Museum Kiosk Proposal

Project Leader: Josh Cannons

Author: Josh Cannons

Current Date: Thursday, October 27, 2016, 12:41:53AT+

Date Created: Friday, April 18, 2014

Date Last Edited: Thursday, October 27, 2016, 12:41:37 PM

Current Revision: 6

Statistics: 17 pages, 3657 words, 23337 characters, 0 embedded objects

Keywords: human Computer Interaction Museum Kiosk

Contents

Index of Tables

Illustration Index

1.0 Introduction

1.1 Background

The Museum of Science and Technology (SAT) have requested the design and implementation of a web-technology enabled kiosk system. This system must provide an accessible interface to visitors that will allow them to obtain an overview of the museum layout and find details of the exhibits they intend to visit.

1.2 Scope

This document intends to cover phase one (1) of the implementation. It will cover the user requirements study and the analysis of its results. From this a list of requirements will be drafted and a low-fidelity prototype developed. A small user group will then be taken through the prototype and a survey given to determine initial user reaction. The results will be analysed and if needed the list of requirements will be amended before phase two (2) will proceed.

1.3 Assumptions

This project makes the assumptions that all available information required has been disclosed in full and full use of relevant technologies (hardware interfaces, HTML5, CSS and JavaScript) is acceptable.

1.4 Constraints

- Each page must display the SAT logo that has been provided by the museum. The typeface and colour of this logo must remain true to that of its original.
- The description provided for each artifact cannot be changed without further approval
- All filenames are to remain as decided by the museum committee
- An image of each artifact must be available to the visitors
- Other than resizing, the images are not to be edited in any way
- A separate page must be provided for opening hours and entrance fee's

2.0 User Analysis

2.1 Demographics

According to research done by Reach Advisors (http://www.reachadvisors.com) analysing current museum audience demographics[1], current trends in Science and Technology museums show that they have a younger visitor base. As much as 72% of visitors are under 50 years of age with roughly 66% of those having children in primary school and the majority of adult visitors (80%) have university degree's. 34% of respondents were of an ethnic background, 12% of which identified with being Asian in descent.

It was surmised from the results that Science and Technology Museums "primarily draw family audiences looking for kid-friendly experiences", although it should not be ignored that educated adults without children also seek an adult-focused experience.

Research done by the Office for Disability Issues (http://odi.dwp.gov.uk) show that disabled people are generally less likely to participate in leisure activity than non-disabled people, but it has been shown that attendance to a historic environment site, museum or gallery is becoming more prevalent[2]. It was also shown that roughly a third of disabled people experience difficulties in accessing public and leisure goods and services.

1 See http://reachadvisors.typepad.com/museum_audience_insight/2010/04/whos-coming-to-your-museum-demographics-by-museum-type.html

2 See http://odi.dwp.gov.uk/disability-statistics-and-research/disability-facts-and-figures.php#lsca

2.2 Accessibility Matrix

Access Requirement	Accessibility Issue						
	Vision Impairment	Hearing Impairment	Physical Impairment	Cognitive or Memory Impairment	Technological Impairment	Ethnic Variation	Age Dependant
Viewing touch screen	Will have severe issue with viewing the screen options	Will not have an issue with viewing touchscreen	May have some issue with aligning of screen if immovable	Should not have issue with viewing touchscreen	Should not have issue with viewing touchscreen	Should not have issue with viewing touchscreen	Should not have issue with viewing touchscreen.
Make touch selection	Will have severe issues making selections on touchscreen	Will not have an issue with making touchscreen selection	May have moderate to severe issues making selections depending on impairment	May have minor to moderate issues making selections on touchscreen depending on cognitive impairment. Memory should not pose a significant issue.	Should not have issue with making touchscreen selections	Should not have issue with making touchscreen selections	Significantly younger or older visitors may have spatial issues with making touchscreen selections
Read text	Will have severe issues reading text	Will not have issues with reading text	Should not have issues with reading text	May have minor to moderate issues reading text depending on cognitive or memory impairment.	Should not have issues with reading text	Should not have issues with reading text providing it is in an understandable;e language	Younger visitors will have difficulty depending on their reading level
Remember instruction	Will not have an issue with remembering instruction	Will not have an issue with remembering instruction	Should not have an issue with remembering instruction	May have minor to moderate issues remembering instruction depending on cognitive or memory impairment.	Should not have an issue with remembering instruction	Should not have an issue with remembering instruction	Significantly younger or older visitors may have memorization issues with some instructions
Navigate controls	Will have severe issues navigating certain controls if they are sight dependent	Will not have an issue with navigating controls	May have moderate to severe issues navigating controls depending on impairment if they require complex or accurate spatial movements	May have minor to moderate issues navigating controls if they require a complex series of controls	May have minor issues navigating controls if they require a complex series of controls	Should not have an issue with navigating controls based on internationalised iconography	Significantly younger or older visitors may have spatial issues with some navigation controls if they require accurate movements

Access Requirement	Accessibility Issue						
	Vision Impairment	Hearing Impairment	Physical Impairment	Cognitive or Memory Impairment	Technological Impairment	Ethnic Variation	Age Dependant
Language barrier	Should not have an issue with language	Should not have an issue with language unless speech is required	Should not have an issue with language	May have minor issues with language depending on cognitive impairment.	Should not have an issue with language	Minor to severe issue with language and grammar depending on native culture	Significantly younger visitors may have issues with some language
Understand iconography	May have severe issues understanding visual iconography	Should not have an issue with understanding iconography	Should not have an issue with understanding iconography	May have moderate to severe issue with understanding iconography and visual references	Should not have an issue understanding iconography providing it is well known	May have minor to moderate issue understanding non internationalised iconography	Significantly younger or older visitors may have issues understanding certain iconography
Respond to visual cue's and stimulus	May have severe issue with responding to visual cue's and stimulus	Should not have an issue with responding to visual cue's and stimulus	Should not have an issue with responding to visual cue's and stimulus	May have minor issue with responding to visual cue's and stimulus	Should not have an issue with responding to visual cue's and stimulus	Should not have an issue with responding to visual cue's and stimulus	Should not have an issue with responding to visual cue's and stimulus
Respond to audio cue's and stimulus	Should not have an issue with responding to audio cue's and stimulus	May have severe issue with responding to audio cue's and stimulus	Should not have an issue with responding to visual cue's and stimulus	May have minor issue with responding to visual cue's and stimulus	Should not have an issue with responding to visual cue's and stimulus	Should not have an issue with responding to visual cue's and stimulus	Should not have an issue with responding to visual cue's and stimulus

Table 1: Accessibility Matrix

2.3 Usability Analysis

2.3.1 Vision and Hearing Impairment

Visitors with vision impairment issues will have severe difficulty with their experience unless text-to-speech functionality is given to the kiosk. Those whom suffer from total/legal blindness will most likely not be able to use the kiosk without at least some assistance but by providing an option to have an audio description of exhibits and artifacts; it allows visitors to regain some control of the experience without losing out on any information. A study for a prototype kiosk at the US National Air and Space Museum[3] found that many users of able sight even found much of the text too small and hard to read in certain lights and "…would rather listen than read."

Hearing impaired visitors should not have a problem with using the kiosk providing voice control or interaction is not required.

2.3.2 Physical Impairment

Depending on the physical impairment, certain issues arise with the viewing angle of the device and manipulation of the controls. Those bound to a wheelchair or of smaller stature will require the kiosk screen be on a vertical tilting swivel to allow the screen to be easily reached. This will also allow those of both height extremes to suitable move the controls into a comfortable position. Those with spatial or movement impairments will have moderate to severe difficulty operating the controls of a touchscreen device, depending on the type and severity of their condition and the size and position of the kiosk controls.

2.3.3 Cognitive or Memory Impairment

Depending on the nature and severity of the cognitive issue, the user may experience no issue at all or they may find typical use of the kiosk impossible. As with physical impairments it is impossible to fully estimate the gamut of scenarios available and in turn cater for them all but a bell curve must be found that will satisfy the majority of cases. A distraction free, elegant design along with clear, distinct icons and imagery should allow for the greatest amount of understanding and the touch-screen interface will provide a hands-on experience that can be operable by without the need of any specific skill.

It can be assumed that a visitor with a severe impairment will require the assistance of another to fully utilise the interface, but as with the visually impaired, text-to-speech and audio cues can provide an enjoyable and somewhat interactive experience to those of all levels of functionality.

2.3.4 Ethnic Variation

The main concern with ethnic or cultural variation is language used. It is important to feature the written text in as many languages as reasonable to ensure the maximum range of accessibility. Attention must be

3 See http://www.si.edu/content/opanda/docs/Rpts2003/03.01.KioskPrototype.Final.pdf

made to specific grammar and to the words used as certain meanings might be lost in translation. The language should be simple, direct and to the point without metaphors, colloquialism or similar. Iconography poses the same issue as not all 'common' icons are recognised internationally. Simple icons with text labels should be used for iconography and on user elements like buttons.

2.3.5 Age Dependent Factors and Technological Impairment

Those of particularly young or mature age might find incur minor difficulty along most facets of the kiosk interface. Typically lacking in fine or detailed motor skills, manipulation of smaller or detailed controls becomes difficult or impossible. This problem can be alleviated by providing suitable large buttons and navigation controls. Although “help” functionality should be available, those of particularly young age might have trouble remembering instructions. This age group might also find the reading level of the on-screen text to be too advanced. Those of particularly mature age tend to fall into other categories as their impairments, if any, could be considered visual, auditory or cognitive depending on their nature and severity.

Those of technological impairment might have minor difficulty grasping the controls and navigation of the touchscreen if they are complex or require previous knowledge of web browsing or similar. Touchscreen use has become so prolific, that this issue could be considered minor if at all.

3.0 System Requirements

3.2 Use Case Diagrams

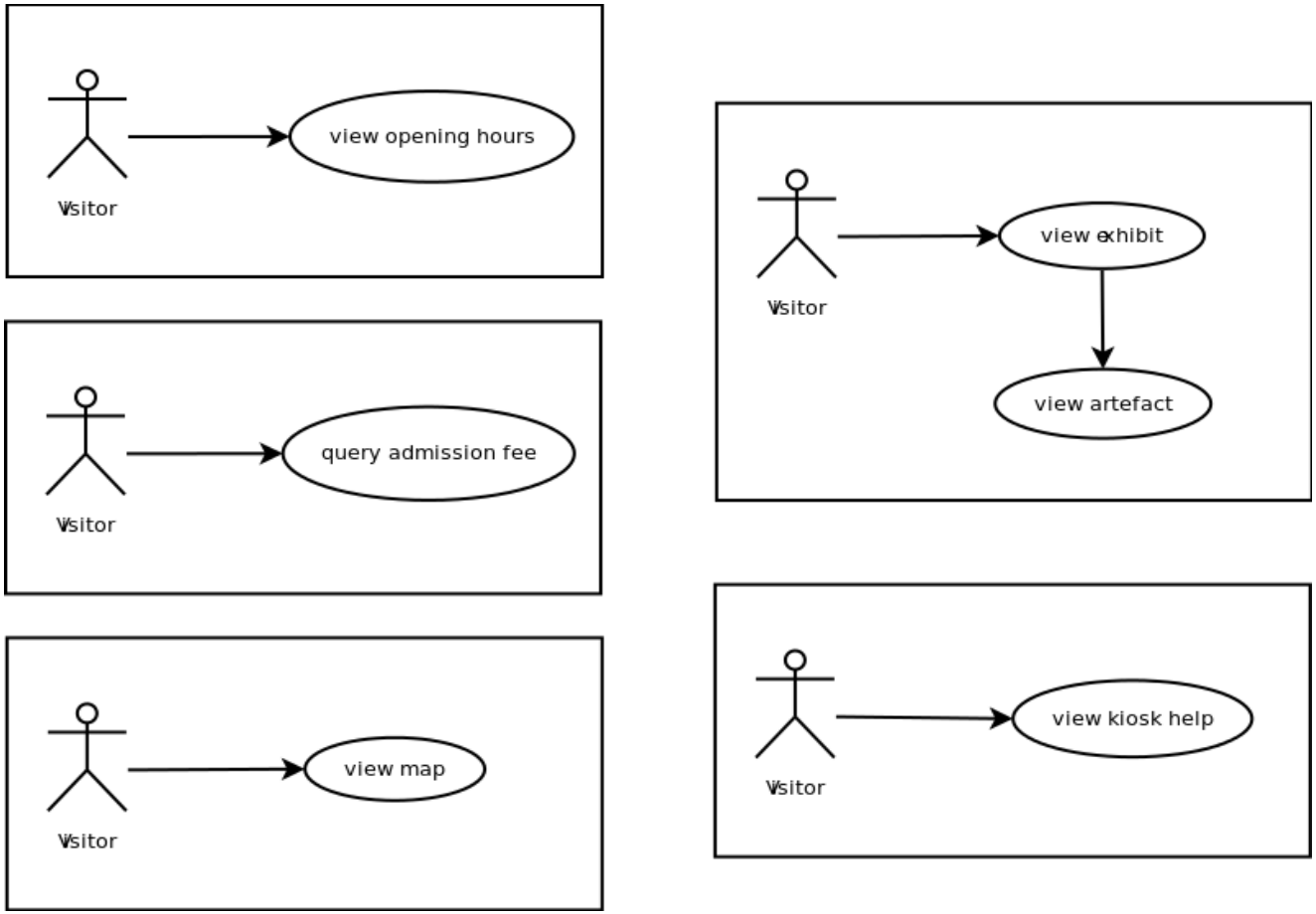

Illustration 1: Use Case Diagrams

3.2 Activity Diagram

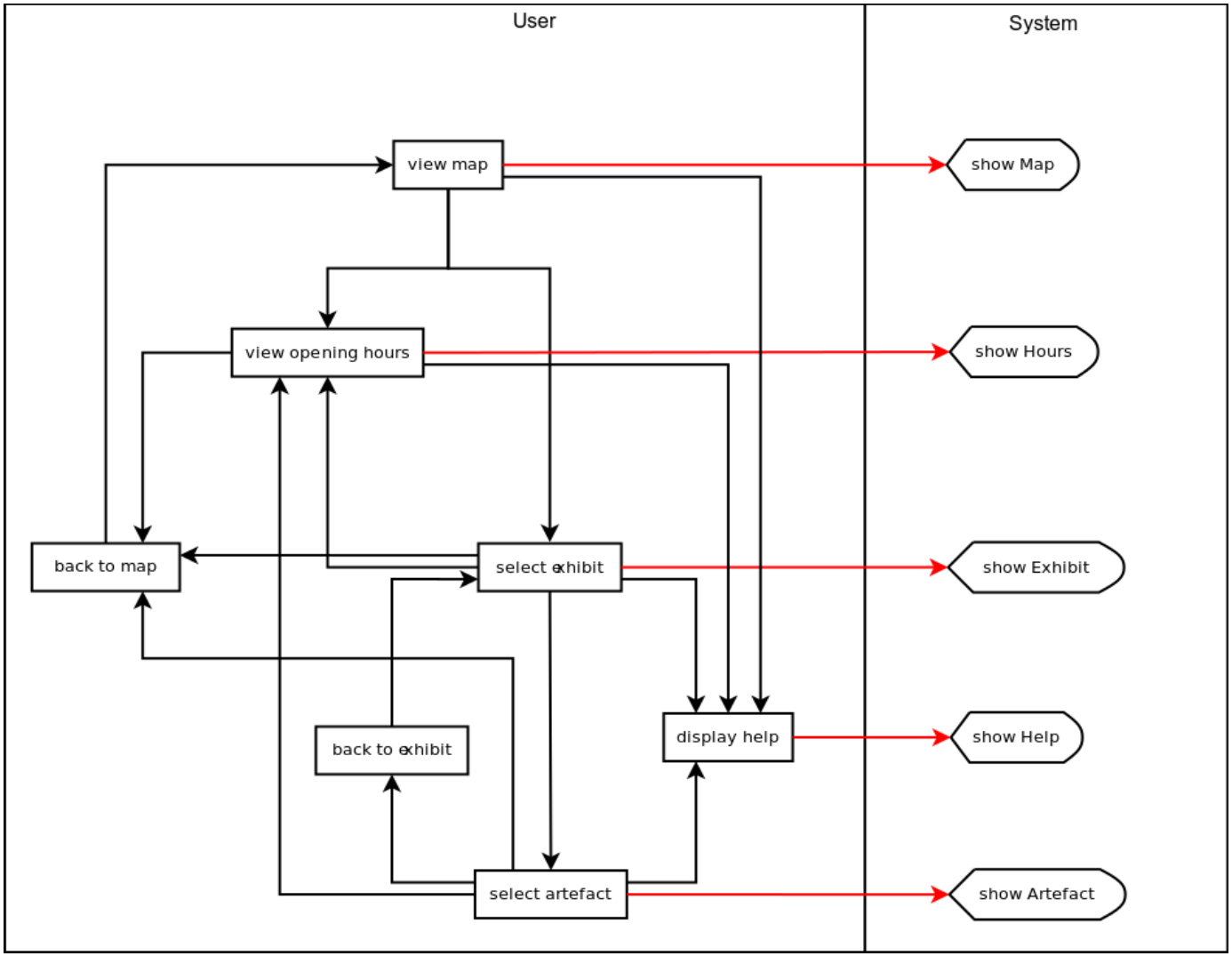

Illustration 2: Activity Diagram

3.3 Usability Matrix

Usability Control	Importance		
	1 (least)	2	3 (most)
Simple use of language		Language must be simple enough for all ages and levels of education	
Variable language selection			With 34% of visitors of non-English speaking origin, the ability to alter the written language is crucial
Text-to -speech option		All major menus selections, opening hours, admission fees and artefact's data should be made available as text-to-speech	
Adjustable screen position			To allow maximum accessibility to all height differentials, screens should be tilt-able
Use of colour-blind safe colour scheme		Apart from existing images, all iconography and text should be made readable to those afflicted with colour vision difficulties	
Consistent use of design			Navigation must be simple enough to allow all people of any culture and generation or technical level access
Internationalised use of iconography		Iconography must remain generic enough and standardised to not exclude any culture or generation.	
Reduction of user memory requirement		Operations must remain simple and no more than a button press from any other screen. Every display must clearly define it's intent.	
Load time is quick	Pages must load quickly to allow for an efficient experience and reduction of wait time. Text-to-speech option must have the ability to stop/pause/restart the current stream of audio at any time.		

Table 2: Usability Matrix

3.3 Usability Requirements

To ensure maximum accessibility it has been shown that particular attention needs to be applied to iconography and ease of navigation. Many of the visitors to science museums have been shown to be families and the requirement to facilitate a large variety of age groups and skill levels is important. Many groups in the accessibility matrix have been percieved to have navigation issues, specifically if the navigation controls are made to small or are not obvious. Particularly affected are those with sight impairments or physical impairments. Although text-to-speech has been seen as a viable option for large amounts of text, it would not be appropriate in a museum setting to have all navigation controls and options read aloud to visitors. Large and very distinct icons and symbols be used along with audio cue's for any given selection to allow those with all but completely debilitating issues to successfully use the kiosk.

The option for text-to-speech should be easily visible, and the option to pause, restart and stop the recording should be made available. Unfortunately it is not viable at the initial roll-out to include a multitude of spoken languages, all text should be made available in as many language as reasonable.

3.4 Design Recommendations

- Vertically tilt-able screen
- Design based around a 1920x1200 screen size until hardware finalised
- All iconography to be as simple as possible to avoid ambiguity and include text labels
- Allow visitor to navigate to any screen from any screen. Consider top or right side placement for navigation controls.
- Implement help button that displays help for the current screen
- Use a colour scheme that does not exclude those of colour sight afflictions, consider simple black on white
- Include SAT logo on all pages
- Use consistent icons and text styles over all pages
- Keep language simple and consistent as to not exclude any reasonable level of understanding
- Provide clear uncluttered display with only relevant information to the visitors
- Allow users to have any relevant information read aloud via-text-to-speech function

4.0 Low Fidelity Prototyping

See included main.htm

Current design has been implemented on a 1920x1200 interface using Mozilla Firefox and is untested at lower resolutions

5.0 User Feedback

To assess the usability of the kiosk design, a survey was developed. Questions were taken from the Questionnaire for User Interface Satisfaction (Chin et al, 1988), the Perceived Usefulness and Ease of Use survey (Davis, 1989) and the Computer System Usability Questionnaire (Lewis, 1995). A standard five (5) point Likert Scale was used.

5.1 User Sample

For this interface evaluation, five (5) people were asked to test the user interface. The age range was 16-45, with the average age of 29. Out of five (5), three (3) people were employed in non-IT industries, one (1) person was an IT professional and one (1) person was unemployed. Two (2) of the five (5) had previously been to a museum and four (4) had previously used a kiosk-style interface. All were familiar with a touch-screen interface and as internationalisation has not yet been implemented, all were English speaking and of western cultural origin.

5.2 Survey Results Matrix

Survey Question	Mean	Min	Max
Reading characters on the screen	3	2	4
Organization of information	4	4	4
Sequence of screens	4	4	4
Use of terms throughout system	3.5	3	4
Position of messages on screen	3	3	3
Learning to operate the system	3.5	3	4
Exploring new features by trial and error	4	4	4
Performing tasks is straightforward	4	4	4
I would find it easy to get the system to do what I want it to do	4	4	4
My interaction with the system would be clear and understandable	3.5	3	4
I would find the system to be flexible to interact with	3	3	3
It would be easy for me to become skillful at using the system	4	4	4

Table 3: Survey Results Matrix

5.4 Analysis

From the matrix above, it can be seen that the overall reception was positive. The main area that can be improved is the readability of the text on high information screen, predominantly the artifact screens. It is

hoped that the text-to-speech function, in addition to the high-fidelity prototype will help to correct this issue. 'Use of terms', 'Position of messages' and 'Learning to operate' received a score of three (3). Still within levels of acceptance but definitely area of improvement for further iterations. It can be surmised that this is the reason behind the rating of three (3) also for the clear and understandable interaction with the system. Flexibility is not a concern at this point as this is a kiosk.

Out of the subjective response questions, list the three (3) most positive and negative aspects of the kiosk, the following were listed as the most common responses;

Positive	Negative
Navigation (4 responses)	Lack of impact (5 responses)
Layout of screens (4 responses)	Text was hard to read (3 responses)
Potential for expansion (3 responses)	There was no on-screen instructions for many screens (3 responses)

Table 4: Subjective Results Matrix

6.0 Conclusion

The above report and analysis shows that the prototype is very much a work in progress. Although the sample users have been relatively satisfied by their initial experience, the sample was very narrow and the design has yet to be tested by any individual with accessibility needs or cross-cultural concerns.

6.1 Recommendations

From the above analysis, it can be seen;

- Use of text needs to be re-evaluated, especially on main map page
- Integrate images, audio and animation for better user experience
- Help systems needs to be implemented
- Re-think the certain aspects of the current design to focus on greater impact
- Implement language selection page

Once completed, the high-fidelity prototype will attempt to integrate the above suggestions before being submitted for user evaluation a second time.

References

Chin, J. P., Diehl, V. A., Norman, K. L. (1988) Development of an Instrument Measuring User Satisfaction of the Human-Computer Interface. Interface Evaluations. *Proceedings of ACM CHI'88 Conference on Human Factors in Computing Systems*, p.213-218

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, v.13 n.3 p.319-340

Lewis, J. R. (1995) IBM Computer Usability Satisfaction Questionnaires: Psychometric Evaluation and Instructions for Use. *International Journal of Human-Computer Interaction*, v.7 n.1 p.57-78

Office for Disability Issues. (2014). *Disability facts and figures*. Available at: http://odi.dwp.gov.uk/disability-statistics-and-research/disability-facts-and-figures.php#lsca. Accessed 09 April 14.

Reach Advisors. (2010). *Whos coming to your museum, demographics by museum type*. Available at: http://reachadvisors.typepad.com/museum_audience_insight/2010/04/whos-coming-to-your-museum-demographics-by-museum-type.html. Accessed 12 April 14.

Shneiderman, B., Plaisant, C., Cohen, M., Jacobs, S. M. (2010). *Designing the User Interface, 5th Edition (Indian Edition)*. Dorling Kindersley under license of Pearson Education, India

The Smithsonian. (2003). *Kiosk Prototype, Final*. Available at: http://www.si.edu/content/opanda/docs/Rpts2003/03.01.KioskPrototype.Final.pdf. Accessed 10 April 14.

Appendix A – Sample Survey

Kiosk Acceptance Survey

Reading characters on the screen	*Very Difficult* ◯	*Difficult* ◯	*Acceptable* ◯	*Easy* ◯	*Very Easy* ◯
Organization of information	*Very Poor* ◯	*Poor* ◯	*Acceptable* ◯	*Good* ◯	*Very Good* ◯
Sequence of screens	*Very Poor* ◯	*Poor* ◯	*Acceptable* ◯	*Good* ◯	*Very Good* ◯
Use of terms throughout system	*Very Poor* ◯	*Poor* ◯	*Acceptable* ◯	*Good* ◯	*Very Good* ◯
Position of messages on screen	*Very Poor* ◯	*Poor* ◯	*Acceptable* ◯	*Good* ◯	*Very Good* ◯
Learning to operate the system	*Very Difficult* ◯	*Difficult* ◯	*Acceptable* ◯	*Easy* ◯	*Very Easy* ◯
Exploring new features by trial and error	*Very Difficult* ◯	*Difficult* ◯	*Acceptable* ◯	*Easy* ◯	*Very Easy* ◯
Performing tasks is straightforward	*Not at all* ◯	*Not often* ◯	*Sometimes* ◯	*Often* ◯	*Always* ◯
I would find it easy to get the system to do what I want it to do	*Not at all* ◯	*Not often* ◯	*Sometimes* ◯	*Often* ◯	*Always* ◯
My interaction with the system would be clear and understandable	*Not at all* ◯	*Not often* ◯	*Sometimes* ◯	*Often* ◯	*Always* ◯
I would find the system to be flexible to interact with	*Not at all* ◯	*Not often* ◯	*Sometimes* ◯	*Often* ◯	*Always* ◯
It would be easy for me to become skillful at using the system	*Not at all* ◯	*Not often* ◯	*Sometimes* ◯	*Often* ◯	*Always* ◯
I would find the system easy to use	*Not at all* ◯	*Not often* ◯	*Sometimes* ◯	*Often* ◯	*Always* ◯

List the three (3) most positive aspects	List the three (3) most negative aspects