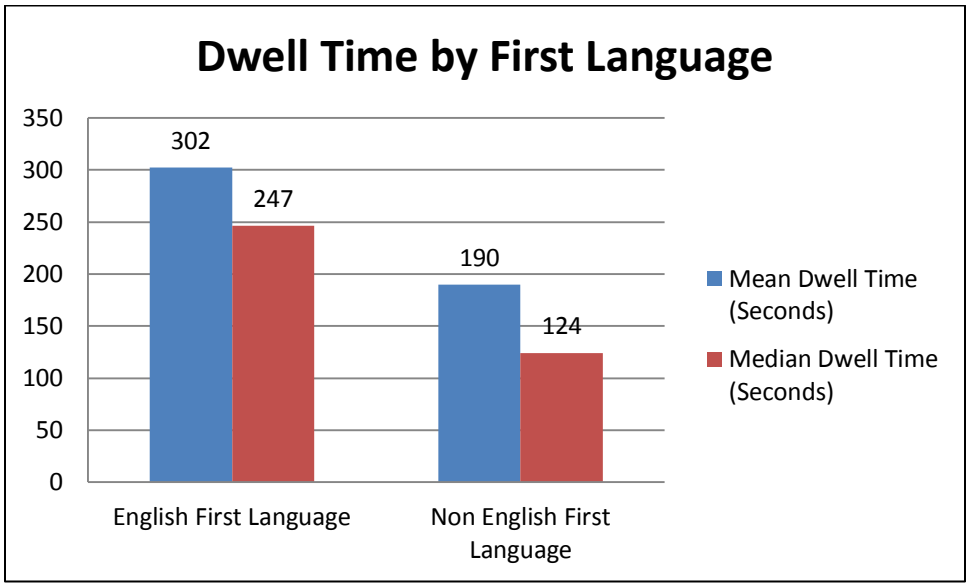

Figure 42: Mean and Median Dwell Times by Language Spoken

It can be shown that dwell time varies across first language, and across survey language. Figure 42 shows the difference in dwell time between survey takers who reported their first language as English versus those who reported another language. There is a significant difference in both median and mean; median dwell time for English first language speaking visitors is double the median dwell time of visitors with other first languages. This could be because all of the provided informational material in the gallery is in English, so people that can read it are likely to spend longer in the gallery.

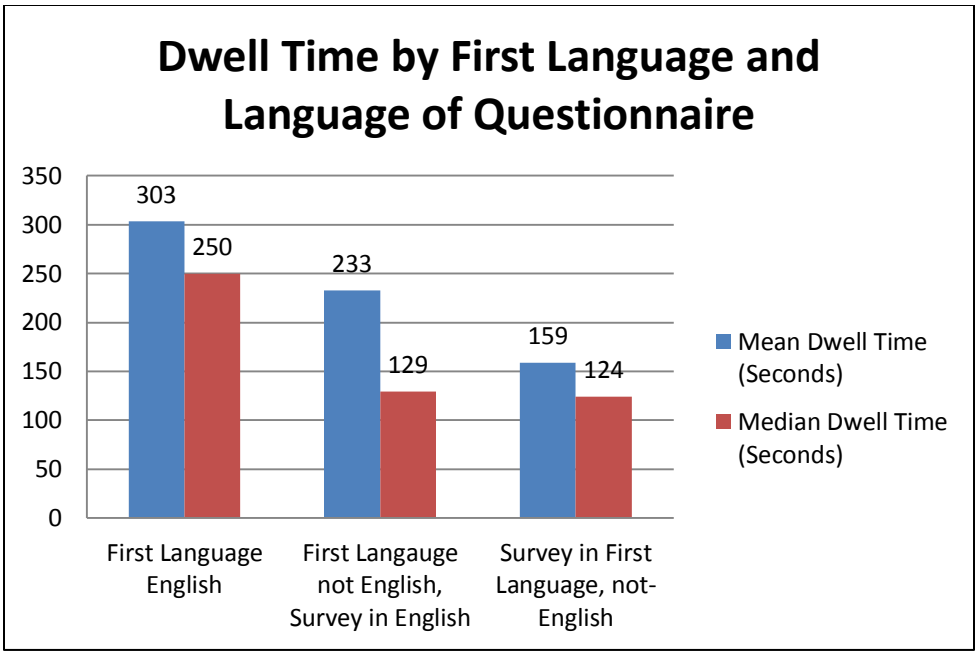

Figure 43: Dwell Time by First Language and Language of Questionnaire

The visitors can be further broken down into those who had some understanding of English (i.e. those who took the survey in English and those who took the survey in their own language). Figure 43 shows the mean and median dwell times by first language and questionnaire language. While median dwell time is similar between non-English first language visitors who took the survey in English versus their own language, the mean dwell time varies, greatly, so there is some difference.

- Gallery attracts mainly Browsers and Followers

Based on visitors' path, number of stops, and dwell time at each case stopped at we grouped each track into one of four categories. We used a slightly modified version of the categories described in our Background Research section, based on input from David Francis, a PhD student working at the British Museum. The graph in Figure 44 shows the distribution of these categories.

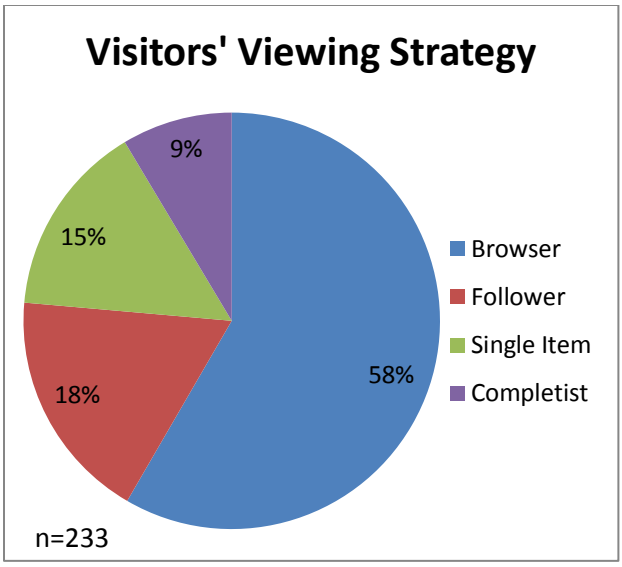

Figure 44: Viewing Strategies in Gallery 68

These results show an overwhelming amount of "browsers" at 58%, succeeded by "followers" at 18%, with "single item" and "completest" visitors coming after. This is unsurprising as most other studies which use a similar system of categories find the distribution of visitors to heavily favor "browsers", with "followers" coming in second. This shows that the majority of visitors will not be using the "narrative" set by the museum in their construction of the gallery, as they simply browse through the gallery ignoring the path set out for them.

- Gallery Attracts mainly Social visitors

A majority of the visitors surveyed, 70%, were first-time visitors to the museum. A majority of visitors said they visited the museum, among other reasons, because it is a major London attraction. Other major reasons given by visitors were 'To see amazing artifacts', 'To understand other cultures' and 'To learn/further my own knowledge'. Fewer visitors responded with 'To stimulate my own creativity', 'It's a good way to pass the time', 'For peaceful, quiet contemplation' and 'I have a professional interest in the museum/a particular exhibit'. A breakdown of answers to this question is shown in Figure 45.

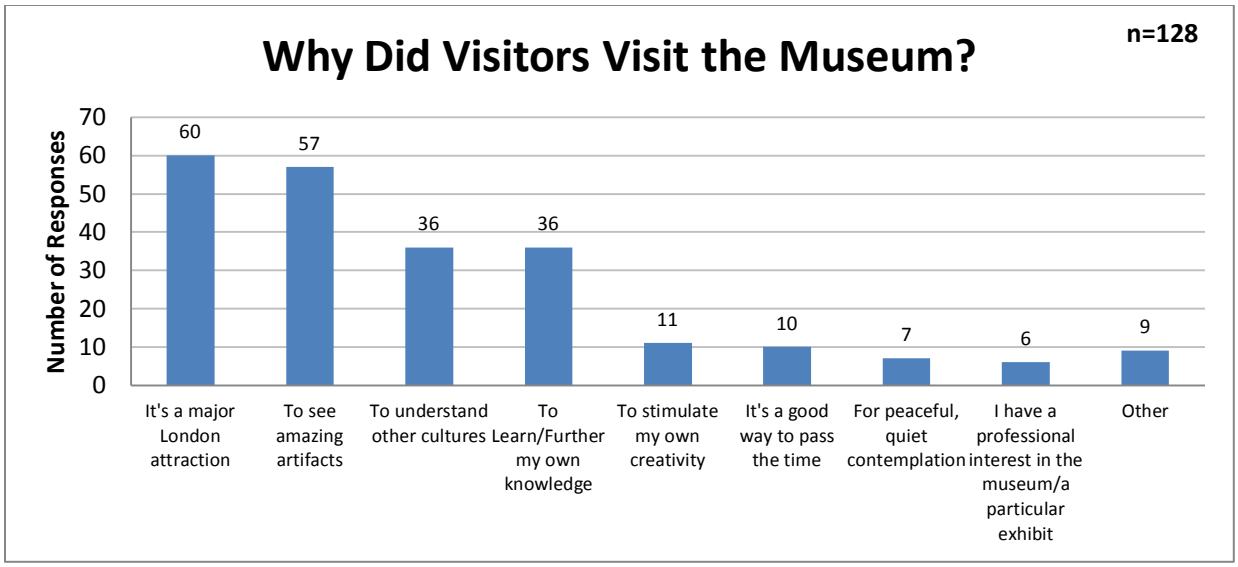

Figure 45: Reported Reasons for Visiting the British Museum

The responses to the questions above were used to sort visitors into the meaning making categories of "social," "intellectual," "emotional," and "spiritual." As shown in Figure 46 the gallery has mainly "social" visitors (47%) and "emotional" visitors at (37%). These figures were automatically generated using the questionnaire data. Each visitor was ranked on how they answered a particular set of questions. Their answers determined which category they fell into.

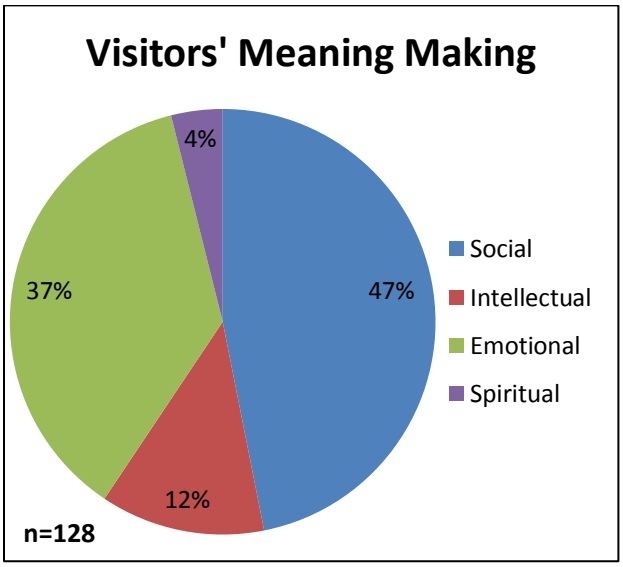

Figure 46: Visitors' Meaning Making

- No visitors tracked used the large print or tactile guides

0% of the visitors we tracked used the large print or tactile guides provided at the entrances of Gallery 68. In addition, only three people were recorded looking at or interacting with the guides in any way. We suspect that this can be attributed to their size and location. They are hardly noticed by visitors, and when they are they find them to be quite large and difficult to carry.

4.1.5. Visitor Counter

- The electronic visitor counter has a linear relationship with the number of visitors to the gallery

The electronic visitor counter in the Money Gallery can be a very useful tool for determining a rough estimate of the number of visitors to the gallery. This counter must be calibrated however, as it is a simple device mounted on only one entrance. The device counts up when a visitor breaks the laser beam it projects across the east doorway. This is not the most accurate way of counting as visitors might stand in the doorway blocking or repeatedly breaking the beam for prolonged periods. This, along with large groups passing through the doorway, results in an inaccurate count.

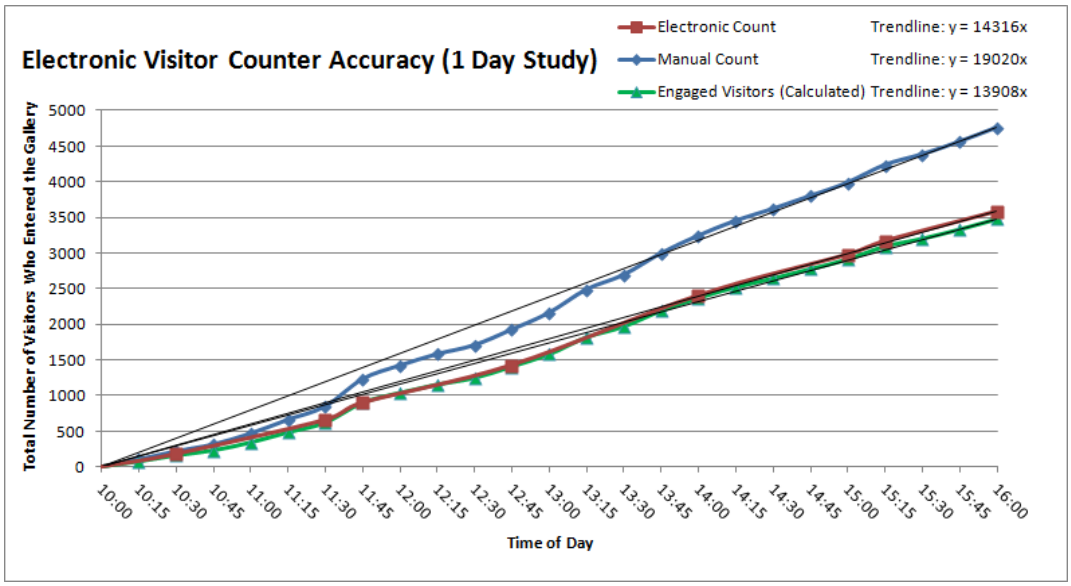

Figure 47: Electronic Visitor Counter Accuracy

When compared to the manual count taken, as shown in Figure 47, the visitor counter tracked about 75% of total entrances. In addition to this number we can estimate the number of visitors who actually engage with the gallery. Using the walkthrough and turnaround rates calculated from our counting data, we can compare the visitor counters number with the number of visitors we estimate were neither walkthroughs nor turnarounds, but actual engaging visitors.

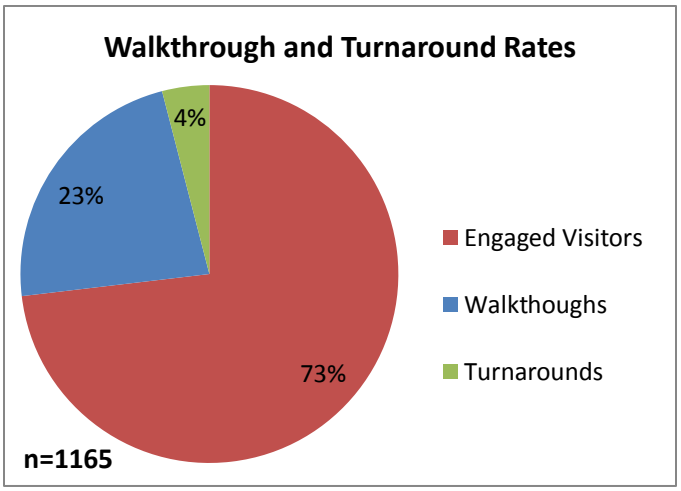

Figure 48: Walkthrough and Turnaround Rates

The visitor counter ends up tracking 103% of engaged visitors. It is important to note that these numbers are most useful and accurate as large scale averages. They were derived from data collected over a long period of time and thus can only speak to the number of visitors over a similarly large time period. In addition it is important to realize that the similarity between the electronic count and the number of engaged visitors is a coincidence, brought about by two competing sources of error (visitor walkthroughs and electronic miscounts) which happen to be the same magnitude.

The formulas that can be used to quickly determine the visitor count are as follows:

$$Total\ Visitor\ Entrances = \frac{Electronic\ Count}{.75}$$

$$Total\ Engaged\ Visitor\ Entrances = \frac{Electronic\ Count}{1.03}$$

We used these formulas to estimate the weekly traffic through the money Gallery. The electronic counter indicated that there were 87390 visitors over a period of three weeks, or 29130

visitors per week. Using our calibration this comes out to 38702 people entering the gallery per week and 28300 people engaging with the gallery per week.

4.2. Methods Based Findings

Questionnaire

- Survey language and first language often differ
- Questionnaire Refusal rate for this study was relatively low
- New Kinds of Questions
- Recognition gives Visitors a better Chance of naming the sponsor of the gallery

Presentation and Analysis

- Syntax 2D makes path data more intuitive to readers
- Syntax 2D shows the flow of visitors through the gallery
- Syntax 2D maps show which sides of standing exhibits are most popular
- Bar Graphs Paired with Heat Maps
- Meaning Making in Excel

4.2.1. Questionnaire

- Survey language and first language often differ

Many visitors report a different first language than the one they take the survey in. Comparing Figure 49 and Figure 50 below, it can be seen that far more people take the survey in English than report it as their first language.

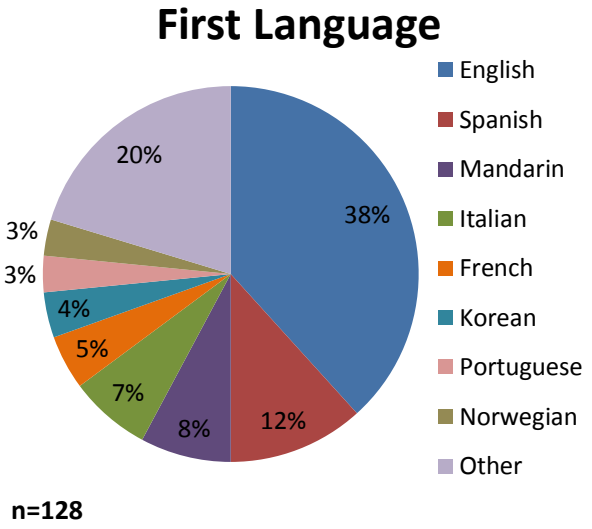

Figure 49: First Language Reported in Questionnaire

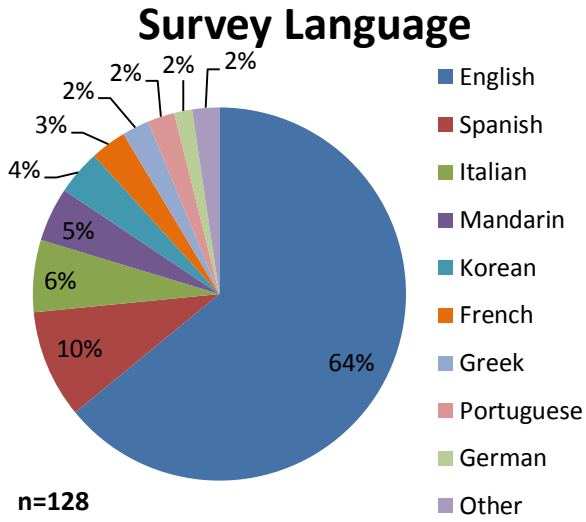

Figure 50: Language Survey was Taken in

There are several possible reasons for this difference. In all cases where the first language and survey language were not the same, the survey was taken in English. Figure 51 below shows a breakdown of visitors who took the survey in English even though it wasn't their first language according to whether or not their language was available. For 42% of visitors, the appropriate language of survey was not available, but they spoke English well enough to take the survey in English. The languages which were not available were Norwegian, Romanian, Russian, Cantonese, Swedish, Polish, Finnish, and Dutch. 58% of visitors took the survey in English rather than an available survey, and there are many possible reasons why. They could be bilingual due to country of origin or immigration. They could also consider speaking English to be part of their experience in the UK.

Figure 51: Availability of Language

The survey language breakdown also gives an estimate of how many people are able to read the signs and plaques posted in the gallery. According to Figure 50, 64% of visitors were comfortable enough with English to take the survey in English, so we can guess that these visitors could read the posted material in the gallery. It is possible that people who took the survey in other languages also were able to as well, so this is likely an underestimation.

- Questionnaire Refusal rate for this study was relatively low

The refusal rate of visitors to the questionnaires in our study was 37.7%. Compared to previous IQP studies in the money gallery, which in the case of the 2013 IQP showed a refusal rate of 67.2%, this is a large improvement. There are a variety of factors that influenced this refusal rate, but the largest is likely the selection of languages we offered the questionnaire in. According to verbal responses given when visitors refused to take the questionnaire only 15% cited a language barrier as their reason for refusing, 41% gave no reason for refusing, 39% cited a lack of time, and 5% said that they "didn't look at enough" to contribute to the study. Our questionnaire was translated into 17 languages including English. This allowed us to reach a very wide range of visitors with our questionnaire. 62% of visitors that we surveyed indicated a first

language other than English. While many of them did take the questionnaire in English, 36% did not. This is a very large demographic that is being tapped into that previous efforts could not access.

- New kinds of questions

Using Qualtrics, the questionnaire software provided by WPI, we were able to include new types of questions in our survey. These questions included "slider" questions which allow users to select a value along a range of numbers, "hotspot" questions which allow users to select a portion of an image, and "drag and drop" questions which allow users to move selected text from one column to another. An example of a "hotspot" question is reproduced in Figure 52.

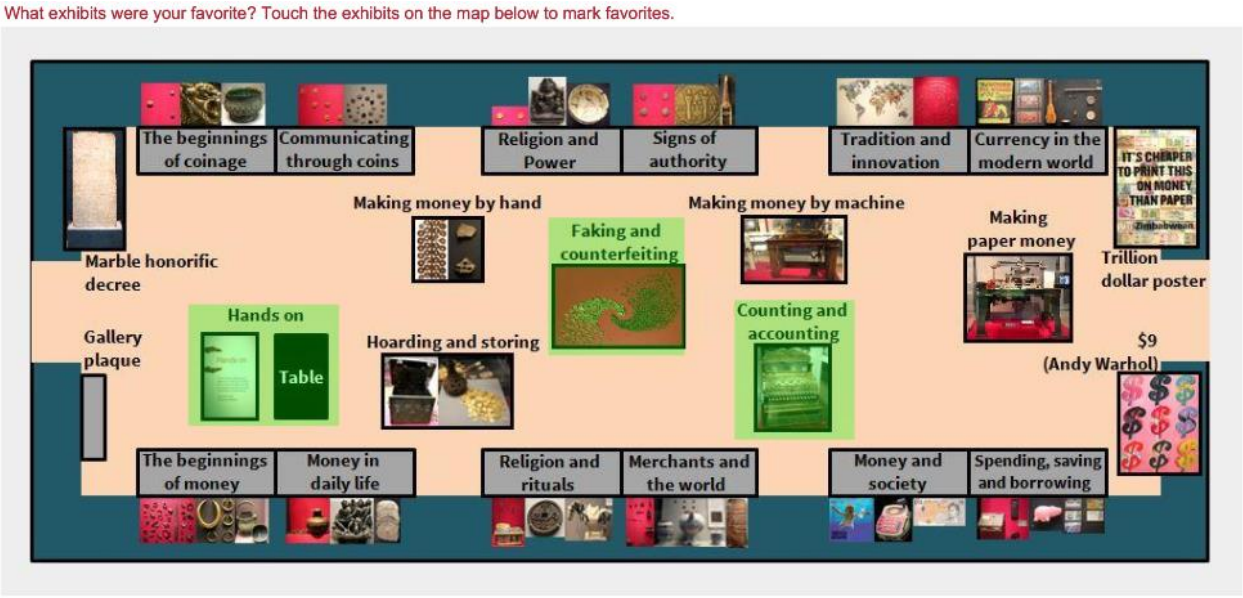

Figure 52: Questionnaire Favorite Map Example

These innovative question types allow us to collect data which might be impractical to collect with traditional methods. For example the "hotspot" questions allow us to collect data on a user's favorite exhibits using a map as a reference and refresher on what they looked at. Using text input for this question might produce ambiguous results. "Slider" questions give visitors an easier way to input numerical results, as well as allowing visitors to evaluate their own knowledge or learning on a scale. "Drag and Drop" questions allow visitors to separate phrases and concepts into two groups.

- Recognition gives visitors a better chance of naming the sponsor of the gallery

Since the Money Gallery is sponsored by Citi Bank as a method of advertising, it is important to gauge how many visitors are able to name the sponsor of the gallery. In previous studies, this was done by asking visitors to fill in the name of the sponsor of the gallery on the survey with no prompting. In our study, we instead provided visitors with a multiple choice question shown in Figure 53. The options were accompanied by the logos for all of the options.

A previous study in 2013 found that 16% of visitors were able to name Citi as the sponsor of the gallery, although this study phrased the question as "Do you know the sponsor of the Money Gallery?" and expected a yes or no answer. It is unknown if the visitor was required to name the correct sponsor to submit a "yes" answer. Our finding is that sponsor identification is higher when the visitor is asked to recognize rather than recall the name of the sponsor.

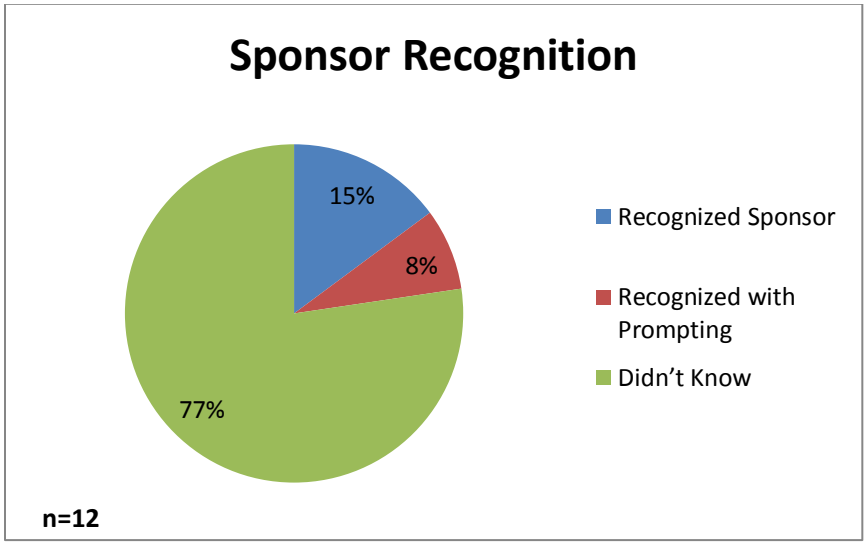

Figure 53: Sponsor Recognition Break Down

4.2.2. Presentation and Analysis

- Syntax 2D makes path data more intuitive to readers

Previous groups have used the maps shown in Figure 5 to display path data, which appear messy and hard to decipher. Syntax 2D generates heat maps similar to the ones used for weather patterns and other data, like the case heat maps. The warm-to-cold color scale is easier to interpret and makes areas of high path concentration, which are red or yellow, stand out much more than the dark-to-light overlays previously used. We also provide a scale next to the heat map as a guide to viewers.

Syntax 2D has the potential to tap into previously difficult to conceptualize data about human behavior. It is currently a time consuming process to input all tracks into the AutoCAD software to generate the .dxf file for Syntax 2D to process. This process could possibly be streamlined more in later studies by using a digitizer tablet to input the tracks by tracing paper rather than using the AutoCAD interface.

- Syntax 2D shows the flow of visitors through the gallery

Syntax 2D can be used to view and analyze the paths of visitors through the gallery to best determine how to convince visitors to stop in the gallery rather than walk straight through. Figure 15 shows that the gallery does have a main stream between the doors which is deflected around case 10 on either side and then around Case 14. Cases 10 and 14 do have rather high attracting power, showing that disrupting visitors' paths can lead to attraction. At the west entrance there is another flow tendency to travel left around Case 14, so visitors end up facing the North wall. These cases have high attracting power which can bring in visitors otherwise intending to travel straight through the gallery.

- Syntax 2D maps show which sides of standing exhibits are most popular

While heat maps for attracting power can show which cases are most popular, visitor paths can show which sides of exhibits are most popular Figure 15 shows the paths of all non-

walkthrough tracked visitors. Looking at Case 17, it can be seen that the east side of the case has many more neighboring paths. Looking at the data from our tracking, 65% of visitors at the case were from the east. This case is also more common for first stops from the east than the west even though it is closer to the west.

- Bar Graphs Paired with Heat Maps

Previous efforts at evaluating the Citi Money Gallery have used rudimentary heat maps of the gallery to show metrics such as attracting power and holding power. Unfortunately these were often created with a single, difficult to understand, unappealing color gradient. We have instead used a color gradient with many bright colors which is easier on the eye, and easier to understand. In addition we have paired the heat maps with bar graphs of the values used for better understanding. By color coding the bar graphs with the same colors as on the heat maps it makes it easy to reference from one to another. In addition the multiple color gradients make it easy to distinguish one color/bar pair from another. An example of these graph pairs is below in Figure 54.

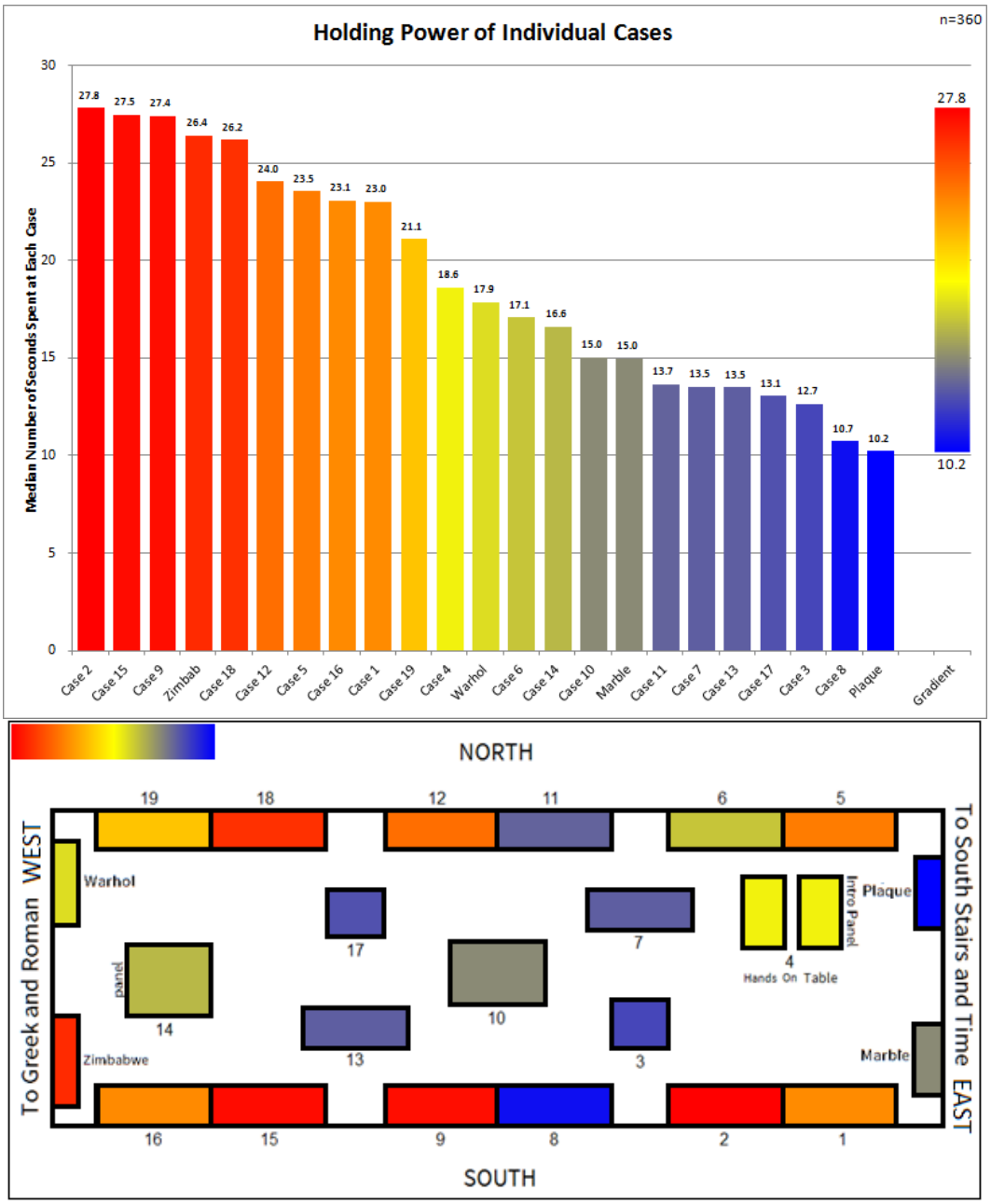

Figure 54: Heat Map and Bar Graph Pair

- Meaning making in Excel

Since we decided to determine our Meaning making statistics using our questionnaire data, we used an excel formula to determine what class of meaning making a visitor used. The responses to the question "Why did you come to the British Museum today?" were sorted such

that each of the eight responses correlated to one of the four types of meaning making (Social, Emotional, Intellectual Spiritual) according to table x. The number of responses in each category was calculated and the most represented category was returned. Ties were determined by deferring to the "lower" meaning making level.

Reason for Visiting	Meaning Making Strategy
It's a major London attraction	Social
It's a good way to pass the time	Social
To understand other cultures	Emotional
To see amazing artifacts	Emotional
I have a professional interest in the museum/a particular exhibit	Intellectual
To Learn/Further my own knowledge	Intellectual
To stimulate my own creativity	Spiritual
For peaceful, quiet contemplation	Spiritual

Table 6: Reasons for Visiting and Meaning Making Strategy

CHAPTER 5: CONCLUSIONS

5.1. Successes

During the course of our IQP, we were able to not only perform the required traditional gallery evaluation, but develop some new and innovative ways of gathering and processing data. The use of Qualtrics software enabled us to offer questionnaire on iPads and we were able to use new question types as a result. The software also gave us the opportunity to enter translated versions of our English survey in order to reach non-English speaking visitors and gather more diverse information about the gallery.

We were also able to use analysis software to present data in more easily understood formats than ever before. We used excel to generate bar graphs and heat maps that complimented each other. We also discovered an entirely new software, Syntax 2D which gives the museum the opportunity to use and analyze visitor paths.

5.2. Recommendations to the Gallery

We have some recommendations to the gallery based on our findings. These findings are focus on increasing attracting power and holding power as well as making the gallery more friendly to the large number of non-English speaking visitors.

- Include more eye catching objects in the case 19 Bitcoin display in addition to the text heavy portions.
- Add attractive lighting to the wall cases to increase their attracting power.
- Increase visibility of wall case info panels.
- Consider adding translations of English text into other languages.
- Increase size and visibility of Citibank logo on the wall plaque and consider adding the logo to other parts of the gallery, including the gallery titles above the entrances.
- Consider increasing visibility of the branching Chinese coin mold in case 3.
- Look at ways to encourage visitors to follow the narrative of the gallery, or match the narrative to the visitor flow.

5.3. Recommendations about Methodologies

In addition, we have recommendations based on our methodologies. These recommendations could be incorporated into future IQPs or other studies in any museum.

- Consider using an electronic data input device to record visitor paths in future studies for easy software input.
- Continue to use translations of any questionnaire given to visitors to increase the demographics reached and decrease refusal rates.
- In future studies pair tracking data with questionnaire data to gain insight into the behavior of different groups.
- Use Syntax2D or equivalent software to analyze visitor paths.
- Consider performing a meta-analysis of all past data to attempt to create a better understanding of why visitors behave as they do, and what types of objects and artifacts affect visitor behavior.

5.4. Conclusions

During the course of our IQP, we were able to not only perform the required traditional gallery evaluation, but develop some new and innovative ways of gathering and processing data. The use of Qualtrics software enabled us to offer questionnaire on iPads and we were able to use new question types as a result. It auto-populated spreadsheets with visitor responses, eliminating the need for manual entry of questionnaire data. The software also gave us the opportunity to enter translated versions of our English survey in order to reach non-English speaking visitors and gather more diverse information about the gallery.

We were also able to use analysis software to present data in more easily understood formats than ever before. We used Microsoft Excel to generate bar graphs and heat maps that complimented each other. We also discovered an entirely new software, Syntax 2D which gives the museum the opportunity to use and analyze visitor paths.

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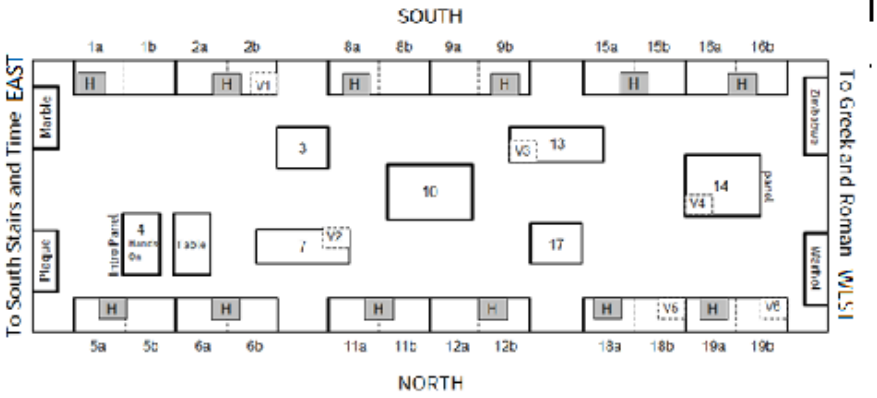
APPENDIX A: TRACKING SHEET

Subject #:_____ Date:_____

Group Information
Number of Adults:_____
Number of Children:_____
Guide Type:
□NONE
□Large Print
□Braille
□Auditory
□Museum map
□Other:_____
Gallery Map:

□Walkthrough?
□Turnaround?

Key:
O – Entrance Used
P – Photograph (mark on subject of photo)
D – Discussion (mark where discussion took place)
G – Glance (mark on exhibit glanced at)
S – Stop not at a case (mark on location)
1 – First case visited (mark next cases visited in order, i.e., 2, 3, etc.)
C – Cellphone (mark where in the visitor path a cellphone was used)



Stop #	Case #	Time	Notes:
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
Total			

Refused Questionnaire? □Yes □No
Refusal Reason:
□Time
□Language
□Other:_____

Engagement:
□Emotional
□Intellectual
□Social
□Spiritual

Viewing Strategy:
□Browser
□Follower
□Searcher
□Researcher

APPENDIX B: VISITOR APPROACH PROTOCOL

1. Performing Day-long Visitor Count
    a. Record date, weather, time of day and any other important factors about the scenario. If possible check the starting count on the door counter.
    b. Two team members should stand inside each door.
    c. Counter 1 should use the handheld counter to count the number of people who walk through the doorway.
    d. Counter 2 should observe how many people are walkthroughs (walk straight through the gallery to the opposite exit) or turnarounds (walk in and turn around before viewing any exhibits). Counter 2 should also note the number of people who exit and are not turnarounds or walkthroughs.
    e. Counters should count visitors for 45 minutes during an hour and use the last 15 minutes to confer or break.
    f. Check the value of the visitor counter at the end of the time.
2. Performing Short Visitor Count
    a. For 10 minutes at the top of every hour, perform the visitor count as outlined above, conferring with the opposite team when complete.
3. Tracking visitors
    a. A two person team should perform the tracking.
        i. Tracker A should mark the path of the visitor on a map of the gallery, noting any aspects in the Legend as well as making any additional notes.
        ii. Tracker B should time all stops at exhibits and complete the second page of the tracking sheet.
    b. As the visitor finishes the exhibit, Tracker B should move to the expected exit to intercept the visitor to administer questionnaire. Questionnaire should be prepped to go.
4. Approaching English Visitors
    a. The Tracker should always approach the visitor from the front.
    b. Greet the visitor in English (“Hello”)

c. Offer Survey and explain project
    i. “Hello! My name is… I am working on behalf of the British Museum. Would you mind filling out a three minute survey about your experience in the gallery?”
d. If visitor accepts:
    i. “Thank You! Please let me know if you have any questions about the survey”
    ii. While visitor is completing survey, complete any note on the tracking sheet. Seem busy so as not to rush visitor.
    iii. Thank the Visitor for their participation. Record the questionnaire number on the tracking sheet and on the final screen of the iPad.
e. If visitor refuses:
    i. Mark on tracking sheet reason for refusal. If requested, destroy tracking sheet

5. Approaching Foreign Visitors
    a. The Tracker should always approach the visitor from the front.
    b. Greet the visitor in English (“Hello”).
    c. If the visitor indicates that they do not speak English, offer explanation card/Point to sign.
        i. “Please take our three minute survey about your experience in the gallery today! Our survey is available in languages other than English.”
    d. If visitor accepts:
        i. While visitor is completing survey, complete any note on the tracking sheet. Seem busy so as not to rush visitor.
        ii. Thank the visitor for their participation.
    e. If visitor refuses:
        i. Mark on tracking sheet reason for refusal. If requested, destroy tracking sheet

APPENDIX C: QUESTIONNAIRE

Money Gallery Questionnaire

1. Subject Number (to be filled in by surveyor): _____

2. What is your first language?

>English
>Afrikaans
>bosanski/босански (Bosnian)
>български език (Bulgarian)
>hrvatski (Croatian)
>čeština (Czech)
>dansk (Danish)
>Nederlands (Dutch)
>Suomen kieli (Finnish)
>Français (French)
>Deutsch (German)
>ελληνικά (Greek)
>हिन्दी (Hindi)
>Italiano (Italian)
>日本語 (Japanese)
>한국어 (Korean)
>Lietuvių kalba (Lithuanian)
>官話/官话 (Mandarin)
>Norsk (Norwegian)
>فارسی (Persian)
>Język polski (Polish)
>Português (Portuguese)
>Русский язык (Russian)
>Español (Spanish)
>Svenska (Swedish)
>Tiếng Việt (Vietnamese)
>Other _____

3. What country do you currently live in?

>United Kingdom
>United States of America
>Argentina
>Australia
>Brazil
>Bulgaria
>Chile
>China
>Colombia
>Croatia
>Cuba
>Czech Republic
>Denmark
>Ecuador
>Finland
>France
>Germany
>Greece
>Guatemala
>Italy
>India
>Iran
>Japan
>Lithuania
>Mexico

>Norway
>Peru
>Poland
>Russia
>Spain
>South Korea
>Sweden
>The Netherlands
>Venezuela
>Vietnam
>Other
_____

4. What is your age? >18-20 >21-24 >25-34 >35-44 >45-54 >55-64 >65+

5. What is your gender? >Male >Female >Other >Prefer Not to Answer

6. Are you alone or with a group?

>Alone

>Group

6. a. How many people were in your group?

0 11 20

←----------||----------→

7. Why did you visit the British Museum today?

>It is a major London attraction

>It is a good way to pass the time

>To learn/Further my own knowledge

>To understand other cultures

>To see amazing artifacts

>I have a professional interest in the museum

>Other _____

8. Why did you visit Money Gallery today?

>No particular reason

>I have a professional interest in the subject

>I have a personal interest in the subject

>Other _____

9. What exhibits in this gallery were your favorites? Touch the exhibits on the map below to mark favorites.

10. What attracted your attention the most? Touch the exhibits on the map below to mark your choices.

11. How much did you know about the topic of this gallery before viewing it?

Nothing at all Average Knowledge Very Much

←----------||----------→

12. Did you learn anything from this gallery?

>Yes

12.a. How much do you know about the topic of this gallery after viewing it?

Nothing at all Average Knowledge Very Much

←----------||----------→

12. b. What are some topics you learned about (e.g. coins, history, different cultures)? _____

>No

13. What are some themes you noticed while viewing the gallery?

_____

_____

14. Is there anything you would like to learn more about?

_____

_____

15. Did you use the paper guide provided in the gallery?

>Yes

15. a. Rate how much the guide enhanced your experience/helped you navigate around the gallery:

Not at all Average Very Much

←----------||----------→

>No

15. b. Why didn't you use the guide?

>I didn’t notice it

> I was not interested

>No specific reason

>Other

15. b. i. Other (please specify a reason, if you wish):

16. How many galleries (if any) did you visit prior to this one?

0 11 20

←----------||----------→

15. a. (If the answer to 16 is > 0) Try naming as many galleries you visited before the money gallery:

17. Do you know who the sponsor of the Money Gallery is?

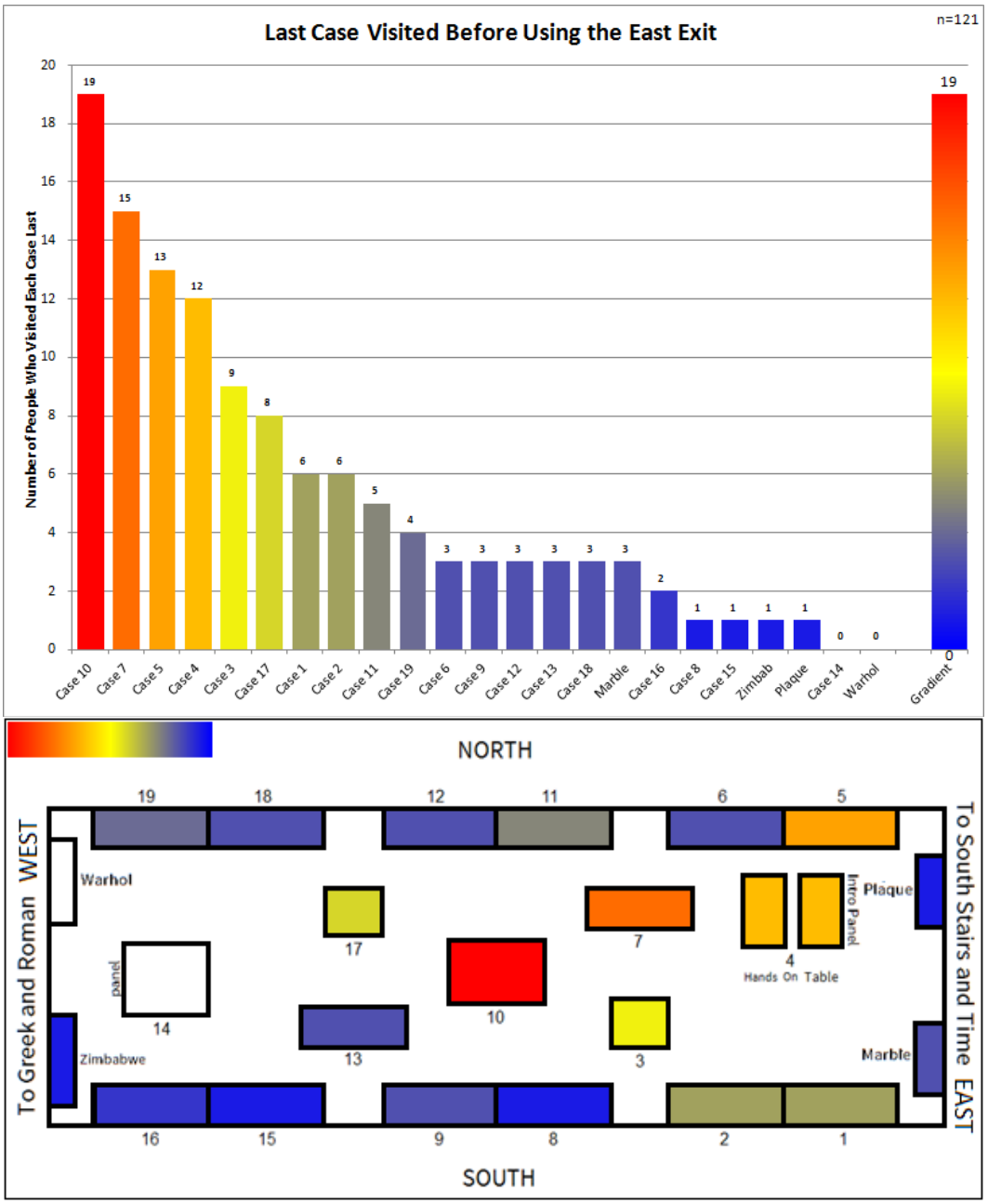
>Yes

16. a. Try naming the gallery sponsor to the best of your abilities:

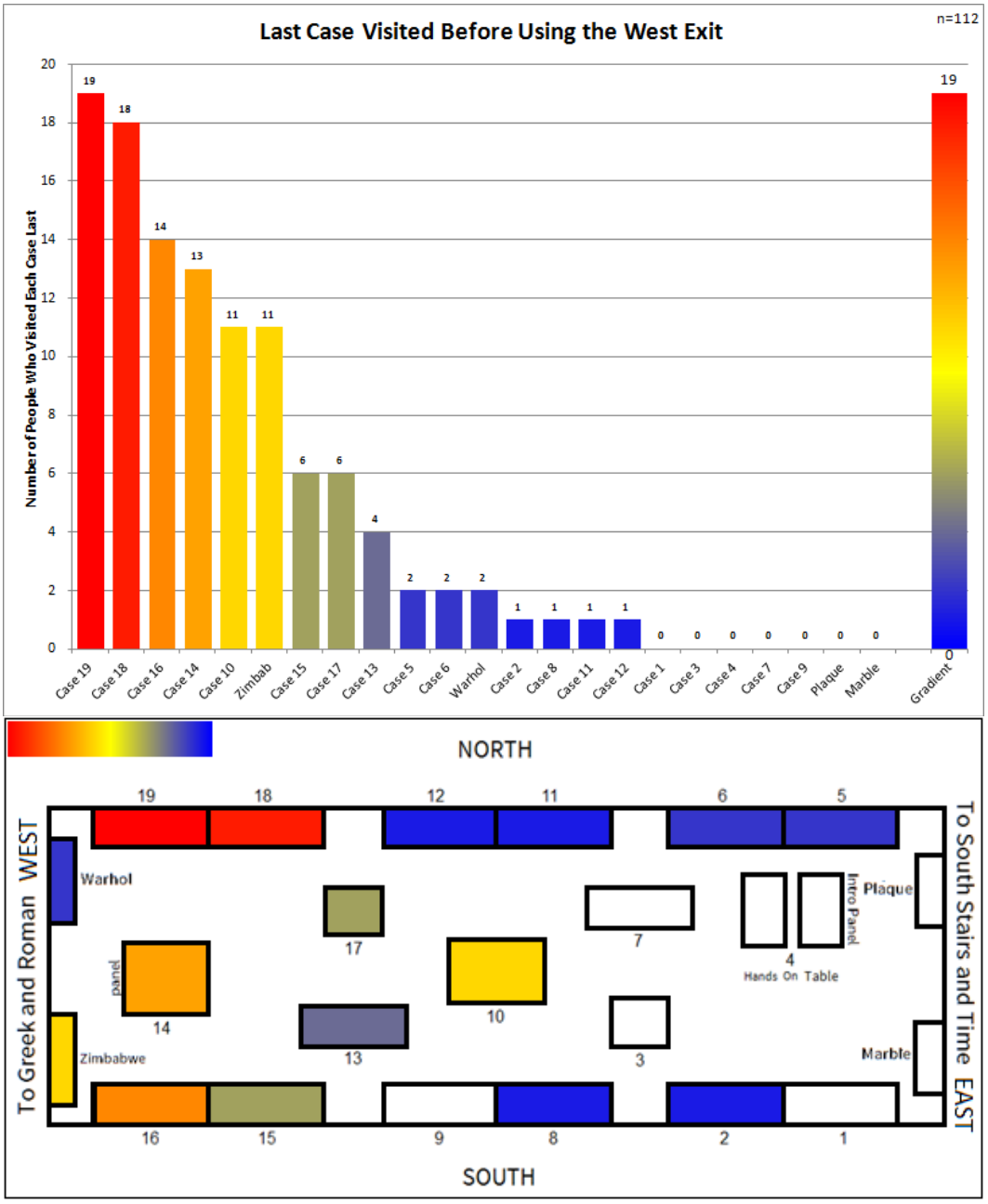
>No

Thank you for participating in our study! Your help is appreciated.

APPENDIX D: ADDITIONAL DATA FOR FUTURE CONSIDERATION

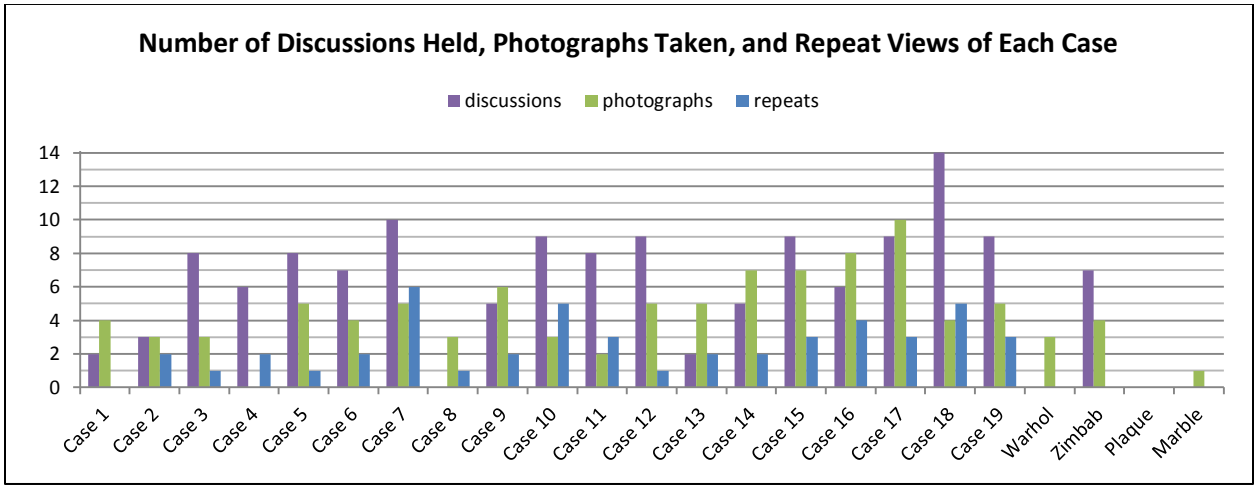


The above graph and map show which cases inside of gallery 68 were the last stop of visitors who exited through the east doors of the gallery. It only takes into account the visitors who exited through the east doors of the gallery and is looking at their last case visited.

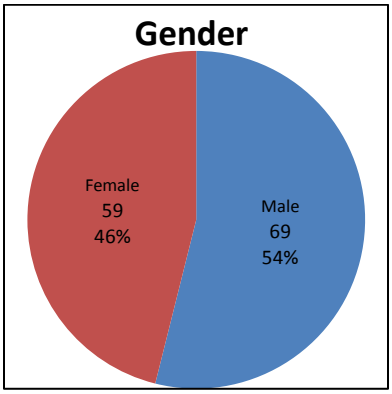


The above graph and map show which cases inside of gallery 68 were the last stop of visitors who exited through the west doors of the gallery. It only takes into account the visitors who exited through the west doors of the gallery and is looking at their last case visited.

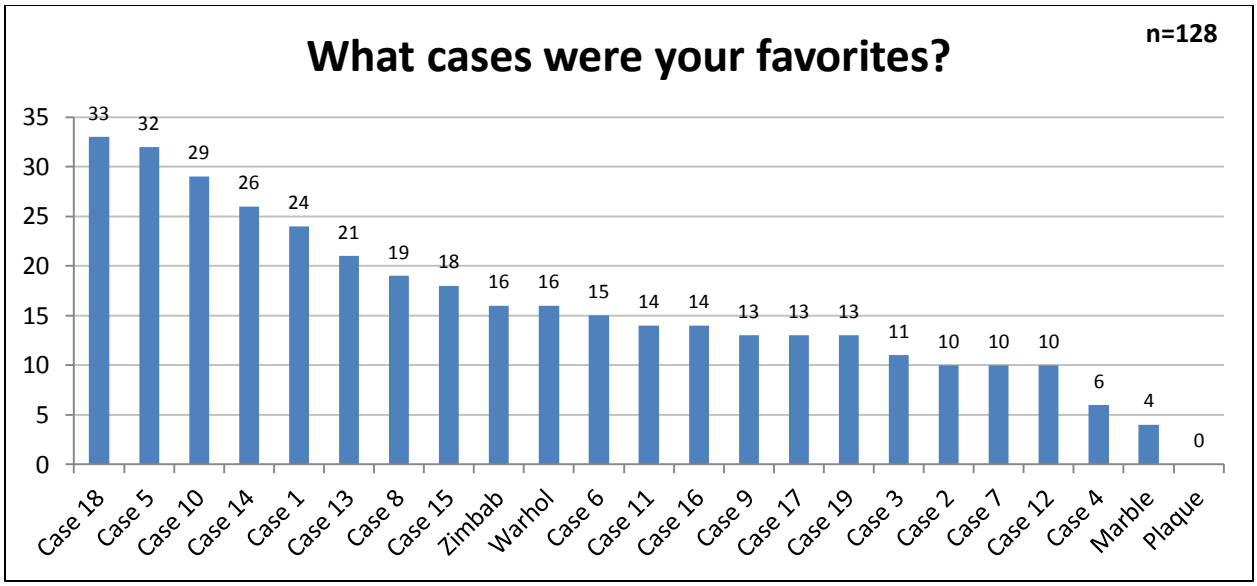
The first two charts show percentages of people who use either door in gallery 68 when exiting and entering respectively. The third chart shows the percentage of people passing through either door in any direction.



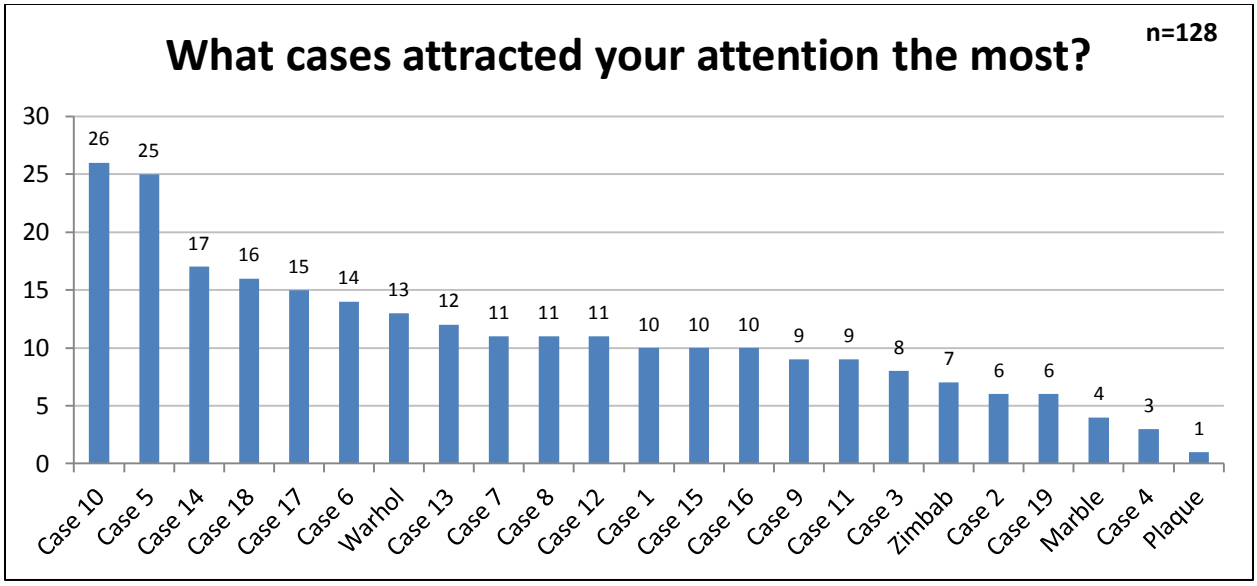
This graph shows the number visitors who photographed each case, how many visitors discussed at each case, and how many visitors viewed a case more than once on the same visit.



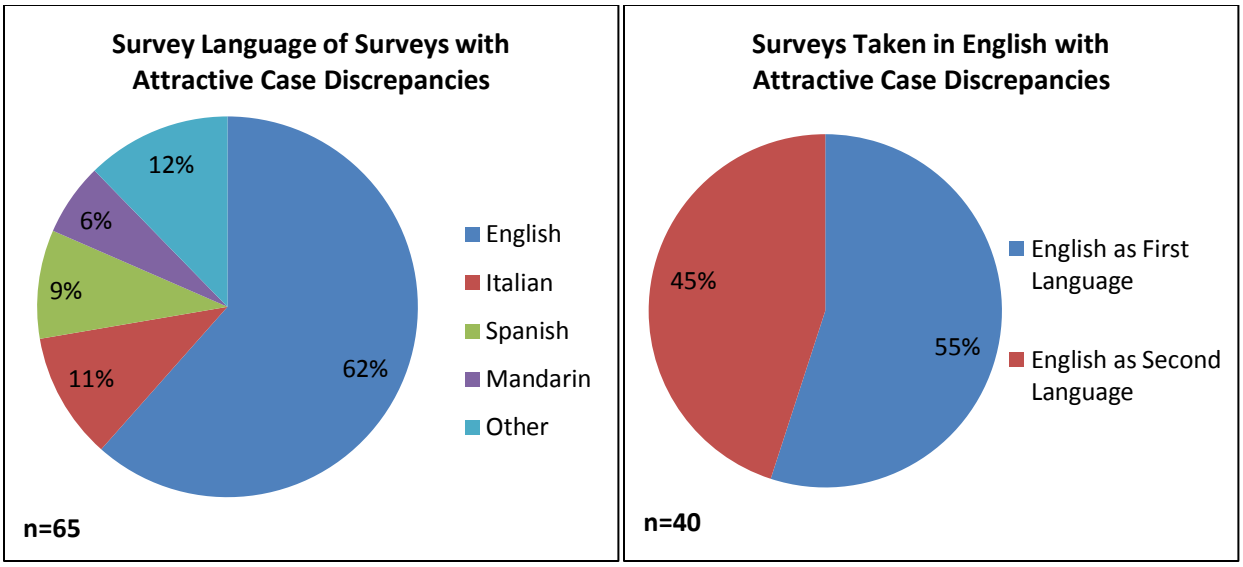
This chart shows the gender distribution of questionnaire takers.



This graph shows how many questionnaire takers marked each case as one of their favorite cases inside of gallery 68.



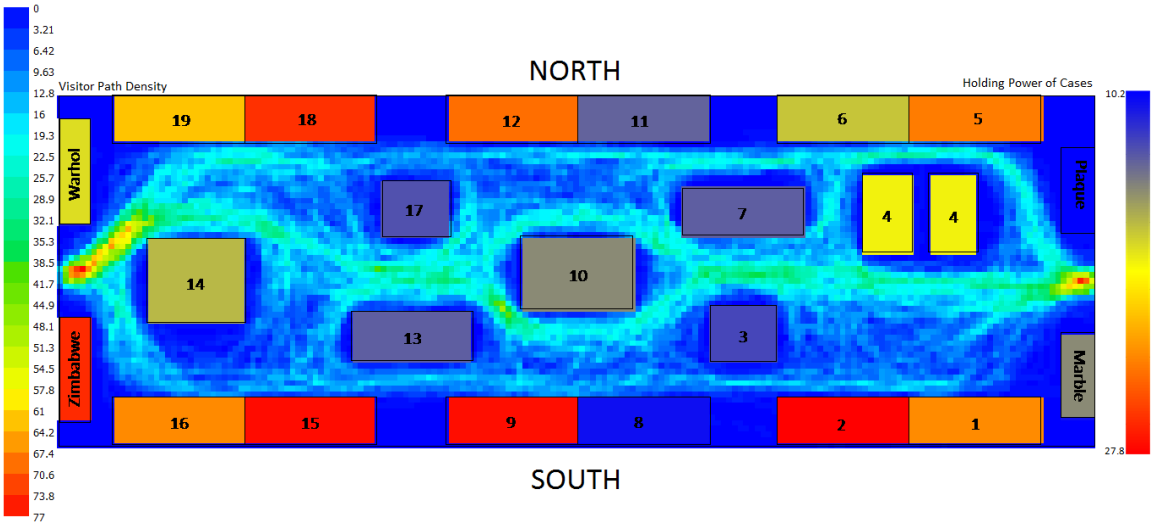
This graph shows how many questionnaire takers marked each case as one of the most attention grabbing cases inside of gallery 68.



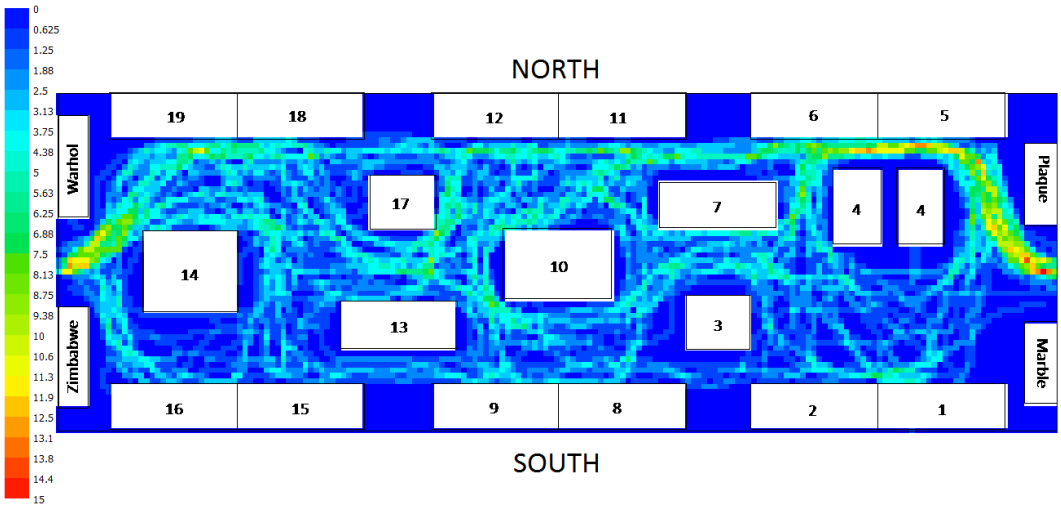
These graphs break down the discrepancies between the cases indicated as attracting and the cases visitors actually stopped or glanced at.

How many galleries did you visit prior to the money gallery?

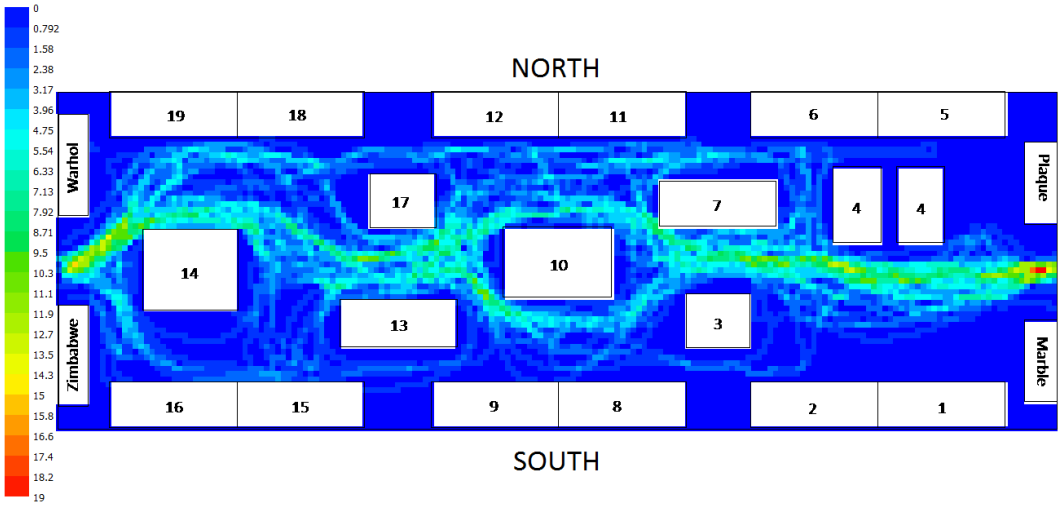
The median number of galleries visited prior to the money gallery was 7. The median number of galleries visited prior was 6. The mode number of galleries visited was 4.



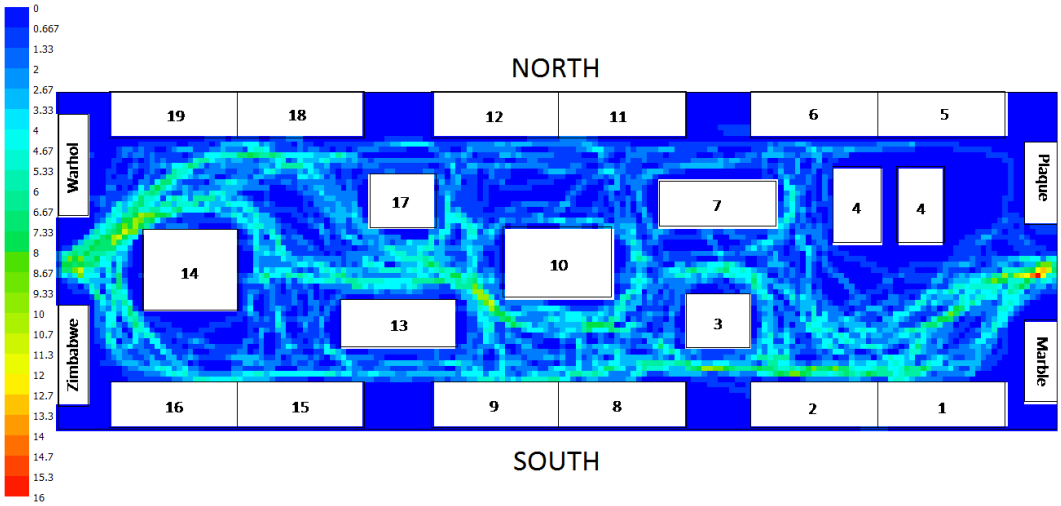
All Paths and Holding Power



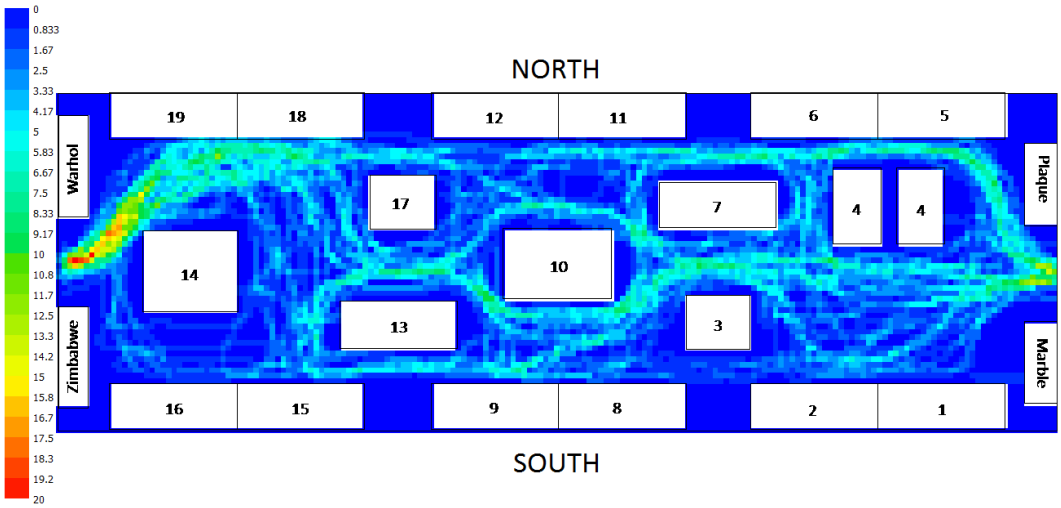
East Entrances Who Turned North, n=36, resolution=183x62



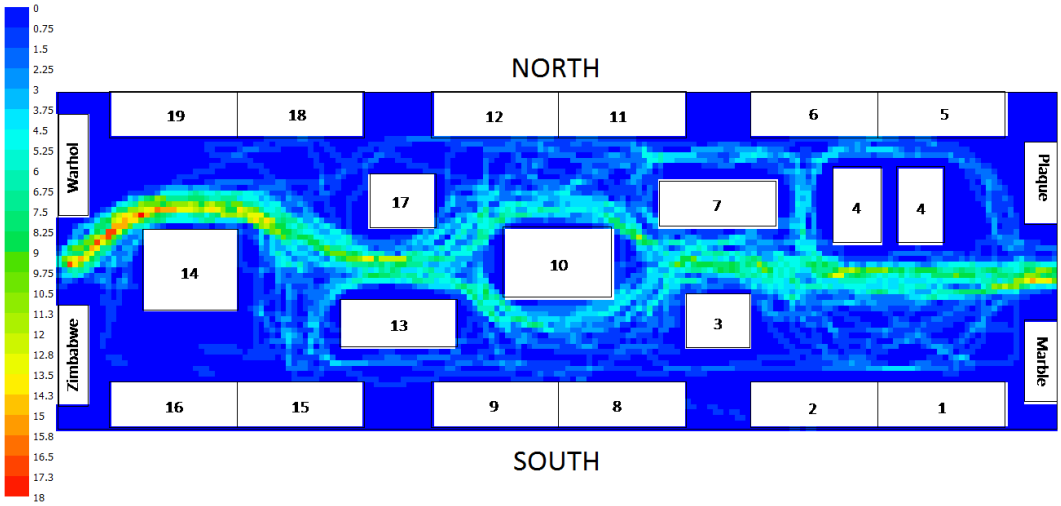
East Entrances Who Took Central Route, n=43, resolution=183x62



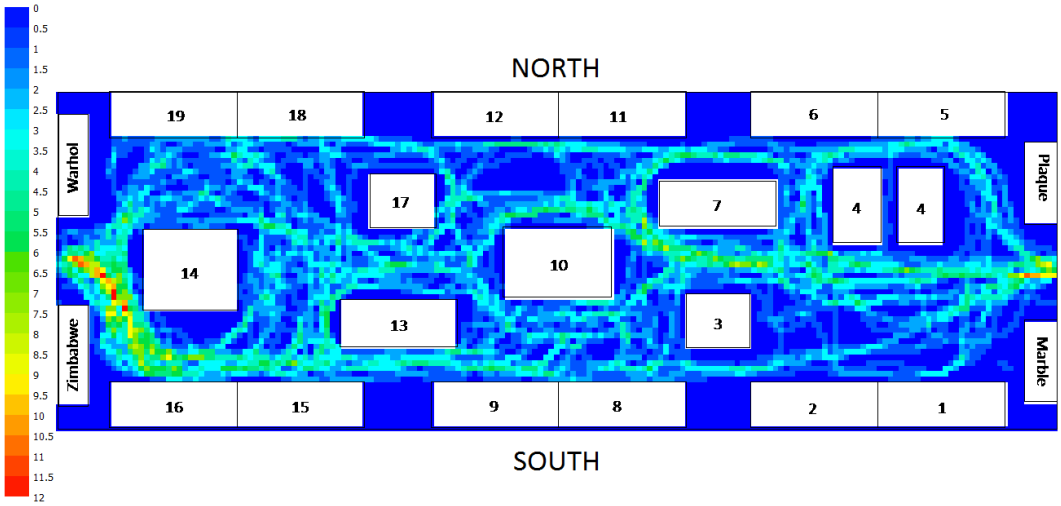
East Entrances Who Turned South, n=33, resolution=183x62



West Entrances Who Turned North, n=47, resolution=183x62



West Entrances Who Took Central Route, n=43, resolution=183x62



West Entrances Who Turned South, n=31, resolution=183x62

APPENDIX E: CONTENT OF CASES

Case	Title	Case Type	Contents
Case 1	The beginnings of coinage	Wall case on South wall	Small objects, earliest coins (case highlight), spade money
Case 2	Communicating through coins	Wall case on South wall	Small objects, small spiral of coins from Gandhara, case highlight display of 6 Nero coins showing how his portrait changed over time
Case 3	Making money by hand	Free-standing case on the Southern side of the gallery, see-through	Some old coins, a strip of farthing coins, a tree-like mold of Chinese coins with square holes
Case 4	Hands-on table	Free-standing case and a table for hands-on activities	When ongoing, it has various coins from around the world that visitors can touch and hold
Case 5	The beginnings of money	Wall case on the North wall	Bigger, golden objects, El Amarna (case highlight) and some other hoards, cowrie shells, a bronze vessel, a few coins
Case 6	Money in daily life	Wall case on the North wall	Ancient Greek necklace, a hoard, large and small coins, a Buddhist statue, the case highlight section contains a vase and coins used as spiritualofferings
Case 7	Hoarding and storing	Free-standing case on Northern side of the gallery	A big chest, a vase and many gold coins, some other coins and smaller objects
Case 8	Religion and power	Wall case on South wall	Statue of a Goddess, largely coins about religion and the proclamation of faith (case highlight), a bowl
Case 9	Signs of authority	Wall case on South wall	Ming dynasty bank note, Chinese coins linked together, a dagger, the first global currency from Mexico and Bolivia (case highlight)
Case 10	Faking and counterfeiting	Free-standing case in the middle of the gallery	Two swirls consisting respectively of counterfeit pound coins and counterfeit ancient Roman coins
Case 11	Religion and rituals	Wall case on the North wall	Large Chinese coins with square holes, a few smaller gold coins, a 16th century collecting box from Italy (case highlight), a horse statue, other coins and objects
Case 12	Merchants and the world	Wall case on the North wall	A balance scale and other objects to weigh gold dust (case highlight), ceramic objects such as pieces of plates, vases, pots and a necklace, a massive Swedish copper coin
Case 13	Making money by machine	Free-standing case on the Southern side of the gallery	An old machine to make coins, large molds for pound coins
Case 14	Making paper money	Free-standing case on the Southern side of the gallery	A machine to print currency notes
Case 15	Tradition and innovation	Wall case on South wall	Large spiral of coins from every country in the modern world (case highlight), necklace, large round stone coin, other banknotes and coins

Case	Title	Case Type	Contents
Case 16	Currency in the modern world	Wall case on South wall	Banknotes from the British Empire, objects from the first banking crisis (case highlight), Soviet, Cuban and Chinese banknotes, a copy of the Wizard of Oz as a commentary on the gold standard
Case 17	Counting and accounting	Free-standing case on Northern side of the gallery	Tiffany cash register, Indian coin counter, counting sticks
Case 18	Money and society	Wall case on the North wall	Displays about circulating messages through coins (case highlights) and notes, counterfeit dollar bills, credit cards, a wedding necklace made of coins, other marriage tokens, a Barbie cash register, Nirvana's Nevermind vinyl record, Harry Potter coin, David Tennant pound note, video screen playing scene from the Runaway Bride, Japanese bean-shaped red lacquer purse
Case 19	Spending, saving and borrowing	Wall case on the North wall	Mondex machine (case highlight), piggy banks, credit cards, banknotes, a chest, a mobile phone, mobile money in India (which changed to a Bitcoin display)
Zimbabwe	Trillion Dollar Poster	West door wall case	A poster printed on Zimbabwean currency notes, saying "It is cheaper to print this on money than paper"
Warhol	$9	West door wall case	One of Andy Warhol's prints involving the dollar sign, consisting of nine dollar signs
Marble	Marble Honorific Decree	East door wall case	A 120BC inscription from Sestus, honoring Menas for his services to the city. He was appointed to oversee the start of Sestus' production of bronze coins.
Plaque	Citi Money Gallery Plaque	East door wall case	Plaque containing the name of the gallery and the sponsor, along with other information about the gallery.

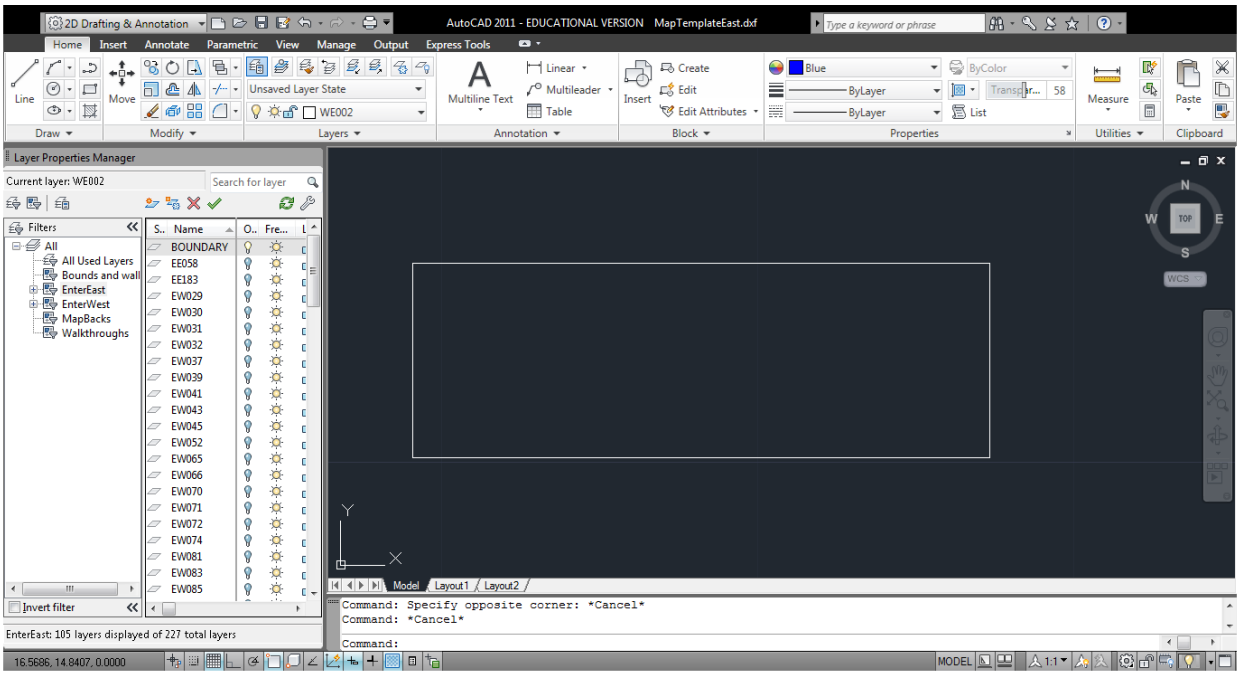
APPENDIX F: SYNTAX 2D INSTRUCTIONS

Using AutoCAD and Syntax 2D to generate Visitor Path Maps:

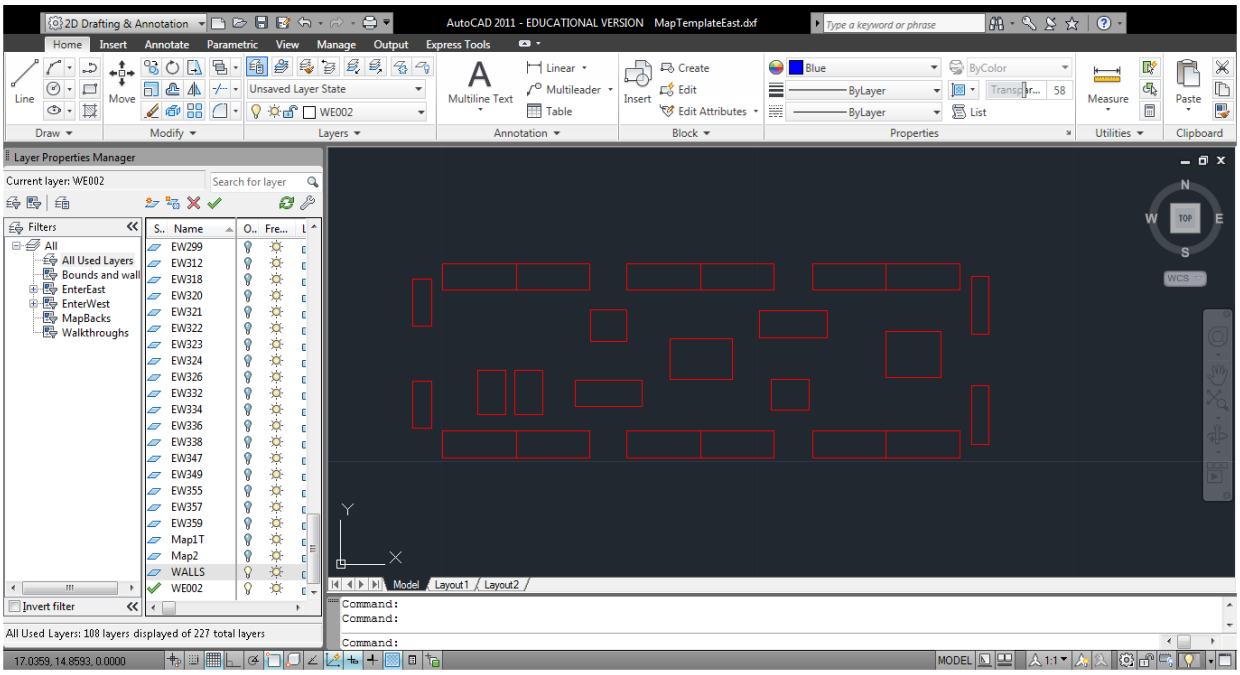
Note: Syntax 2D does have a manual available on the project website. This guide is meant to convey the method we used, the manual on the Syntax 2D website has more information on all applications of the software. This guide does assume some AutoCAD experience.

AutoCAD

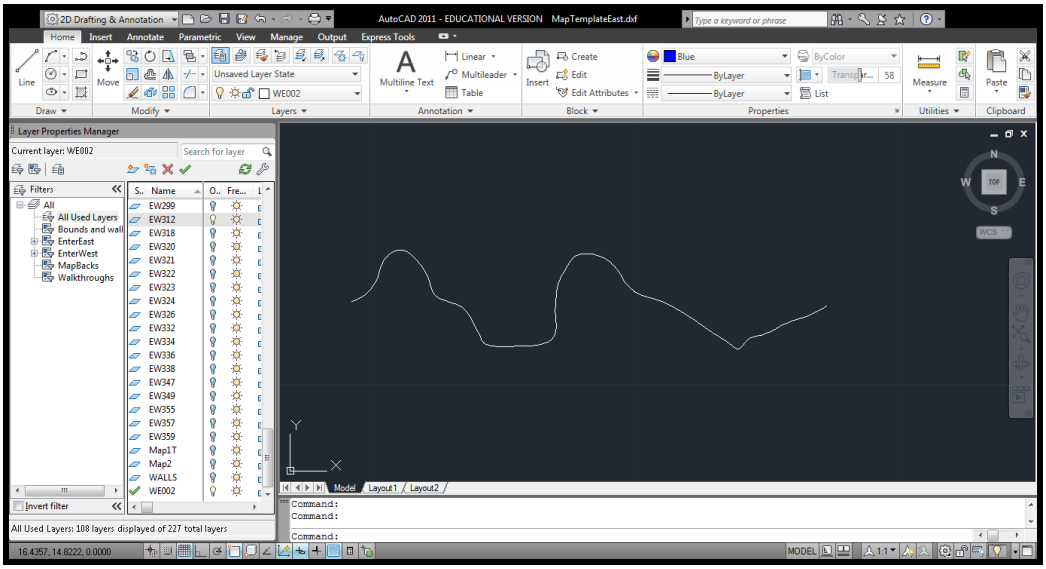
1. Scan tracks and crop to a manageable size.
2. In AutoCAD, create two layers: BOUNDRY and WALLS. These layers are required for Syntax 2D.
3. The BOUNDARY layer should outline the edge of the gallery.



4. The WALLS layer should contain all of the cases as rectangles.



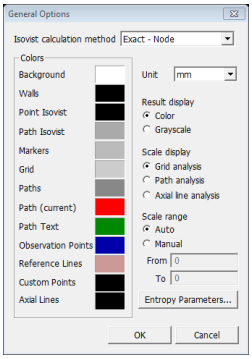
5. For each path to trace
    a. Create a layer with a distinguishing name.
    b. Bring in the scan by dragging it into the autocad window, clicking on a location for the lower left corner, scaling, and rotating as appropriate
    c. Using a Spline, trace the path using as many fit points as necessary
    d. Delete the scan used to trace



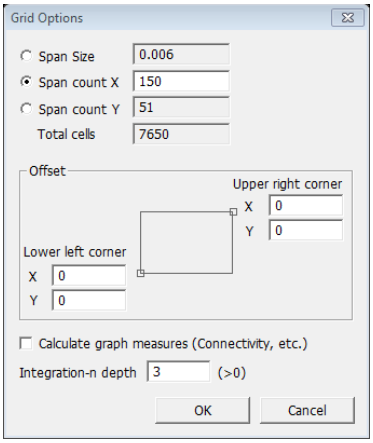
6. When all tracks are completed, save the file as a .dxf.

Syntax 2D

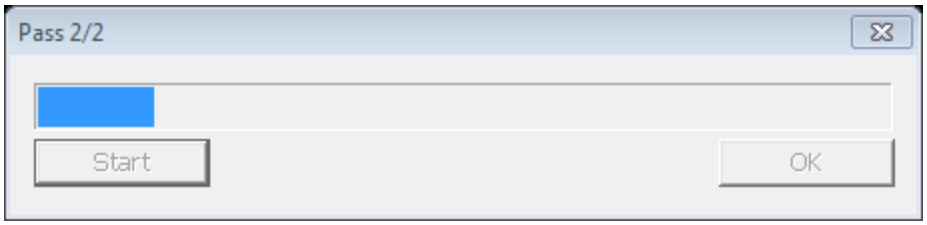
1. Launch Syntax 2D. Import the .dxf file by selecting File > Import > DXF…
2. Navigate to the location of the .dxf and click Open
3. In the Layer window ensure that each layer in the left pane is appropriately typed by selecting the layer and selecting the appropriate radio button on the right. All unneeded layers should be labeled as “Ignore” Type. Click OK.
4. Wait for Syntax 2D to pop up the General Options window. It may say that it is “Not Responding” if you are using a large file, it will recover. This may take a few minutes. Click OK when the window pops up.



5. To generate the path heat map (called Path Count in Syntax 2D), first click Grid > Grid Setup/Options. Enter an appropriate resolution using either “Span Size,” “Span count X,” or “Span count Y.” We used a Span count X of between 150 and 250 for most graphs. A larger number means a finer resolution which takes more computation time. Click OK.



6. Click Grid > Initialize Grid
7. Click Grid > Create Grid Isovist. Click Start. This process could take a while depending on your grid. Click OK when finished.



8. When completed, click Grid > Grid Options > Path Count to display the Visitor Path Heat Map. The buttons below can be used to hide the paths, grid, etc. to show the map more clearly.