

THESIS

INSPIRING ENGAGEMENT THROUGH THE USER EXPERIENCE:
A PROJECT WITH THE FORT COLLINS MUSEUM OF DISCOVERY

Submitted by

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ABSTRACT

INSPIRING ENGAGEMENT THROUGH THE USER EXPERIENCE: A PROJECT WITH THE FORT COLLINS MUSEUM OF DISCOVERY

This project focused on user experience to create a plan for a web application that would increase engagement with the audience of a local museum. With the support of the Fort Collins Museum of Discovery, the researcher performed user experience research to create an interactive feature on the museum's website that can showcase the experiences and history and science content the museum has to offer.

The project was conducted using a human-centered design framework and focused on engagement and user experience. Activity theory and the user experience framework drove the method. The process started with five stakeholder interviews, then proceeded to four observation sessions, five personas, and rounds of prototyping and testing. The final deliverable to the Fort Collins Museum of Discovery was a project plan – including specific design, content and technology recommendations resulting from research and development – they can use to implement the web application on their currently existing site to increase engagement and their audience size.

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INTRODUCTION

User experience and engagement are two of the more recent popular topics in information technology practice and, more specifically, in web design and development. As technology pervades everyday life more and more, the experience a user has with interfaces and systems has come under increasing focus. Close attention to the user side of interfaces did not really begin until the 1980s (Johnson, 2010) – precisely around the time in which computers began to diffuse into the home, shifting the use of technology from efficiency to satisfaction, from mere function to subjective pleasure (Glanznic, 2012). Although attention to the user experience has been around, in some level, since the 1940s, the development and adoption of the World Wide Web in the mid-1990s has made it increasingly popular (Norman, Miller & Henderson, 1995). Engagement, on the other hand, in respect to technology, has mostly been discussed since the advent of Web 2.0 and, more specifically, social media (Harrison & Barthel, 2009), all of which enable users to interact with technology in a more in-depth way.

User experience is an applied discipline with growing clout as a method in the industry; thus, to appropriately study it, an applied project is needed. The Fort Collins Museum of Discovery (FCMoD) is an ideal candidate for such a project because it is dynamic, interactive and new, and also in need of greater community engagement. This need presents an excellent opportunity to explore the relationship between engagement and user experience (UX) by developing a tool to increase engagement by addressing UX steadfastly throughout the process.

The FCMoD, in its physical location, places a high emphasis on UX. It is a relatively new museum (it opened in 2012) that combines and extrapolates the material of other museums in the area. On its website, FCMoD describes itself as:

An exciting and unique new museum experience is here! Combining science with history and culture, the Fort Collins Museum of Discovery connects you to a deeper understanding of your world and your place in it, from our local community to the global community beyond. FCMoD is a place where people can come together for shared events and experiences, a place for building community while providing inspiration and insight. (FCMoD, 2013)

The museum has received some recognition beyond northern Colorado, even on Forbes.com, but within its own community it is perceived as a children's museum instead of one with broad appeal. However, the FCMoD aims to appeal to adults as well as children with its exhibits. Located in a contemporary building in a gentrified part of town, the museum is known for its interactive exhibits, which range from the "Music & Sound Lab" to "Food, Forage and Farm." Although these exhibits hint at a status as a children's museum, the FCMoD is also host to events such as "Fifty Shades of Fort Collins" which, inspired by the recent best-selling adult book *Fifty Shades of Grey*, included pole dancers and was limited to attendees aged 21+.

Goal and Research Questions

Perhaps part of the reason for this struggle to reach all audiences is FCMoD's website, <http://www.fcmod.org>. Although the website is functional in terms of providing basic information, it does little to inspire further engagement with the museum and nothing to reveal the unique, interactive nature of the museum's exhibits. The basis for this project is to promote that engagement.

The goal of this project was to make the museum website more than just a perfunctory web presence, but rather an exciting, informational resource that reflects the nature of the museum and that inspires engagement with the museum in terms of attendance and awareness. This project created a set of guidelines, models, and prototypes for a one-page web application that can augment the existing site. The sample page developed from this research is an elaborate, interactive page made with HTML, CSS and JavaScript. Based on e-mail and in-person

discussion with the museum's Digital Media Director, the page encapsulated a myriad of different exhibits at the museum, giving a virtual tour of sorts. In the process of developing this project, four research questions were answered, based on activity theory, the concepts of engagement and user experience.

Research Question 1: What forms or modes of content are most engaging to users?

Just having the intention of cultivating user experience and engagement does not make it happen, just as carefully designing and developing a product does not guarantee a user's worthwhile experience or strong engagement with it.

Research Question 2: How can the user experience approach be applied to a small-scale education/entertainment web application?

The user experience approach, which consists of collecting field data, modeling the system, developing personas and creating prototypes, and which will be discussed more in-depth in the methodology, is focused on working from the ground up.

Research Question 3: How can the methodology associated with activity theory be applied to a small-scale education/entertainment web application?

The activity theory approach works in a similarly inductive way to that of user experience. Mwanza (2001) outlines the following steps of an activity theory methodology: model the situation; produce a map of the interactions with the system; break apart these interactions by role, part of the system and purpose; develop research questions; collect data in the field; and interpret results.

Research Question 4: What are the similarities and differences between the user experience approach and the activity theory methodology?

Although some similarities and differences were discovered in the literature review phase, further ones were found during the process of the project. These revealed insights that might otherwise not have been found by using only one approach.

LITERATURE REVIEW

A key part of human-computer interaction, or the study of how people work with hardware and software is, of course, the human. ISO 9241-210, one of the International Organization for Standardization's guidelines, states that human-centered design approach is supposed to "make interactive systems more usable by focusing on the use of the system and applying human factors/ ergonomics and usability knowledge and techniques." The ISO standard characterizes the human-centered design approach as involving the following:

- The adoption of multidisciplinary skills and perspectives
- Explicit understanding of users, tasks and environments
- User-centered evaluation driven/refined design
- Consideration of the whole user experience
- Involvement of users throughout design and development
- Iterative process

In essence, a more holistic, thoughtful process will yield a better product. Krippendorff & Butter (2008) propose four pillars of the human-centered design approach. The first is second order understandings: the designers and developers must understand the meanings that others' might construct from their work. The second is meanings: meanings are perceptions of the artifact, or designed product, but dependent and situated with the users and how they see, interact with, and describe it. The third pillar is that there is no one "user" but rather a network of stakeholders, all with different requirements. The fourth pillar is interfaces, or the way in which the network of stakeholders can interact with the system. This interaction always occurs in one of three stages: recognition, exploration or reliance. Recognition is the initial encounter with the interface, which leads stakeholders to use it, ignore it or avoid it. Exploration occurs in further encounters, when stakeholders learn how to use it. Reliance occurs when the stakeholder has mastered the interface and it is taken for granted.

In order for this reliance to happen, it might be necessary to move beyond human-centered design. Apple founder Steve Jobs was noted for saying “You can't just ask customers what they want and then try to give that to them. By the time you get it built, they'll want something new” as far back as 1989 (Burlingham & Gendron, 1989, p. 2). Technology and the human condition seem to be changing so rapidly that both technology's capabilities and human's uses for it need to be considered – a balance discussed by Battarbee and Koskinen (2008) when outlining three main strategies for designing experiences. The first is a product-focused strategy, considering the technology and interface as the source and cause of experiences. The second is human-centered, as discussed above. The third is interaction-focused, integrating them both into a timeline which begins by focusing on the experiences the product can afford and ends with how it is actually experienced. Because of the importance of users' needs in web development, and because this project involves the creation of a new system to inspire experiences, interaction-focused strategy will be used to guide the design of this project.

Engagement

There are about as many definitions (and clarifications) of engagement as there are articles on the topic. Disciplines such as marketing, gaming, education and new media technology have all used the construct in a range of ways.

A significant area in which engagement with digital content is examined, games research, is often based on narrative experience research in order to determine why people play video games. By default, it seems that video game players are engaged – they “exemplify behavior that is intense, purposive, and goal-directed” (Hoffman & Nadelson, 2009, p. 245) and are typically intrinsically motivated as well. A good part of this may stem from the virtual reality aspects of video games, through which issues like presence and flow have been researched at length.

Regardless, gaming is characterized by frequent re-engagement, showing that games are doing something right in terms of engagement. Furthermore, on a larger scale it also has the chance to change behavioral outcomes – perhaps part of why it is of such interest in education. According to Busselle and Bilandzic (2009), “the extent to which one becomes engaged, transported or immersed in a narrative influences the narrative's potential to affect subsequent story-related attitudes and beliefs” (p. 521). This change in attitudes and beliefs has implications far beyond the study of narratives.

Although engagement is not a new term to the field of education, it has become increasingly important in light of distance education. Cognitive engagement in this case can be defined as “the integration and utilization of students’ motivations and strategies in the course of their learning” (Richardson & Newby, 2006, p. 1). Because of the lack of imposed structure on how and when students learn, ensuring that students are engaged is critical so they actually get something out of the course content (Sun & Rueda, 2012). This is helped via distance learning systems that, ideally, make the online environment mimic a physical classroom in terms of increased interaction with the instructor, other students, and content, potentially increasing positive attitude and course satisfaction (Bernard, Abrami, Borokhovski, Wade, Tamin, Surkes, & Bethel, 2009).

Marketing and advertising researchers look at engagement not from an instancial perspective, but from a holistic one. That is, engagement is “the collective experiences that readers or viewers have with a media brand” (Mersey, Malthouse, & Calder, 2010, p. 40). Through this conceptualization, engagement is infinitely desirable, which is why Mollen and Wilson (2010) believe that marketers treat it as “the definitive umbrella term for online

mechanisms that deliver competitive advantage to those employing them and contribute to the creation of 'loyalty beyond reason'" (p. 919).

Because of this, many researchers in marketing and advertising reference the Advertising Research Foundation (ARF) definition of engagement: "Engagement is turning on a prospect to a brand idea enhanced by the surrounding context" (as cited in Wang, 2006, p. 1). Among its many issues, the ARF definition has the same critical problem as many applied definitions, wherein it focuses on the outcomes. To understand engagement and get the best results from inspiring it, one must understand the processes and concepts that encompass it.

Definitions and Frameworks of Engagement

One of the most compelling definitions of engagement is that of Mollen and Wilson (2010, p. 923):

First, engagement is a mental state that is accompanied by active and sustained, even complex, cognitive processing. ... Second, engagement is associated with the satisficing of utility and relevance. ... Third, engagement involves emotional bonding or impact, emotional congruence, and pleasure and satisfaction.

Engagement can indeed be understood as a cognitive process. And it is more than just mental channel surfing – users are actively and willfully processing content. They are doing this willful processing because of some value it has to them, be it from a utilitarian or hedonistic standpoint.

Although the Mollen and Wilson (2010) definition does not mention it, a recurring theme in engagement literature is that engagement has both psychological and behavioral components (O'Brien & Toms, 2008; O'Brien, 2011; Oh, Bellur & Sundar 2010). Although the psychological perspective is inherent in the Mollen and Wilson definition, Oh, Bellur and Sundar (2010) discuss the behavioral side of the construct at length. These behavioral issues are the concern of

those seeking to use engagement in their field to mobilize users. In specific, the behavioral experience of engagement is an outcome of studies of user engagement.

A common theme in existing frameworks of engagement is the clear delineation of the initial stimulus, the cognitive process of engagement itself, and the behavioral outcomes at the end. Although the fact that a process would have a beginning, middle and end comes as no surprise, conceptually it is important because it emphasizes that there is more to engagement than just the behavioral outcomes, or just the design of the interface, or just the extended time staring at the screen. Rather, it all these dimensions must be considered in order to understand the ways in which users do and do not engage with content, a platform, or an interface.

The engagement framework by Mollen and Wilson (2010, p. 920) treats engagement as a third experiential state in the online environment, after interactivity and telepresence, respectively, during which instrumental and experiential value are determined. That is, it is not until right before the end of the process of engagement that the user determines their opinion regarding the stimulus. It seems unlikely that internal states go in this order. However, it could be argued that this framework is simply a less-refined, more concept-confused version of the Oh et al. (2010) framework, discussed later, if one considers interactivity to be physical interaction and telepresence to be cognitive experience. Interactivity is certainly an example of physical interaction and telepresence a type of cognitive experience.

The framework by O'Brien and Toms (2008, p. 949) is different from the Mollen and Wilson (2010) one in that value – what O'Brien and Toms refer to as specific or experiential goal – is moved up to point of engagement. Interactivity and telepresence, never explicitly stated in itself but manifest in different attributes listed like awareness, are part of the period of engagement, versus predecessors to it. It also notes further attributes within each step of the

engagement process, like aesthetics, novelty, and affect. Interestingly, positive affect is located both within period of engagement as well as within period of disengagement, where it is joined by negative affect. This makes a certain amount of sense, but it also causes potential problems for how affect can be conceptualized in regards to engagement. The O'Brien and Toms (2008) framework also takes into account the idea of re-engagement and varying levels of engagement intensity.

The final framework is that of Oh et al. (2010, p. 16). It seems simple and elegant, breaking engagement down into its cognitive and behavioral parts. The researchers claim that their model only discusses the processes in the period of engagement, in order to ensure that “presumed causes of engagement (e.g. sensory appeal, control, challenge, novelty, attention, curiosity, etc.) and presumed outcomes (e.g. flow, immersion, presence, enjoyment, etc.) are not clouding the definition of the concept itself” (p. 21), but that is a fallacy on two accounts. First is that their presumed causes and outcomes are not necessarily only at the point of engagement and point of disengagement, but present throughout the process, as in the O'Brien and Toms (2008) model. Second is that closer examination of their model shows that there is still an acknowledgment of the beginning and end of the process.

In the Oh et al. (2010) model, engagement starts with a physical interaction and then a cognitive experience. The physical interaction is the actual exposure to the stimulus, although the cognitive experience is the start of all those processes of engagement – beginning at attention and moving forward to immersion. At the stage of absorption, the individual is actively investing cognitive resources towards interacting with the content. Finally comes the disengagement and behavioral outcomes in the form of outreach, which in this case is essentially sharing the information.

Engagement and User Experience

Although there is no literature connecting engagement and user experience, the two concepts correspond directly, from frameworks to purposes. Indeed, it seems that at some level they are the same thing, but “user experience” came out of human-computer interaction and “engagement” came out of marketing and education. This means that they are both dealt with differently in terms of practical application. Whereas the implementation user experience tends to focus on the duration of product usage, that of engagement tends to focus on the result of product usage. Because both are being considered in the creation of this project, it is necessary to understand the similarities and differences of both.

Roto et al. (2011) propose a chronological framework of user experience that starts with the anticipated experience, goes through momentary user experience during usage of the system, and results in reflecting on the experience through episodic user experience and reflecting on numerous experiences through cumulative user experience. According to Lowgren and Stolterman (2004, p. 137):

In order to perceive the whole, or the dynamic gestalt, of the digital artifact, we need to experience it as a process, which is to say that we need to try it. The gestalt of the digital artifact emerges in the interaction with the user over time. There is no way for a user to get an idea of the dynamic gestalt without interacting with the artifact and exploring different possibilities and courses of events.

In these time spans of user experience, practitioners of UX have the same concerns as proponents of engagement: bring the user in, give them a worthwhile time while they are in, and let them go with a positive feeling towards the experience. Forlizzi and Ford (2000) note that “we can realize that a good product is one that offers a good or memorable narrative that the user will engage with, and pass on to others, either by sharing the artifact or by talking about it” (p. 422).

User Experience

User experience (UX) has become one of Web professionals' and researchers' favored topics, and as such it has many definitions. One of the most basic ones is that of Forrester (2009, p. 2): "Users' perceptions of the usefulness, usability, and desirability of a Web application based upon the sum of all their direct and indirect interactions with it." This definition, however, is geared towards UX practitioners, not UX researchers, who utilize a significantly less concrete definition, focusing on storytelling and relationships instead of function and perception. Within the literature, there are two main philosophical definitions. The first is that of Hassenzahl (2010, p. 9):

An experience is an episode, a chunk of time that one went through – with sights and sounds, feelings and thoughts, motives and actions; they are closely knitted together, stored in memory, labeled, relived and communicated to others. An experience is a story, emerging from the dialogue of a person with her or his world through action.

The second is that of McCarthy and Wright (2004). This definition combines the ideas from John Dewey, the American philosopher and educational reformer, and Mikhail Bakhtin, the Russian philosopher and literary critic, both active in the first half of the 20th century:

For Dewey, experience is constituted by the relationship between self and object, where the self is always already engaged and comes to every situation with personal interests and ideologies. ... action is situated and creative. ... For Bakhtin, the unity of felt experience and the meaning made of it are never available a priori but must always be accomplished dialogically. (p. 17-18)

The similarities in both are obvious. Both definitions emphasize the idea of dialogue between the subject and the object – in human-computer interaction, the user and the digital artifact. There is also the idea of user experience being a temporal thing, in that it has a beginning, a duration and an end. However, in terms of practice, the two are quite different.

Hassenzahl (2010) seeks to simplify the elements of user experience, and indeed has developed

frameworks topic, despite its transient nature. McCarthy and Wright (2004), on the other hand, emphasize subjectivity, and see user experience as part of a greater whole in said user's life.

Elements and Models of User Experience

Moving beyond these philosophical differences, definitions of UX by researchers and practitioners have narrowed to discuss particular elements that hold true across studies and theoretical discussions.

The first of these constant elements of UX is its temporal nature. That is, "experience refers to uniquely meaningful, salient, and coherent mental events with both cognitive and affective qualities that take place over a period of time, however brief" (Cupchik & Hilscher, 2008, p. 243).

The second is the emphasis on the user's context – mood, culture, goals and so forth.

According to Sward and Macarthur (2007, p. 42):

UX is the value derived from interaction(s) [or anticipated interaction(s)] with a product or service and the supporting cast in the context of use (e.g., time, location, and user disposition). User value can be actual value (e.g., efficiency and effectiveness), perceived value (e.g., trustworthiness, emotions, satisfaction, aesthetic, social rewards, behavior, entertainment, etc.), or a combination of both.

This value relates to three different types of goals in user experience: be-goals, do-goals and motor-goals, which closely reflect the hierarchy of activity theory. Hassenzahl (2010) says that HCI can be understood as "goal-directed action mediated by an interactive product" (p. 11). Be-goals are self-related, giving motivation and meaning to activities, much like the overarching activities in activity theory. Do-goals are task-related and akin to the "action" of activity theory. Motor-goals, which are action-related, are synonymous with activity theory's operations.

Per the above elements of user experience, Forlizzi and Ford (2000) put forth a model of user experience with products, wherein the user has emotions, values and prior experience, and the product (which for the purpose of this discussion is synonymous with system and artifact)

has form, language, features, aesthetic qualities and utility. Both are situated within the context of use, and the context of use is situated within social and cultural factors. Many parts of this model are familiar to the definition of user experience, except that Forlizzi and Ford emphasize the importance of the product instead of just focusing on cognitive theory. Because of this, Roto, Law, Vermeeren, and Hoonhout (2011) declared the three factors of UX to be the context, the user, and the system.

Mahlke (2007) proposed a user experience research framework that has context/task parameters, user characteristics and system properties as critical elements of human-technology interaction. Using this framework, there are three components to user experience: perception of instrumental qualities, perception of non-instrumental qualities and emotional user reactions. These three components are elaborated upon at different lengths in almost all discussions of user experience.

The perception of instrumental qualities, which Hassenzahl (2004b) calls pragmatic attributes, includes usefulness and usability. Usefulness, or utility, has to do with how relevant the product is to the user's needs. Usability, on the other hand, is a whole separate concept that was developed before UX and still is frequently studied independently of it. Usability is "how effectively, efficiently and satisfactorily a user can interact with a user interface" (Usability.gov). This includes intuitive design, ease of learning, efficiency of use, memorability, error frequency and severity and subjective satisfaction. According to Hassenzahl (2010), these are "hygiene factors" and directly relate to the ability to and ease of fulfilling needs.

The perception of non-instrumental qualities includes aesthetic aspects, symbolic aspects and motivational aspects. Hassenzahl calls these hedonic attributes: motivating attributes that help make the experience a positive one, like stimulation, beauty and identification. Indeed, he

found “beauty to be a good (often the best) predictor of a product’s overall impression or general user satisfaction. Moreover, a strong correlation between beauty and usability repeatedly emerged” (Hassenzahl, 2004a, p. 321).

The emotional user reactions are the subjective feelings, motor expressions, physiological reactions, cognitive appraisals and behavioral tendencies of the user. This fits with Hassenzahl’s pragmatic/hedonic framework in that products have attributes that users construct by combining its features (instrumental and non-instrumental qualities) with their expectations (emotional user reactions).

The three of these (perception of instrumental qualities, perception of non-instrumental qualities and user reactions) result in the consequences of user experience – the overall judgments, choice between alternatives, and usage behavior that the user makes.

Wright, McCarthy and Meekison (2003) use a “threads of experience” framework to describe the process of experience, because “people do not simply engage in experiences as ready-made, they actively construct them through a process of sense making” (p. 48). These threads, which they describe as intertwining to create experience, are compositional, sensual, emotional and spatio-temporal. As implied by the name, the compositional thread has to do with narrative and the structure of the experience. Although one might not describe technology as sensual (until the Apple products revolution, anyway), this thread deals with the look and feel of technology. Although sensuality can invoke emotions, the emotional thread deals with the feelings surrounding an experience – satisfaction at success, frustration at lack of success, etc. The spatio-temporal thread has to do with the passage of time (or the feeling that it is not) during an experience.

These threads of experience can be expanded to the properties of experience as outlined by Hassenzahl (2010). One principle is that user experience is situated in a context and in a time period: “Experience emerges from the integration of action, perception, motivation, and emotion, however, all being in a dialog with the world at a particular place and time” (p. 16). User experience is also dynamic, extended over time and potentially recurring. It includes perception, action, motivation, and cognition, making it holistic. Because user experience is based on perception and other individual factors, user experience is subjective – though user experience is also partially the same due to design. Lastly, user experience should be positive; not necessarily positive in terms of valence, but positive in terms of being worthwhile and adding value.

Activity Theory

Although there are many theories that are relevant to and focus on human-computer interaction, activity theory is the most relevant for this project because of its focus on technology and agency. According to Nardi (1996):

Activity theory focuses on practice, which obviates the need to distinguish ‘applied’ from ‘pure’ science – understanding everyday practice in the real world is the very objective of scientific practice. Activity theory is a powerful and clarifying descriptive tool rather than a strongly productive theory. (p. 7).

Activity theory is also highly relevant because it focuses on the mediation of human activity, the precise premise of human-computer interaction (Kaptelinin & Nardi, 2006).

Activity theory has its roots in the Soviet psychological activity theory developed by Leont’ev (1978). It is a very holistic theory, in that it does not just focus on the individual, the system, or the context – rather, all three are important. Bertelsen & Bodker (2003, p. 294) say that the focus of activity theory is:

Analysis and design for a particular work practice with concern for qualifications, work environment, division of work, and so on; analysis and design with focus on actual use and the complexity of multiuser activity. In particular, the notion of the artifact as

mediator of human activity is essential; focus on the development of expertise and of use in general; active user participation in design, and focus on use as part of design.

The tenets of activity theory are an emphasis on human intentionality; the asymmetry of people and things; the importance of human development; and the idea of culture and society as shaping human activity (Kaptelinin & Nardi 2006).

Unlike other theories throughout the 20th century, activity theory has an emphasis on human intentionality; that is, humans are engaged and involved in the macro and micro happenings of their lives. Humans are not acted upon – well, not as much as they could be – rather, they do the acting as a result of needs. This relates closely to the second tenet of activity theory, or the asymmetry of people and things, which is not present in many early human-computer interaction theories.

Humans are not just another node in a system, or in this case the interface-mediated relationship between human and machine. Although it might be true that the subject (the human) and the object (whatever it might be) both have agency, only the subject's agency drives the interaction. Activity theory emphasizes the importance of human development on individual and social levels through this agency-based activity as a topic of research as well as a research methodology. Activities cause development both at an individual level, and at a sociocultural level, refining knowledge, skills and tools through the process. According to Kaptelinin and Nardi (2006, p. 36-37), “the human mind is intrinsically related to the whole context of interaction between human beings and the world, that it is an organ of a special kind, emerging and developing in order to make interaction with the world more successful” (p. 36-37).

The last tenet of activity theory is that it is neither a cultural nor a cognitive theory – or perhaps more accurately, it is both because human activity is situated both within the subject's

immediate context and within their context at large, and activity theory strives to account for all scopes of said activity.

The idea of activity, at the surface, is very similar to the dictionary definition: “Activity in a narrow sense is a unit of life, a subset of all possible processes related to the interaction of the subject with the world” (Kaptelinin & Nardi, 2006, p. 62). Activity, although it is broken down into a hierarchy, is considered the unit of analysis in activity theory research. This is important because, according to Bertelsen and Bodker (2003), “this unity implies that human conduct cannot be understood as the mere aggregation of behavioral atoms, and that consciousness is routed in practical engagement in the world” (p. 304).

Human activity is object-oriented – it is directed towards a purpose. In the case of activity theory, “activity refers to a specific level of subject-object interaction, the level at which the object has the status of a motive. A motive is an object that meets a certain need of the subject” (Kaptelinin & Nardi, 2006, p. 59). Focusing on the object in activity theory research gives a more holistic, deep understanding of why people act and interact with tools as they do.

But although activity theory is concerned with the big picture, the theory also revolves around a hierarchy of types of activity. The top level, activity itself, is very concerned with motive, be it supporting the tribe or finishing graduate school. The second level within activity is the action; this level is concerned with reaching more short-term goals, like hunting for food or writing a thesis. The last level of activity is operations, which are the automatic, improvised doings of everyday life – per the existing examples, this might be sharpening spears or gathering research. “In other words, an activity may be composed of a sequence of steps, each of which is not immediately related to the motive even though the sequence as a whole may eventually result in attaining the motive” (Kaptelinin & Nardi, 2006, p. 62).

This understanding of the steps in activities is part of what makes activity theory so appropriate for the study of human computer interaction. However, it merits noting that “while mediators can be designed to autonomously assume human operations and actions, they cannot, in themselves, create meaningful activities. Artifacts cannot decide what they want; they cannot form an intention, or say what is meaningful and what is not” (Kaptelinin & Nardi, 2006, p. 251). This is where user experience becomes useful.

Research Question(s) / Hypotheses

This project addressed four research questions that are oriented around activity theory and the concepts of engagement and user experience. Kaptelinin and Nardi (2006, p. 151) have the following suggestions for designing engaging artifacts based on activity theory:

- **Balance:** the effective motives should be properly represented – if a motive is systematically ignored, the activity may face a breakdown;
- **Inspiration:** the object of activity should not only be rationally feasible but also attractive and energizing;
- **Stability:** if the object changes too often, the activity can be disorganized; and
- **Flexibility:** when factors such as motives and available means change, the object of activity should be redefined to avoid becoming obsolete and ineffective.

However, just having the intention of cultivating user experience and engagement does not make it happen, just as carefully designing and developing a product does not guarantee a user’s worthwhile experience or strong engagement with it. “As designers trying to craft an experience, we can only design situations, or levers that people can interact with, rather than neatly predicted outcomes. A product offers a story of use that invites engagement” (Forlizzi & Ford, 2000, p. 420). However, single-page applications are considered to increase ease of use and “stickiness” of the interface, which may enhance experience and engagement.

The development and user testing of different prototypes should glean insight to what web-based media hook (point of engagement), absorb (period of engagement) and inspire action

(point of disengagement) in users, at least within the context of a project with this scope and goal.

Therefore, the first research question is:

Research Question 1: What forms or modes of content are most engaging to users?

The user experience approach, which consists of collecting field data, modeling the system, developing personas and creating prototypes, and which will be discussed more in-depth in the methodology, is very intent on working from the ground up. According to Garrett (2002), user experience is divided into five levels. The bottom level is the strategy level, in which project developers establish user needs and site objectives before the project even begins. Out of the needs and objectives come functional specifications and content requirements, which are the scope level. Infrastructure issues begin on the “structure” level with interaction design and information architecture. On top of that is “skeleton,” which is where many companies focus their UX efforts because it affects users’ behavior, by covering interface, navigation and information design. The top level, “surface,” is the visual design – the look, the feel, etc.

Because the user experience approach will be applied throughout the project, user experience-centric steps of the methodology such as modeling, scenarios and prototyping, respectively, will give insight to how an approach might best be utilized in such a project. This leads to the second research question.

Research Question 2: How can the user experience approach be applied to a small-scale education/entertainment web application?

The activity theory approach works in a similarly inductive way to that of user experience. Mwanza (2001) outlines the following steps of an activity theory methodology: model the situation; produce a map of the interactions with the system; break apart these

interactions by role, part of the system and purpose; develop research questions; collect data in the field; and interpret results. Granted, this particular methodology assumes that some existing system or process is in place, but several of the steps mimic that of user experience.

This research question will be answered in a similar way to the first research question. The activity theory methodology places a lot of emphasis on the roles and needs of users, and will be dealt with largely in the early, scoping stages of the project. Some issues might be met in that activity theory typically assumes that some sort of process is already in place, but the process of viewing a physical exhibit and a virtual one are not necessarily similar. Thus research question three is the following:

Research Question 3: How can the methodology associated with activity theory be applied to a small-scale education/entertainment web application?

According to Hassenzahl (2010, p. 73):

experiences with technology (as many other experiences as well) [seem] to be far less unique and far less variable as implied by the proponents of the ‘phenomenological’ approach: we all like to be challenged; we all like beautiful things, we all care about what others think about us and we all like romantic sunsets.

This engagement with the product – or the experience that it offers – could be considered critical to the success of the product as a whole. According to Cupchik and Hilscher (2008 p.242), “the more fluid and integrated the process of engagement the more memorable the design object is as a useful tool.”

The final research question is:

Research Question 4: What are the similarities and differences between the user experience approach and the activity theory methodology?

With these questions in mind, a methodology combining elements of activity theory and user experience was developed.

METHODS

This project aimed to develop a project plan for web-based interactive features in collaboration with the Fort Collins Museum of Discovery (FCMoD) using a human-centered design approach based on activity theory. To do so, it followed a process that included stakeholder interviews, participant observation, persona and scenario development, graphic design technical development, and prototype testing with the target audiences. This chapter details the methods used at each step to develop the project plan.

Ideally, user experience is a “ground up” phenomenon – not something tacked on the end as an afterthought. As such, this project used a goal-directed design process, creating the focus on user experience from the implementation of project specifications. Sharp and colleagues break this process down into four different activities which surface throughout the various steps in the process:

Identifying needs and establishing requirements for the user experience, developing alternative designs that meet those requirements, building interactive versions of the designs so that they can be communicated and assessed, evaluating what is being built throughout the process and the user experience it offers. (Sharp, Rogers, & Preece, 2007, p. 17).

Step 1: Interviews

The first of these steps was stakeholder interviews. The stakeholder interviews were conducted first because they determined the vision and constraints of the project and informed how further research was conducted. In this case, stakeholders are those with responsibility in the client organization, such as the digital media team, directors, etc.

Step Two Designs (2006) recommends doing stakeholder interviews on site, face-to-face, and interviewing stakeholders in a range of roles in the organization, using different qualitative

question sets for each type of role. Darnall and Jolley (2004) advise expanding this sample scope to include non-expert stakeholders – for example, members of the community, museum goers, and volunteers. This step in the process involved interviews with five stakeholders, including the primary contact, the Digital Media Director, other museum employees, and FCMoD volunteers. Questions for all these groups included how they got involved with the FCMoD, the details of their role with the organization, reflections on the exhibits and visitors, and what purpose they felt a web application might serve the organization. Interview questions were guides, rather than rigid scripts, as both the user experience design process and qualitative interview process require responses to be organic in order to get the most value out of them (Babbie, 2010).

The five interviews conducted lasted between 25 and 55 minutes each, with an average of 35 minutes. All interviews were conducted on the premises of the Fort Collins Museum of Discovery during slow hours. All interviews were transcribed for analysis, resulting in approximately 59 pages of transcripts. Selected quotes can be found in Appendix A.

Step 2: Observation

After the foundation was laid, field observation began. The goal of the observation step was to establish a qualitative understanding of how visitors interact with and react to the physical exhibits in the FCMoD. This provides crucial insight about the scope of appeal and engagement among actual audiences that will guide the design and development of the virtual objects. Paired with interviews and research on similar products in the marketplace, these observations provide a framework for identifying effective components and functions for the digital products.

For this step, the researcher was what Wimmer and Dominick (2011) refer to as an “overt observer,” in that she remained separate from the subjects and did not hide the fact that she was observing. Because this project was intended to be a virtual version of existing exhibits, seeing

how visitors interact with physical objects had implications for the design of their virtual counterparts. For example, certain demographic groups might focus on some features of exhibits but other demographic groups might ignore those features in favor of others, or might appreciate the museum for completely different reasons.

To conduct these observations, a total of 42.5 hours were spent observing and taking notes in the FCMoD. A range of time periods were selected in order to capture different types of visitors and contexts of the experience. This was done because FCMoD staff noted that different types of people attend on different days and times. This way, a sufficiently wide range of visitors and exhibits were observed for this step. Observation procedures were focused on how different visitors interacted with the content on display. Observation notes included thoughts and reflections from the researcher, and were collated shortly after the period of observation, as recommended by Lindlof and Taylor (2002). Notes also included researcher perceptions of visitor demographics, as well as of visitor’s reactions to the displays, such as interest, excitement, boredom, or confusion. Table 1 shows the days and hours in each time slot spent in observation.

Table 1. Observation Data Collection

Time slot	Observation hours	Fieldnotes hours
Morning weekday	3	2
Morning weekend	4	3
Afternoon weekday	4	2.5
Afternoon weekend	4.5	3.5
TOTAL	16	11

The observations provided demographic and psychographic information invaluable in later steps of the user experience process. It also helped identify attendance to different aspects of the museum and its exhibits, which informed application design. A summary of observation notes are in Appendix B.

Step 3: Personas

The persona step aims to identify the specific objectives of the website features to be developed through mapping the functions and features of web elements and the characteristics, including needs and interests of target audiences. Personas are important for understanding what the product will do and what deliverables should be, and contribute to the justifications of design decisions from a user perspective.

Personas are essentially archetypes of users. Much like archetypes in literature, they are used to outline typical activities, attitudes, aptitudes, motivations and skills of the user. Cooper, Reimann and Cronin (2007) identify the steps for creating personas as identifying behavioral variables, coding subjects to behavioral variables, identifying behaviors, synthesizing the data, and checking for completeness and redundancy. Personas are used to determine and communicate project requirements and whether or not the project was successful, as well as to test the project throughout. Personas can frequently lead to the development of user stories, an important part of scenarios. For example, a persona model might identify a typical adult user as a woman in her 50s with children or grandchildren under 15 who wants to learn more about the museum topics in order to discuss them with her children.

Personas are often used in market research (O'Connor, 2011) to focus development on key characteristics of the target audience. They can be developed in different forms depending on the need of the project, and usually include specific, personal details about what is identified through other research as a “typical” user. Crucial to persona development are details about how the individual interacts with and reacts to the product or concept of interest as well as their goals and motivations related to the product. For this project, personas were built around use of the

FCMoD website. Five personas were created, reflecting typical users: students, teachers, parents, grandparents and retirees.

Step 4: Scenarios

The next step established functional specifications and content requirements for the digital content. This step incorporated client feedback and a basic framework of the information to be presented so that the best way to present it could be determined through specifications for the project. With this content, business drivers and system resources were balanced against users' needs in order to create a requirements definition that was viable for all parties involved.

An important part of the requirements definition is scenarios, which describe how the user might use the interface. These scenarios determine whether or not the system provides a good experience and fulfills the goals of the user. Spool (2005) states that to develop scenarios one has to know the users' goals, the process they might use, what information they are going to put into and get out of the system, experience with similar systems, constraints on the user, the user's environment and tools, and the user's relationship to the system.

For this project, five scenarios were developed – one for each persona. These reflect the typical motivations and patterns of feature use of the different created personas. Personas and scenarios can be found in Appendix C.

Step 5: Prototyping

Prototypes are un-refined versions of the final product – sometimes very unrefined (paper representations) and sometimes more refined (the code in nearly final form). The former, called low-fidelity prototypes, are intended as flexible ways to explore design possibilities, but the latter, high-fidelity prototypes, are pared-down versions of the final product which can be used for testing (Sharp et al., 2007). Because it is impossible to prototype everything without just

completing the project itself, Cerejo (2010) recommends prototyping complex interaction and important functionality, particularly the interactions and functionality that will be used most often.

Two prototypes were developed – originally more prototypes were considered, but in light of responsive design and best practices, it was felt that one static prototype and one interactive prototype would be sufficient to develop the recommendations in the client document. In addition to showing the overall design and interactivity of the web application, these prototypes also tested the forms and modes of content used for each section of the application, though they lacked the full implementation, in most cases, that they would require in a released version. Prototype screenshots can be found in Appendix D.

The prototypes were tested against eight potential users. Prototype testing was done in two rounds. Each round used a convenience sample and was done in one of the testers' homes on a laptop on a kitchen table. Testers ranged in age from 10 to 66. For each tester, the researcher sat down with them and the laptop and discussed the context of the web application, and then let them interact with it for as long as they desired.

Step 6: Quality Check and Going Live

Prototypes led to the development of documentation for the Fort Collins Museum of Discovery in the form of a set of detailed guidelines. These guidelines address their audiences, needs, options and plans for pursuing the final development of the interactive feature. This document includes:

- Themes
- Personas and scenarios
- Content type recommendations

- Technology recommendations
- Plans for final implementations
- Designs and source code

A copy of the documentation for the museum is in Appendix E.

RESULTS AND DISCUSSION

This project applied a user experience approach heavily influenced by activity theory in order to develop recommendations for a web application for the Fort Collins Museum of Discovery. Interviews and observations were used to develop project scope and requirements, personas and scenarios were used to develop user requirements, and prototyping contributed to the development of final recommendations for the web application.

Themes from Interviews

The five interviews with key stakeholders were examined for themes across participants in order to identify key barriers, opportunities, needs, and goals according to the stakeholders themselves. This analysis allowed the researcher to ground the project in the perspectives of key decision-makers and contributors to the FCMoD's overall goals and vision.

Analysis revealed three key needs that drove the design of this project:

1. **Need to appeal to a broader audience:** “I think that there's a lot here for adults. I think that a lot of the adults that I see come through the doors and enjoy the museum ... we're all just big kids. Just because we're hands-on doesn't mean we're FOR children.” (Reservation Specialist)
2. **Need to portray the breadth and depth of the museum:** “We want the community to ACTIVELY be cocreating with us, what's in here ... but this idea that the museum can be like the community's living room ... that's really what we want to be.” (Digital Media Director)
3. **Need to illustrate the interactive and dynamic nature of museum:** “I think obviously the most popular exhibits are going to be the hands-on stuff. ... I think it

has to be engaging somehow, almost on a personal level, otherwise why would they care.” (Digital Dome Specialist)

These themes correspond with the problems that the museum faces itself – a need to be fun but deep, a need to be youthful but mature. Trying to manage all of these issues within the scope of one project is not necessarily even possible, but that is why keeping these concerns in mind while going into future steps is so critical: just because those “in the know” see these as issues does not mean their potential and actual audiences do. More quotes from interviews can be found in Appendix A.

Themes from Observation

In order to gain insight about the actual experiences of museum visitors, a series of observations were conducted and analyzed. These observations were examined to identify key patterns in how visitors interact with the existing physical exhibits. Analysis was focused on identifying ways to coordinate visitors’ web experience with actual museum experiences as much as possible. As a result, differences among those of different ages and genders were identified that were used to guide the development of the interactive feature being created in this project.

With the concerns of stakeholders in mind, observation sessions revealed different themes about the actual experience of the museum:

1. **Children willingly interact with exhibits more than adults:** There was guided “guided discovery” happening – adults led children through the exhibits. But children also touched more things and played around more than the adults did. One child said “I don’t want to have to wait for anything.”

2. **Males seem to be more enthusiastic than females:** Male guardians seemed more inclined to help figure out how exhibits worked, whereas female guardians stood back and let the children figure it out. Similarly, male children seemed to engage more readily and run around from exhibit to exhibit more than female children.
3. **Interaction does not always happen in intended or expected ways:** On the wind wall, the weird fans are a large part of the appeal – people put their hands through them out of curiosity. A new exhibit was being put together and it seemed like an exhibit unto itself, with lots of people watching the construction.
4. **Methods of interaction can be hard to determine without help:** It seems that part of the point of the volunteers may be to demonstrate currently empty exhibits – a volunteer was at one and using it and as soon as two girls came up to do the same thing, the volunteer left.
5. **Museum-goers can become overwhelmed easily:** It seems like many people get overwhelmed by how much there is to do, and exhibits are not intuitive enough so that people are afraid to play.

Harkening back to the museum's reputation as a children's museum, children did seem more willing to engage than adults. Why this might be is unclear, but it is clear that project needed to not just seek to engage children, but adults as well. Perhaps because of the STEM angle of the museum, males were more apt to engage, but the predominant gender of the museum-going population did not seem to be skewed one way or the other. Thus, the project needs to not be geared towards one gender or another, but instead be gender inclusive while still being appealing.

Regarding the interaction of users with exhibits, one of the governing concepts of the museum is that of guided discovery. Although some discovery did seem guided, adults and children interacted with exhibits in different ways, with children frequently interacting in unintended ways and adults interacting in the intended ones. Thus, the project needs to encourage both ways of interacting. It also has to be clear how one might interact and what happens when one does, which point four inspires.

Lastly, although there was discussion in one of the stakeholder interviews of making the project a greatest hits of the museum, observation sessions made clear that the application must not overwhelm users – it should be fun and funky but streamlined.

Persona Models Created

The next step, creating personas, allowed the researcher to develop archetypes of users that could then be used to identify key behaviors, needs, attitudes, and perspectives that would guide the design of the interactive feature. Personas are also used to guide prototyping and testing in subsequent steps of this project. As a development tool, personas are generally created from interviews with users, as was done here, and written to reflect a fictional but detailed character that represents specific user types. In order to clarify these user requirements, personas were developed based on who the interviewed museum stakeholders said they wanted to engage, as well as who was demographically represented during observation sessions. Information from interviews informed the emphasis on minorities and teachers, whereas observation of those in the museum added students, female caretakers and seniors to the list. Thus the personas reflect both the stakeholders' goals in target audience for the museum as well as their actual visitors. The personas consist of one child and four types of adults.

Chloe: The Diligent Student

- 10 years old, fourth grader
- Using a standard desktop computer setup, fairly familiar with using a computer, typically supervised by an adult
- Accessing the web application to complete a school assignment

This persona represents a typical young visitor to the museum who is old enough to use a website on her own. She has an interest in the topics addressed by FCMoD, but wants fun and simple ways to interact with a website rather than complex educational material. Learning for Chloe is often concurrent with or even incidental to enjoying the website's games, videos, images, and sounds.

Jada: The Determined Teacher

- 28 years old, elementary school teacher
- Using a laptop with a touchpad, familiar with using a computer for work and play, tech-savvy
- Utilizing the web application as a tool to get others at her school interested in going to the museum

Teachers are an important target market for the FCMoD, not only because they bring classes to the museum, but because they assess the quality and accessibility of the information provided with substantial expertise. This persona has high demands on content as well as entertainment value of web elements, and may use the website to fill in her own gaps in knowledge, or even to plan lessons around content.

Reinaldo: The Resourceful Father

- 42 years old, mechanic and father

- Using a smartphone, familiar with using apps
- Accessing the web application as a way to entertain and educate his children

Parents are another key audience for FCMoD, as they generally are making the decision to visit the physical museum and/or oversee children's use of the website. However, it is vital for the FCMoD to appeal to this group outright, rather than exclusively as accompanying children. This type of visitor offers an opportunity to capture the attention of adults who might otherwise believe the museum is only for children.

Danielle: The Working Grandmother

- 56 years old, business manager and grandmother
- Using a tablet, familiar with using a computer but does not think of herself as tech-savvy
- Utilizing the web application to prepare herself for a visit to the museum with her grandchild

Visitors over 50 are one of the most important audiences of museums in general, and as such drive a considerable volume of business. Although currently many in this age group visit FCMoD with children, the FCMoD website can offer content interacting and accessible to them for their own use. The importance of this group suggests that the web elements must be carefully designed to avoid alienating this set of users and should use common, clear language rather than, for example, internet slang or styles that signal the site is only for younger visitors.

Brian: The Curious Retiree

- 73 years old, retired engineer
- Using a laptop, accustomed to using software
- Accessing the web application to entertain himself and learn more about the museum

Like the Danielle persona, the retiree persona represents an important audience for FCMoD. Web materials can capitalize of this group's interest by offering more in-depth content, links to additional resources, and a wide range of interface types, such as visual, textual, as well as interactive features.

By comparing the requirements of these different audience archetypes, patterns of typical use and user requirements were developed. Overall, this analysis demonstrated that although the web elements needed to include light-hearted and fun elements such as games, they also needed more complex and detailed information for older and more sophisticated users. However, no personas were clearly advanced web users; as a result, all web features need to be clear, easily understood, and have very simple interfaces. These personas led directly into the creation of scenarios.

Scenarios Developed

Integrating the interviews, observations, and personas developed for this project allowed the research to create scenarios that could guide prototype development. Because the range of targeted users is so broad, it was vital to develop a comprehensive understanding of how different types of users approach the interactive features in different ways.

One scenario was created for each persona, detailing their motivation, needs, and requirements in using the product. Incorporating their demographic information and goals, these scenarios outlined activities and interests within the use of the web application.

Chloe: The Diligent Student

- Accesses the web application post-field trip
- Must complete ten tasks and show that she completed them
- Searches purposefully for information

- Spends time, after finishing, on interactive features and animal videos

As a young user, Chloe might be on the FCMoD website as part of an assignment or for her own entertainment. Therefore, specific tasks must be easy to find and complete, but using the various features must also be entertaining.

Jada: The Determined Teacher

- Accesses the web application to do research on expanding her school's interdisciplinary, experiential education options
- Wants a tool that will show them how valuable such a trip would be to students
- Searches web application without specific focus but getting a good idea of what the museum has to offer
- Checks out the games, but gets more in-depth information, which she intends to show to her superiors

As a teacher, Jada's use includes understanding the exhibits, overall atmosphere, and topics of the FCMoD. For her, the scope of the content and the style in which various topics are shown are important. Therefore, the web elements should correspond well with and reflect closely the approach used in exhibits.

Reinaldo: The Resourceful Father

- Wants his children to do well in school, but knows they tend to be more interested in playing than in schoolwork
- Accesses the web application to show his children something educational but fun
- Searches the web application as directed by his child, looking at everything but spending more time on areas with more to interact with

- Spends more time on areas with options for higher engagement and thus more clicking
- Takes advantage of the web application's content to learn more about the issues in the region

Parents, similar to teachers, use web elements to understand both topics and approaches shown in the museum. Important to this group's use is the ability to find needed information as well as engage their children even before they visit the museum. A good balance between educational and entertainment styles and activities is vital for this group.

Danielle: The Working Grandmother

- Accesses the web application in preparation for a visit to the museum with her grandson
- Navigates to the web application from the website's main page, and although she does not typically go for this sort of content, the layout and design make her comfortable using it
- Stays on the application long enough to get a good idea of what the museum has to offer

Central to this group's use is a clear and simple interface that can invite interaction with web elements not generally targeted to their demographic, such as games and videos. Content on the site must also allow these users to access more complex information when desired.

Bryan: The Curious Retiree

- Accesses the museum site and web application after hearing about it through his grandchildren and wanting to pass some time

- Clicks through each section in turn mostly aimlessly, but ends up focusing on areas with text content because it is a medium he is more familiar with
- Shares some of what he learned with his wife, who is also retired, and they consider going to the museum with friends

This group is generally not the target audience for entertainment sites online. As such, care must be taken to communicate that the more light-hearted elements of the web features are not exclusively for children, and make clear how they can teach users about different topics. Both the Danielle and Bryan personas' scenarios emphasize the importance of developing activities and content that is both entertaining and informative via a simple and clean interface.

This sort of thoughtful thinking about how people might actually use the project is invaluable to the process of developing prototypes, because it flags specific things that are integral to the use of particular audiences. Overall, the scenarios emphasize the importance of creating features that coordinate well with the FCMoD's actual exhibits in both style and topic, using a simple and self-explanatory interface, and balancing information and entertainment carefully.

Prototyping

The culmination of the user research and development of personas and scenarios is the creation of a series of prototypes that represent a draft of the actual features to be developed. Prototypes are a chance to get feedback on design, content and interaction decisions before releasing a web product, and allow for more functional feedback than might be garnered just by using analytics after release. For the purpose of this project, two rounds of prototyping (and, consequently, prototype testing) were done, allowing for recommendations to the museum to be more tailored. Feedback from actual users provided insight into the function, appeal, clarity, and

usability of the different elements proposed. Importantly, through this process, detailed notes by the researcher were analyzed to incorporate users own words and responses into subsequent iterations of the design.

Static prototyping

The initial prototype was developed keeping current web design trends and best practices in mind, while making sure the different requirements of the personas and the needs of their use cases were met. As with many design tasks, this proved harder than initially imagined. Just designing for such an age range, alone, required a more flexible style and functionality than more narrowly targeted websites. In addition, planning a cohesive, purposeful experience across multiple devices led the design away from an over-designed, resource-heavy experience and towards a slimmed-down one with less complexity.

The design used large buttons in keeping with the museum's main website graphic design and following the trend of flat design. The color palette, drawing from FCMoD's existing branding, was purposefully gender neutral. The large buttons make the design appear more playful, but have the added benefit of breaking down nicely in smaller screen widths, as well as being large touch buttons on touch devices. In addition, the graphics are not specifically "older" or "younger," creating appeal for a wide range of ages. In the interest of giving affordances to increase the likelihood of interaction, each button had the title of the topic area, an icon to show what content might be expected, and a short description of what sort of content that was (e.g. "slideshow" or "game"). These dual labels provide information that is more appealing for children (e.g., "big backyard") as well as more descriptive text for adult users (e.g., "interactive feature"). It is expected that young children might not understand what some descriptive phrases

mean, but that they would be able to ignore such phrases and still have a sense of what they are clicking on in their exploration of the site.

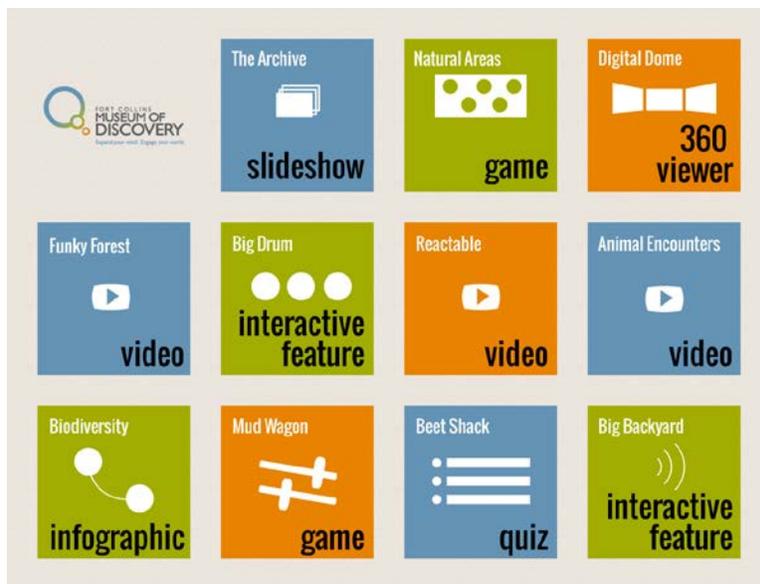


Figure 1. Home screen in the static prototype

Clicking one of the buttons would open up the content in a modal window, or a section that opens up on top of the rest of the content. Per common practice, an overlay opened up over the entire page to set the content off from the home screen. At the top of the modal window is a header that is the same as the one on the button so users can reorient themselves to which button they clicked on. Because adults, particularly older ones, prefer reading content, each content section was designed to have a paragraph of text orienting the user to the content at hand. However, this paragraph is not essential to using the interactive feature. Thus children could ignore the text and still learn about the topic and find it entertaining. After that came the content itself – a slideshow, interactive feature, game, etc. Dummy text and rough visuals of actual content were used, as close coordination with museum personnel in order to get “real” content proved unfeasible.

The Archive was a mockup of a slideshow with a photo and text. Natural Areas was a low-fidelity mockup of a Whack-a-Mole game. Digital Dome was a low-fidelity mockup of a 360° viewer. Funky Forest was a video placeholder. Big Drum was an audio-less mockup of an interactive audio feature. Reactable was a video placeholder. Animal Encounters was a video placeholder. Biodiversity was a simple infographic layout. Mud Wagon was a series of sliders. Beet Shack was a quiz. Big Backyard was an audio-less mockup of an interactive audio feature. Images of each screen can be found in Appendix D.



Figure 2. Big Drum and Mud Wagon in the static prototype

Results of Static Prototype Testing

Feedback from the first round of prototype testing showed that some affordances, or clues to make using an object intuitive (Kaptelinin, 2013), had been appropriately given, but other areas of the design were lacking in clues of use.

It seemed that the myriad of affordances for initial engagement worked as well as might be expected. For example, after scanning the entire page, one older tester initially gravitated towards the clue of content type (e.g. “game”) as a way to determine whether he wanted to click, but then later clicked based on interest in the topic area (e.g. Natural Areas). However, another tester rejected the design immediately, saying that none of it “grabbed her” because there were

no photos, and the words alone were not enough to draw her in. Because of this feedback, the guidelines to the museum will include suggestions of how to incorporate images into the design. For example, an image that displays when the mouse hovers over a square could provide additional information about available activities, as well as generally adding visual interest.

As anticipated, certain demographics were drawn to some types of content more than others. The same tester who initially was unintrigued by the game of Natural Areas did go to The Archive and indicated his intent to navigate through all of the slides, and would also have watched all of the video under Reactable. This might go to support the idea that people are immediately inclined to engage more when the content is in a form they are comfortable with. As a result, the proposed mix of styles and interactive forms was confirmed as an effective way to draw in a wide range of users.

Interactive prototyping

After testing from the first round, an interactive prototype was programmed with HTML, CSS and JavaScript. Eleven different interactive features were programmed, and each included text and content relevant to the museum to make the testing process as close as possible to what an actual web feature would include. These detailed, extensive interactive prototype activities were fully live for testing, and allowed testers to click through them at their own pace and actually use the different media provided. This level of detail in the interactive prototypes was vital to this final stage of testing because it allowed a full understanding of how users interact with different types of features, rather than requiring the researcher to extrapolate use of one medium such as a video to another such as a series of clickable images.

The most obvious differences between the static prototype and the interactive prototype are the changes to particular content types that had to be made based on the feasibility of

developing many types of content without going through a long development cycle – for example, the 360° viewer became an embedded space viewer – and turning what had been placeholder content into more high fidelity versions as with the whack-a-prairie-dog game. The Archive was a functioning slideshow. Natural Areas was a click-through demo of the Whack-a-Prairie-Dog game with actual graphics. Digital Dome was an embedded space viewer from SkySurvey.org. Funky Forest was a video from Minute Earth. Big Drum was an interactive audio feature which played different drum sounds upon clicking different areas. Reactable was a video from Veritasium. Animal Encounters was a video from AnimalWonders Montana. Biodiversity was a bar graph with pictures. Mud Wagon was a series of sliders. Beet Shack was a quiz. Big Backyard was a series of animal photos that played animal noises upon click.

The static prototype testing also showed that the modal windows’ status as content that popped up, and consequently ways to exit from them, needed to be made more clear, so the modal window was made smaller to show that it overlaid the page, and a large “close” button was added at the bottom.



Figure 3. Natural Areas and Digital Dome in the interactive prototype

Results of Interactive Prototype Testing

Analysis of the field notes taken during interactive prototype testing revealed that overall, the proposed web features were very appealing and easy to understand for users. Results from interactive prototype testing were much more fruitful than static prototype testing because testers interacted more readily with the more familiar user controls. In a few cases, users did not know what to expect from a section, or did not understand what the section was supposed to entail because of lack of full implementation and adequate help text. This process highlighted the types of information users needed to understand the interactive features and highlighted the places on the page users looked to answer their questions.

Users scanned the page first before clicking on things, but many noted that they might not know what a section was. One of the ten-year-old testers pointed to the Biodiversity/infographic section and said “I don’t even know what that means.” A middle-aged tester said that she avoided sections like Reactable because all she knew about it was that there was a video, but clicked on Animal Encounters because, while it would also be a video, she knew what to expect it to be about. Because of this, future versions of the project would benefit from implementing the hover-photo effect – showing the photo when the button is interacted with – as considered after the static prototype testing, from creating better clue icons, or from renaming sections from what they are referred to by the museum to what might resonate with users who know nothing of the content. Indicating what sort of content was contained in a section definitely seemed valuable to users. The ten-year-old testers gravitated towards the game and quiz sections immediately, but avoided every one of the video areas. One older tester said out loud what the type of content was before clicking a section, making it clear that she was clueing into what the types of content were as part of her inclination to interact.

Once the modal windows were open, interactions with content varied based on age, interest in the topic and comfort with the content type. Testers who were 40+ in age immediately gravitated towards reading the text. One twenty-something user read the text if she was interested in the topic, as in Funky Forest, but disregarded it in areas where she immediately understood the content, as with the quiz in Beet Shack. One ten-year-old-tester read the text, but only if she was confused as to how the content type worked, as with Natural Areas' Whack-a-Prairie-Dog game and Mud Wagon's Pack Your Wagon game. This suggests that for young users, some instructions are helpful, but adult users look to descriptive text to learn more. This dual appeal corresponds well with the need identified in persona and scenario development for different levels of information for different types of users.

Some areas seemed almost universally popular, whereas other areas were disregarded almost entirely. Big Drum and Reactable were largely ignored, perhaps because their labels were less clear. Big Backyard was universally liked – possibly because people knew they would be getting something involving outdoors, and then because there were things to interact with over and over again that were fun and funny. It merits noting that everyone laughed at the angry chipmunk noise, regardless of age or gender, so perhaps no one is too old for cute, funny content. This suggests that interactive features do not all need to reflect a serious, “mature” approach to the information, but instead can use more typically youthful styles without alienating older users.

Many testers were intrigued by Mud Wagon and Natural Areas, but because they lacked full implementation (the Mud Wagon sliders slid, but there was no response mechanism built, and the Whack-a-Dog game looked like a game and allowed clicking, but was not actually a full game) many users were confused as to if they were actually doing it right, so they were reminded that they were doing fine and it was just a prototype. Unlike other videos, the Funky Forest video

that was used – one by Minute Earth on YouTube – was popular and watched by half of the testers. Unlike the Animal Encounters video, whose section got clicked on but it itself did not get played, the Minute Earth video got played by everyone who opened that section, perhaps because it was shorter and perhaps because it was an animated video and not live action. This result emphasizes the importance for both younger and older users of interacting with short videos and other content in interactive features. It also suggests that even those interested in learning more about a given topic are moving quickly through the content and respond well to shorter experiences. Overall, these results indicate the importance of moving forward in testing with real content and more fully implemented features in order to more accurately gauge user responses.

Recommendations

Given the interviews, observations, personas, scenarios, prototypes and prototype testing, recommendations for next steps were developed. The recommendations fall into three categories: content type, technology and implementation. A more technical description of these recommendations is available in the Client Document, the ultimate project deliverable, in Appendix E.

Content Type Recommendations

Currently the project features videos, a slideshow, two games, several interactive features, and an infographic. These are the core types of features developed based on collaboration with the FCMoD. Other types of features could be developed in different topic areas, as well. Furthermore, content could later be added for other exhibits or to drill down into particular areas of the museum. The interface as a whole could also be gamified, but this is not recommended.

Because the museum is so interactive, switching out less interactive content like the Biodiversity infographic and the videos would be more indicative of the dynamic nature of the museum itself. Instead, other interactive features could be added, including interactive charts and graphs. A section that allowed for user-submitted content or actively user-modified content would also be in line with the goals of the museum, although that type of feature is more complex for programmers, museum staff and users and is recommended for use with caution.

This iteration of the project has a strong reliance on audio capabilities – both for the videos and for interactive features such as “Big Drum” and “Big Backyard.” Although this is part of what makes those interactive features special, users do not always have audio availability due to different devices and viewing situations. As such, it is recommended that content that does not require such audio capabilities be emphasized, though audio-rich content types should still be used when the content is meaningful.

Gamification, or the practice of making things more game-like and thus more fun, is popular when building interfaces that inspire lifestyle changes – with exercise applications, for example – but it would probably not behoove this web application. For one, the content itself is already novel, which is one of the benefits of gamification. Also, it might serve to make things more difficult to use, particularly with older audiences (Koivisto & Hamari, 2014). However, the social aspect of gamification – sharing progress and what one is doing, might merit adding. In either case, it merits persona testing.

Technology Recommendations

Technology recommendations for this project include a variety of JavaScript libraries, jQuery plugins and CSS frameworks that would provide needed functionality, increased scalability, or an enhanced user experience in future versions.

In order to complete the interactive prototype, normalize.css, Modernizr, Flexslider and jQuery UI were used. Normalize.css and Modernizr aid in making designs browser friendly and consistent across browsers. FlexSlider was used in the interactive prototype of this project for “The Archive,” and is a quick and convenient way to do responsive slideshows. jQuery UI has a host of different widgets and interactions available, and the slider widget was used in the interactive prototype of this project for “Mud Wagon.”

Given the devices used by personas, as well as current best practices, the final version of the web application needs to be fully responsive to a wide range of scenarios and devices. FitVids.JS and FitText, in particular, would make responsive iterations of this project easier to complete. FitVids.JS is used to help make the typically difficult-to-work-with iframes for videos responsive. FitText would be helpful in scaling header sizes appropriately in smaller screen sizes widths. Additionally, Magnific Popup would be an alternative to the hand-written modal windows in the interactive prototype because it is easily responsive both to content size and to screen size.

It is unreasonable to assume that the graphic design of this project will always be what the museum needs or even fit its branding. Masonry and Metro UI CSS could help revamp the home screen, in particular, for future versions. Masonry is a popular framework for grid layouts that does not assume standard heights across elements in order to work. Metro UI CSS is a comprehensive set of styles and JavaScript to help facilitate flat design, and might also be used in a redesign of the home screen interface as well as some of the modal window elements.

This project was designed to be flexible and allow for changing out content and adding new content. Angular JS, CSS 3D Flip Box, jQuery UI and D3.js can all aid in that goal. AngularJS is frequently used in the creation of web applications, and would make this project

more scalable to allow easier additions of content to future iterations. CSS 3D Flip Box makes html content appear to flip different directions and could be used in the creation of future content types, or to make the already-existing buttons appear more dynamic. jQuery UI, used in the interactive prototype, has interactions like draggable and droppable and widgets like tooltip could be used in future content types. D3.js is excellent at data visualization and could be used in the creation of future content types to create interactive charts and other graphics.

Implementation Recommendations

Though this prototype is quite functional, there are still numerous steps that need to be taken before implementation.

The first and most important is to fully implement responsiveness. The design of the home screen is natively responsive, but the modal windows and the content within them – particularly the embedded content – need more work before they will be properly responsive for all screen sizes. JavaScript and CSS also needs to be cleaned up and minified before release in order to decrease load times and HTTP requests.

Affordances for each section's button should also be improved. Representative photos for the content of each section, to show when the button is hovered over or focused, should be included to draw in audiences who do not connect based on the icons and the text labeling. Those text labels for each section – whether the name of the topic or the name of the content type – and the icons themselves should also be more closely considered.

In order to fully capitalize on the work of this project, further testing in-house of particular content areas against particular personas would be beneficial. Because of the wide audience of the museum, the prototype testing group is not necessarily representative of all of the museum's audiences.

Because of the section-based design, this project can be released as each individual content area is finalized. Sections can also be added as additional content is identified and developed.

Answers to Research Questions

RQ1: What forms or modes of content are most engaging to users?

This research question was answered through prototyping, and the simple answer is that a style that has sufficient visual and audio appeal while maintaining a clear and simple interface is important to all users. The variety in mode tested here was very successful, suggesting that one or two types of interaction are not sufficient to reach the very different audiences of the FCMoD. The appeal of specific areas is more dependent on demographic, and therefore a range of content types is vital to integrating these interactive features. For example, young users accustomed to playing games were more intrigued by that content, whereas older users who are more accustomed to reading than games seemed to focus on more traditional forms of content, like slideshow and video. However, in both cases, an interest in the topic seemed to override any turn-off or turn-on to a particular form of content, showing that while good design gives access to and encourages engagement with content, design and content cannot exist independently of each other. Overall, users engage more in content that is comfortable and familiar to them.

It would be beneficial to test this more thoroughly with actual content from the museum, and more fully fleshed-out features to negate any off-putting effects an incomplete experience might have resulted in – when interactions do not occur as one expects, it can color one’s entire experience with a technology. In order to properly fully test this question it would be valuable to test all the different forms of content in regards to the same topic. More quantitative testing, such as eye-tracking, might also be valuable to make up for what prototype testing lacks in rigor as a

method because it would show how users are actually scanning the page before they click on a section.

RQ2: How can the user experience approach be applied to a small-scale education/entertainment web application?

User experience is an ideal approach for developing a web application, even one that is small and “edutainment” oriented. User perspectives, language, reactions, and interests are key aspects of engagement for websites, and basing design on user experiences allows designers to integrate the needs of actual users into the process.

During the course of this project, it became clear why user experience is a focus of so much of the user-facing information technology industry. Data gleaned in this process had a direct effect on the requirements and implementation of the project. Qualitative analyses are very effective for understanding participant perspectives and language, and they help researchers avoid preconceptions that could hinder the product from satisfying the needs of actual users. Indeed, this approach helps determine if those requirements are, in fact, requirements. Furthermore, it helps one imagine the users complexly while still keeping the scope of the project in mind. For example, fully conceptualizing the potential users through personas helped design to their needs and wants, and prototype testing confirmed or denied whether or not designing to their needs and wants had actually been successful, as well as helped identify unforeseen issues and interests.

RQ3: How can the methodology associated with activity theory be applied to a small-scale education/entertainment web application?

To fulfill the requirements of this web application for FCMoD, activity theory was not well-suited to a small-scale, entertainment oriented project. Activity theory, when implemented

as part of a project, is more suited to the design of artifacts integral to the daily functioning of a user because it supposes a high level of human intentionality and investment in the work being done with the technology being studied. A set of interactive features on the FCMoD website were envisioned by stakeholders as a supplement, or additional value, added to the core site, as revealed in the stakeholder interviews. This was part of why domain models were initially proposed and later eliminated – creating them supposed a much grander system than was actually being developed.

However, activity theory is quite useful for understanding users' engagement with the content and understanding how their engagement is relevant to the larger cultural relevance of the museum – a relevance which was not necessarily central to this project. For example, Nardi (1996) talks about the importance of mediation in human experience, and museums are certainly a form of mediation – a media-based museum even more so. Future research on the museum as a whole, including their exhibits and overall position in the community, could benefit from approaches that draw more heavily on activity theory.

RQ4: What are the similarities and differences between the user experience approach and the activity theory methodology?

Both user experience and activity theory are qualitative and ground-up, but vary in terms of applicability. User experience and the use of it as a framework for project discovery, design, and development is frequently used in web development projects. Activity theory, on the other hand, is more of a meta-theory and tends towards being more general and addressing broader issues than those specifically addressed in this project. Thus it does not provide as much guidance for details and nuances in the development of specific web elements as UX does.

While writing the initial proposal, activity theory seemed appropriate to pair with UX, but in practice, and in actually developing and implementing a methodology, lack of compatibility in terms of actual usability emerged rapidly. Though many of the same tools are used for understanding the requirements of users and the system, activity theory's implementation strives for such a level of granularity – by breaking each activity down to its smallest components – that it is difficult to obtain actionable guidelines. In this project, one specific difficulty was with domain models. Activity theory emphasizes domain models to conceptualize overall use of a website. Domain models are concerned with how stakeholders and users are connected to each other and to the technology, but for this sort of project, this approach did not focus tightly enough on individual elements in the design process, such as layout, use of images, or types of interactivity to be used, instead focusing tightly on peripheral issues which, while interesting, did not help implement the project.

The standard UX method was extremely effective for this project, on the other hand. Furthermore, implementation of different steps of the method seemed different depending upon whether the approach was more UX- or AT-based, with UX being more focused on implications for practice whereas AT approaches to steps seemed more esoteric and less immediately applicable.

Activity theory seems to be ideal for developing a system that might change how someone does work; UX seems to be ideal for just about everything, whether workflow-related or not. Activity theory is excellent for placing a project within a larger scope of culture – it looks at personal perceptions and how they fit into a larger system, which in terms of researching the effect of a project could be invaluable. However, for working in a project while in the field, there is no question as to why user experience has become the guiding framework that it is.

As such, it is recommended that for purposes of project development, the user experience approach be used. However, for determining the value of a project within a larger context, activity theory merits consideration.

CONCLUSIONS

This project started with a goal of creating a web application that would engage a wide range of users with different types of content. The driving interest was to identify which types of content engaged people the most. The final deliverable of the project was a Client Document that summarized themes from interviews and observations, identified personas and scenarios, presented static and interactive mockups, and listed overall recommendations for development and implementation of interactive elements to be added to the FCMoD website.

This project used a six-step process to build insight and focus the design recommendations based on interviews with stakeholders, observations of museum visitors, development of personas and scenarios, and eventual prototype testing with a range of users. Interviews determined needs of the museum and what sort of content and interactions they were interested in having in the web application. Observations helped create an understanding of the potential users of the web application, how they interact with content, and what sort of content they might be interested in. Personas created a summary of typical needs for different audience types. Scenarios provided specific use cases upon which to base interface and other design decisions. From analyses of these four steps, a static prototype was created and tested, then refined into a high fidelity interactive prototype, which was also tested with users. Feedback from prototype testing resulted in recommendations for the final project that were put into the Client Document (Appendix E).

Inferences

An assumption going into this project was that people would be more interested in interacting with types of content with which they were familiar, and that was certainly shown to

be the case. However, prototype testing showed that interest in a topic can override some turn-offs that might come about based on a content type. In other words, if people are interested in a topic, they might interact with the content regardless of whether or not the content type is one with which they are accustomed to interacting. It also showed that a lack of interest in a topic, but an interest in the type of content might still drive interaction with the content. This suggested that both content and form were effective entry points for user interaction with the web elements created. Regardless, however, the content has to be well- and fully-implemented, or it might confuse and disengage users regardless. This has interesting implications for groups other than the museum who might be trying to educate different audiences – if it is a topic that the audience knows and likes, the way of presenting the information is much less critical than if it is a topic the audience may not feel comfortable with, in which case they need to be pulled in with the interaction and made comfortable with it that way.

Next Steps

There is much work that could be done in order to fully capitalize on the work of this project. For release, the next steps for this project are to fully implement responsiveness, finish implementation and to clean up CSS and JavaScript files.

This project also would benefit from committing fully to the user experience approach to web design and development without being concerned about using activity theory as well, and it is recommended that UX be the focus of development moving forward. Focusing on user experience is a well-established way to create new front-end experiences and redesign old ones, and professionals in the field have written extensively about how to create good user experiences from concerns like Hick's Law to storytelling to form design (Smashing Magazine, 2012).

Further testing in-house against particular personas would be beneficial. As the museum is trying to appeal to a broader audience, doing user research on each of their audience segments and determining what the best experience for them would be in the museum, in the website and in the web application itself would be valuable for them. Because of the wide audience of the museum, the prototype testing group was not necessarily representative of all of the museum's audiences.

Iterative prototyping of future content types will be invaluable in the expansion and maintenance of the web application. This would also allow for testing content types not currently present in the prototype – specifically things such as interactive charts and graphs as well as user-generated and more gamified content areas. This sort of testing could also show whether the currently existing content types are really the best for each topic area – e.g. is Reactable best exhibited through a video? Is a game the most indicative of the content of Natural Areas?

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APPENDIX A: SELECTED QUOTES FROM INTERVIEWS

Digital Media Director

“We want the community to ACTIVELY be cocreating with us, what's in here, so as I said that's really aspirational, and that's going to take some time to build, but this idea that the museum can be like the community's living room ... that's really what we want to be.”

“Obviously, people love ... the hands-on stuff, I mean, people learn in all sorts of different ways, some people learn best that way, that we talk about planned discovery which is coming in and figuring something out on your own.”

Digital Dome Specialist

“I think obviously the most popular exhibits are going to be the hands-on stuff. ... Music and Sound is the most popular area, and I think it's because of all the hands-on stuff that they just touch and feel and do and I think that's really important. I think it has to be engaging somehow, almost on a personal level, otherwise why would they care.”

Reservation Specialist

“I think that there's a lot here for adults. I think that a lot of the adults that I see come through the doors and enjoy the museum ... we're all just big kids. Just because we're hands-on doesn't mean we're FOR children.”

“The little kids, they love the hands-on stuff, anything that they can get into and touch they love it. A lot of kids like the stuff to do with the animals, so the biodiversity wall ... just anything animal-wise they seem to gravitate towards. For our older audience, they really appreciate all the artifacts.”

Marketing Director

“We don't do a really great job of telling a story of the museum, and, you know, what you can find here and all the different levels of exploration that can happen here. And there's kind of a fine line because you don't want people to get the whole museum experience without having to walk through the door, but it needs to show it enough that it's a hook to bring people in.”

Associate Director

“When we say 0-100 for our target audience, unfortunately that's really what it is, which makes it tough to kind of manage, so I think the website has been a reflection of ‘let's try to do something where it looks engaging but it doesn't look like a kid museum so it looks a little bit more refined.’”

APPENDIX B: SUMMARY OBSERVATION NOTES

Children are actively engaged in exhibits. Parents are either only idly engaged, engaged as a way to engage their children, or completely unengaged. Perhaps it is due to “children’s museum” stigma? However, some children seem to be lost without adult supervision. Maybe regardless of age people are just scared to play – is it a sign of vulnerability to just have fun? Conclusion: project needs to promote as active engagement and curiosity in adults as in the children.

In addition to engaging actively, children interact with exhibits in – what one might assume to be – unintended ways. Adults tend to interact with more complex exhibits and in the intended fashion. Conclusion: project needs to be sophisticated but playful, with clear ways to interact but also hidden Easter eggs.

Boys seemed to be more enthusiastic about interacting and exploring than the girls, frequently striking off on their own instead of staying in packs. Likewise, fathers seemed to help children engage with exhibits more than mothers did. Conclusion: project needs to make females and males both feel comfortable using it.

Some things seem to be more engaging than others, but perhaps it is mostly because some things are actively getting used by other people – have to be able to see the coolness. Indeed, it seems like some volunteers are there purely to spur interest in particular exhibits. Part of this likelihood to interact might be because children, in particular, do not read directions, they just go for it. Conclusion: project must make it clear how to interact and what happens when one does interact.

The museum has a lot of content, but it seems like children and adults alike are not necessarily sure where to go. There seems to be a lot of getting overwhelmed, and perhaps the 'guided discovery' is not guided enough, which is why it is such a communal experience for families. Conclusion: streamline project so it is easy to figure out what there is to interact with, minimizing overstimulation.

APPENDIX C: PERSONAS AND SCENARIOS

The Diligent Student



Name: Chloe

Age: 10

Job Title: student

Education: 4th grader

Environment: at home on the family computer. Has access to a medium-sized monitor and a mouse.

Technical Expertise: familiar with using a computer and the Web for basic entertainment, also some familiarity with Word for school assignments. Typically supervised by an adult.

Goals: complete a school assignment

Scenario: After a field trip to the museum, Chloe has a follow-up assignment to get specific answers from the museum website. She has a series of 10 tasks which she has to complete and answer questions about thoughtfully. She searches purposefully for what she needs, informed slightly by what she retained from her museum visit. Once done with her actual work, she spends most of her time on the very interactive features, but also spends some time consuming animal-related content.

The Determined Teacher



Name: Jada

Age: 28

Job Title: Elementary school teacher

Education: Master's in Education

Environment: On her work laptop. Always uses a small screen, frequently only has access to a touchpad to navigate.

Technical Expertise: familiar with using computers and the Web for professional tasks and for entertainment. Tech-savvy.

Goals: Inspire interdisciplinary efforts at her school by exposing administration to what the museum does

Scenario: Jada is interested in interdisciplinary, experiential education and is trying to persuade the administrators at her school to shell out the money to go see the museum. She wants a tool that will show them how valuable such a trip would be to students. Her time on the application is spent getting a good idea of what the museum has to offer, and how it's different from other experiences the students might have. She checks out the games, but also spends time on the videos and slideshows, getting more in-depth information, which she intends to show to her superiors.

The Resourceful Father



Name: Reinaldo

Age: 42

Job Title: Mechanic, Father

Education: High School diploma

Environment: At home on his smart phone, flanked by his two children. Small screen with only touchpad capability.

Technical Expertise: familiar with using apps and browsing the web on his phone, though he sometimes has difficulties managing the screen

Goals: Help entertain his children and educate them outside of the constraints of school

Scenario: Reinaldo wants his children to do well in school, but knows they tend to be more interested in playing than in schoolwork. They also frequently like borrowing his phone to play games, since they are not yet old enough to have their own smartphones. He prompts them to go to the museum website, which he heard about through a friend. He “drives” while the children guide him through the web application. Together they click on everything, spending more time on areas where there are more chances for engagement, and thus more clicking. While there, he also takes advantage of the web application’s content to learn more about the issues in the region.

The Working Grandmother



Name: Danielle

Age: 56

Job Title: Business manager, Grandmother

Education: Bachelor's in Business

Environment: At home on her tablet, with which she occasionally uses a mouse and keyboard.

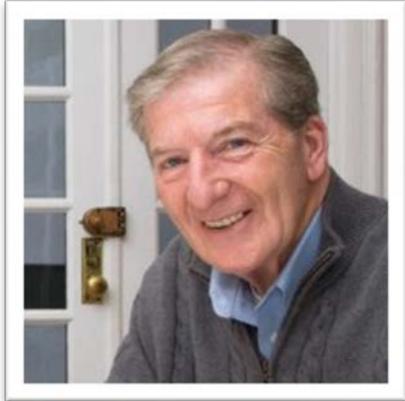
Technical Expertise: accustomed to using the Web and

other standard programs for work, but does not think of herself as tech-savvy

Goals: Prepare for a visit to the museum with her grandchild this weekend

Scenario: Danielle is on grandchild duty in a few days, and wants to retain her reputation as being totally cool in her grandson's eyes. Danielle has not been to the museum before, always imagining it to be a children's museum, but now that she has a child to go with, she wants to know what to expect when she is there. She navigates to the web application from the museum site's main page. She doesn't think of herself as tech savvy or a gamer, but the design of the application makes her feel comfortable using it. She stays on the application long enough to get a good idea of what the content is and to determine that in fact the museum is a good, interactive place to take a kid on a weekend afternoon before getting back to her other work.

The Curious Retiree



Name: Brian

Age: 73

Job Title: Retired Engineer

Education: PhD in Engineering

Environment: At home on his laptop. Always uses a mouse or has a terrible time navigating.

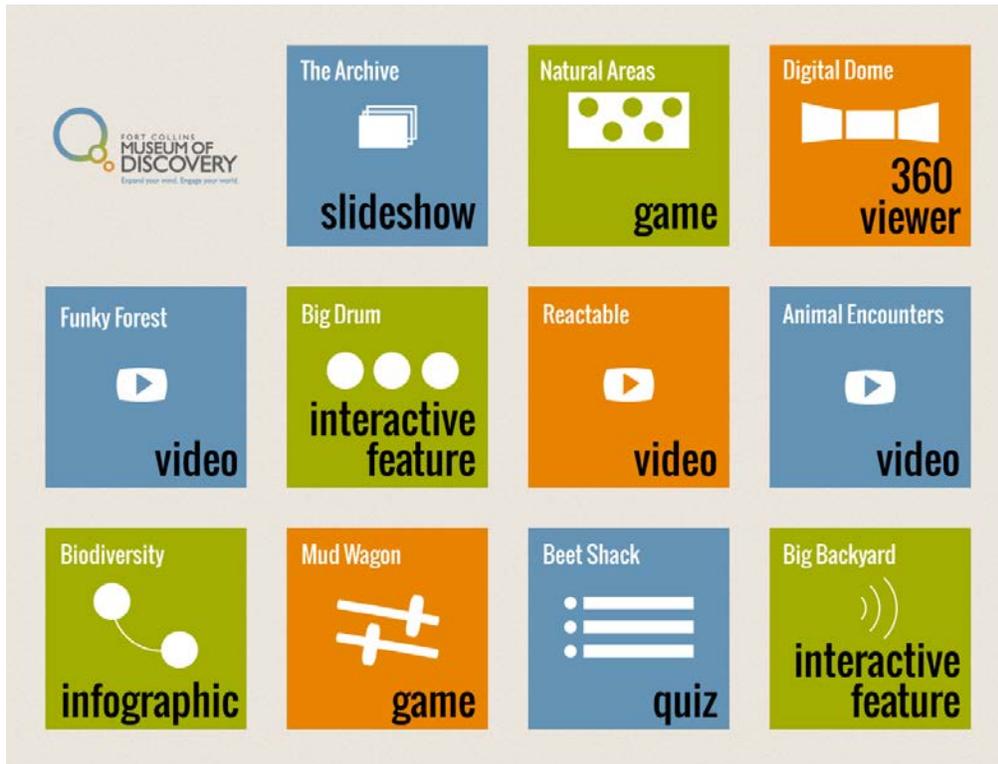
Technical Expertise: Not as tech-savvy as he would like to be, but working on it. Accustomed to using computer software, and learning to navigate the Web more effectively. Gets baffled by how things work occasionally.

Goals: entertaining himself and learning more about the museum

Scenario: Brian heard about the Fort Collins Museum of Discovery through his grandchildren and wants to find out more about it, while also passing the time. He pulls up the site while sitting on the couch on his laptop. He slowly pokes around at things. His initial experience is mostly aimless, clicking through each section in turn, but he ends up focusing on areas with more readable content because it is a medium he is more familiar with. He later shares some of what he learned with his wife, who is also retired, and they consider going to the museum with friends.

APPENDIX D: PROTOTYPES

Static Prototype Screenshots



The Archive

Words words wordsiness for the old folks. I thought all children despise effort and enjoy cartoons. I'm a comfortador also. Can't call to mom, can't say a word. No, Angel, it's not you. The only time you were ever at peace in your whole life was when you were dead. Love keeps her in the air when she ought to fall down. She alone will stand against the vampires the demons and the forces of darkness. Start with the part where Jayne gets knocked out by a ninety-pound girl, 'cause I don't think that's ever getting old. Freedom is life's great lie.



Windmill

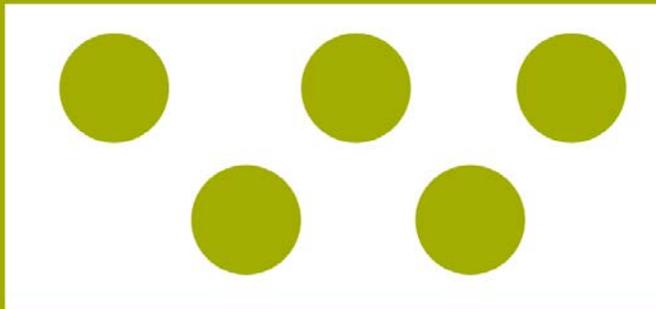
My Uncle Rory was the stodgiest taxidermist you've ever met by day. Well, a gathering is brie, mellow song stylings; shindig, dip, less mellow song stylings, perhaps a large amount of malt beverage; and hootenanny, well, it's chock full of hoot, just a little bit of nanny. Seems odd you'd name your ship after a battle you were on the wrong side of. It was like the Heimlich, with stripes!

<<

>>

Whack-a-Prairie-Dog*

Words words wordsiness for the old folks. I thought all children despise effort and enjoy cartoons. I'm a comfortador also. Can't call to mom, can't say a word. No, Angel, it's not you. The only time you were ever at peace in your whole life was when you were dead. Love keeps her in the air when she ought to fall down. She alone will stand against the vampires the demons and the forces of darkness. Start with the part where Jayne gets knocked out by a ninety-pound girl, 'cause I don't think that's ever getting old. Freedom is life's great lie.



*no critters will be harmed by playing this game

Digital Dome

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Funky Forest

Words words wordsiness for the old folks. I thought all children despise effort and enjoy cartoons. I'm a comfortador also. Can't call to mom, can't say a word. No, Angel, it's not you. The only time you were ever at peace in your whole life was when you were dead. Love keeps her in the air when she ought to fall down. She alone will stand against the vampires the demons and the forces of darkness. Start with the part where Jayne gets knocked out by a ninety-pound girl, 'cause I don't think that's ever getting old. Freedom is life's great lie.

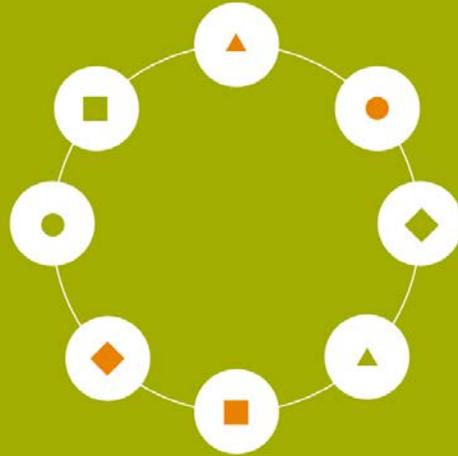
Clever section title



Big Drum

Words words wordsiness for the old folks. I thought all children despise effort and enjoy cartoons. I'm a comfortador also. Can't call to mom, can't say a word. No, Angel, it's not you. The only time you were ever at peace in your whole life was when you were dead. Love keeps her in the air when she ought to fall down. She alone will stand against the vampires the demons and the forces of darkness. Start with the part where Jayne gets knocked out by a ninety-pound girl, 'cause I don't think that's ever getting old. Freedom is life's great lie.

Clever section title



Reactable

Words words wordsiness for the old folks. I thought all children despise effort and enjoy cartoons. I'm a comfortador also. Can't call to mom, can't say a word. No, Angel, it's not you. The only time you were ever at peace in your whole life was when you were dead. Love keeps her in the air when she ought to fall down. She alone will stand against the vampires the demons and the forces of darkness. Start with the part where Jayne gets knocked out by a ninety-pound girl, 'cause I don't think that's ever getting old. Freedom is life's great lie.

Clever section title



Animal Encounters

Words words wordsiness for the old folks. I thought all children despise effort and enjoy cartoons. I'm a comfortador also. Can't call to mom, can't say a word. No, Angel, it's not you. The only time you were ever at peace in your whole life was when you were dead. Love keeps her in the air when she ought to fall down. She alone will stand against the vampires the demons and the forces of darkness. Start with the part where Jayne gets knocked out by a ninety-pound girl, 'cause I don't think that's ever getting old. Freedom is life's great lie.

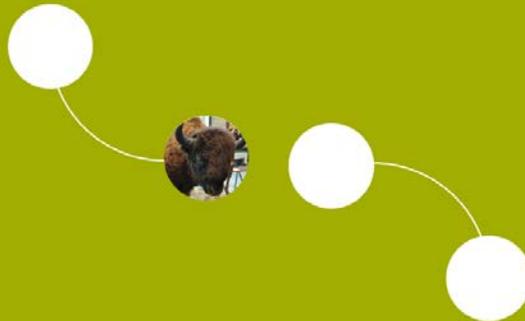
Clever section title



Biodiversity

Words words wordsiness for the old folks. I thought all children despise effort and enjoy cartoons. I'm a comfortador also. Can't call to mom, can't say a word. No, Angel, it's not you. The only time you were ever at peace in your whole life was when you were dead. Love keeps her in the air when she ought to fall down. She alone will stand against the vampires the demons and the forces of darkness. Start with the part where Jayne gets knocked out by a ninety-pound girl, 'cause I don't think that's ever getting old. Freedom is life's great lie.

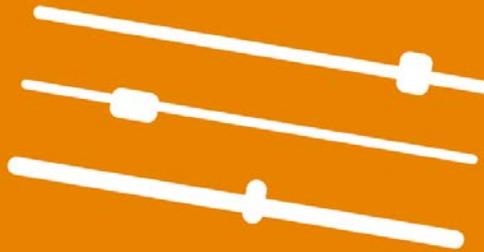
Clever section title



Mud Wagon

Words words wordsiness for the old folks. I thought all children despise effort and enjoy cartoons. I'm a comfortador also. Can't call to mom, can't say a word. No, Angel, it's not you. The only time you were ever at peace in your whole life was when you were dead. Love keeps her in the air when she ought to fall down. She alone will stand against the vampires the demons and the forces of darkness. Start with the part where Jayne gets knocked out by a ninety-pound girl, 'cause I don't think that's ever getting old. Freedom is life's great lie.

Pack your wagon!



submit >>

Oops, that doesn't balance!

Beet Shack

Words words wordsiness for the old folks. I thought all children despise effort and enjoy cartoons. I'm a comfortador also. Can't call to mom, can't say a word. No, Angel, it's not you. The only time you were ever at peace in your whole life was when you were dead. Love keeps her in the air when she ought to fall down. She alone will stand against the vampires the demons and the forces of darkness. Start with the part where Jayne gets knocked out by a ninety-pound girl, 'cause I don't think that's ever getting old. Freedom is life's great lie.

Clever Quiz Title

Woman, you are completely off your nut. Since when do they have orgies, and why aren't I on the mailing list? Don't be ridiculous. Martha Stewart isn't a demon. She's a witch.

- It's getting eerie, what's this cheery singing all about?
- Instead you go all Dumbledore on me.
- So we'll integrate non-progressional evolution theory with God's creation of Eden.
- What do they need such good eyesight for anyway?

Since when do they have orgies, and why aren't I on the mailing list? Don't be ridiculous. Martha Stewart isn't a demon. She's a witch.

- You haven't seen my drawer of inappropriate starches?
- Say, aren't you leaving a hole in the middle of some soggy group hug?
- So we'll integrate non-progressional evolution theory with God's creation of Eden.
- What do they need such good eyesight for anyway?

submit >>

Big Backyard

Words words wordsiness for the old folks. I thought all children despise effort and enjoy cartoons. I'm a comfortador also. Can't call to mom, can't say a word. No, Angel, it's not you. The only time you were ever at peace in your whole life was when you were dead. Love keeps her in the air when she ought to fall down. She alone will stand against the vampires the demons and the forces of darkness. Start with the part where Jayne gets knocked out by a ninety-pound girl, 'cause I don't think that's ever getting old. Freedom is life's great lie.

Clever section title



Critter name



Critter name



Critter name

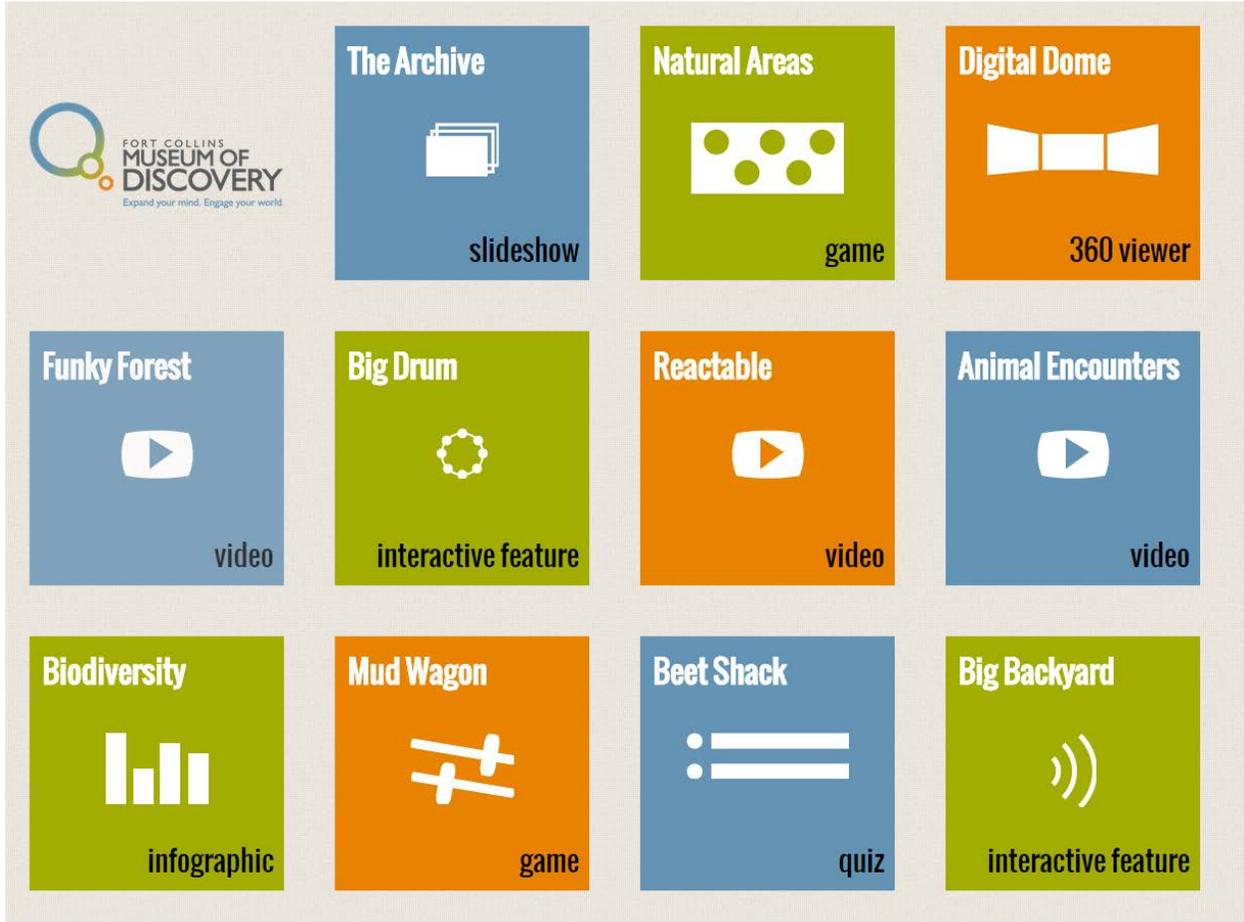


Critter name



Critter name

Interactive Prototype Screenshots



The Archive

Natural Areas

Digital Dome

The Archive

Some words about how very awesome and interesting The Archive at the museum is, and how you can go to visit. Also some text on how below is a sampling of photos and objects from The Archive. Now some lorem ipsum to fill space: I'll tell you what, then: don't...step on any butterflies. What have butterflies ever done to you? Allons-y! Please, when Torchwood comes to write my complete history, don't tell people I travelled through time and space with her mother! I'm Dr. James McCrimmon from the township of Balamory. I'm the Doctor, I can save the world with a kettle and some string! And look! I'm wearing a vegetable!



The Fair

Text about the fair, and lorem ipsum: It's a bit more exciting when you go the other way. Your hips are fine, you're built like a man! Soon, I expect. Or later. One of those. Shut up! Just shut up, shut up, shut up, shuttity up up up! Well, you're very similar heights. Maybe you should

wear labels. Clara, I'm not your boyfriend. I never said it was your mistake.

Search the archive

>>

[Close]

Funky F

Biodive

infographic

game

quiz

interactive feature

Natural Areas

Some text about the Natural Areas part of the museum, and how prairie dogs and black-footed ferrets are kind of a big deal. Also some text about how to play the game, and some cute stuff about no critters getting harmed. Now some lorem ipsum to fill space: Yeah? Well I'm the Lord of Time. Aw, I wanted to be ginger! I've never been ginger! And you, Rose Tyler! Fat lot of good you were! You gave up on me! Ooh, that's rude. Is that the sort of man I am now? Am I rude? Rude and not ginger. I don't want to go.

Whack-a-Prairie-Dog



[Close]

Funky F

Biodive

infographic

game

quiz

interactive feature

The Archive

Natural Areas

Digital Dome

Digital Dome

Some text about the Digital Dome and what sort of content it has, then some text about what this spiffin' iframe below has in it. Lorem ipsum: There was a war. A Time War. The Last Great Time War. My people fought a race called the Daleks, for the sake of all creation. And they lost. We lost. Everyone lost. They're all gone now. My family. My friends. Even that sky. What? What?! WHAT?! People assume that time is a strict progression of cause-and-effect... but actually, from a non-linear, non-subjective viewpoint, it's more like a big ball of wibbly-wobbly... timey-wimey... stuff.

Scope out the galaxy in style



[Close]

Funky F

Biodive

infographic

game

quiz

interactive feature

The Archive

Natural Areas

Digital Dome



Funky Forest

Some words about ecosystems to introduce the video below because that sort of thing is muy importante. Lorem ipsum: I never know why. I only know who. There's something that doesn't make sense. Let's go and poke it with a stick. No. You're too short and bossy, and your nose is all funny. Come along, Pond! Geronimo! Father Christmas. Santa Claus. Or, as I've always known him, Jeff. Overconfidence, this, and a small screwdriver. I'm absolutely sorted. You are the only mystery worth solving.

Learn from Minute Earth



[Close]

Funky F

Biodive

infographic

game

quiz

interactive feature

The Archive

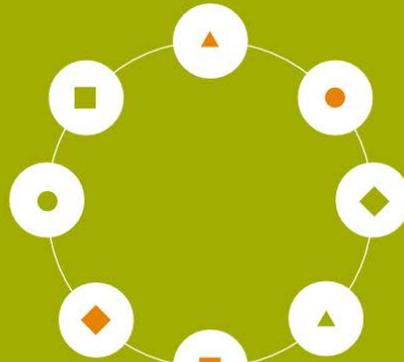
Natural Areas

Digital Dome

Big Drum

Some text talking about how you click on the circles below in order to hear some sweet sounds. Maybe also some stuff on how this is a pseudo-recreation of the Big Drum exhibit in the museum itself, and how they can do some seriously super-cool things if they go in. More lorem ipsum: It's a fez. I wear a fez now. Fezzes are cool. I need...I need...I need... fish fingers and custard! Usually called 'The Doctor.' Or 'The Caretaker.' Or 'Get off this planet.' Though, strictly speaking, that probably isn't a name.

Play the drums!



[Close]

infographic

game

quiz

interactive feature

The Archive

Natural Areas

Digital Dome

Reactable

Some text about chemistry to make people want to watch this video. Watch this video. Lorem ipsum: An old friend of mine. Well, enemy. The stuff of nightmares reduced to an exhibit. I'm getting old. Ricky, if I was to tell you what I was doing to the controls of my frankly magnificent timeship, would you even begin to understand? The past is another country. 1987's just the Isle of Wight. Fantastic! And everybody lives, Rose! Everybody lives! I need more days like this! Go on, ask me anything, I'm on fire! Rose... before I go, I just want to tell you: you were fantastic. Absolutely fantastic. And do you know what? So was I!



Learn with Veritasium

[Close]

infographic

game

quiz

interactive feature

The Archive

Natural Areas

Digital Dome

Animal Encounters

Some words about critters and habitats to introduce the video. Now some lorem ipsum: Brave heart, Clara. I never know why. I only know who. You are the only mystery worth solving. Oh, I always rip out the last page of a book. Then it doesn't have to end. I hate endings! Please tell me I didn't get old. Anything but old. I was young! Oh... is he grey? Bow ties are cool. Thank you, Strax. And if I'm ever in need of advice from a psychotic potato dwarf, you'll certainly be the first to know. No idea. Just do what I do: hold tight and pretend it's a plan.



Learn with Animal Encounters

[Close]

infographic

game

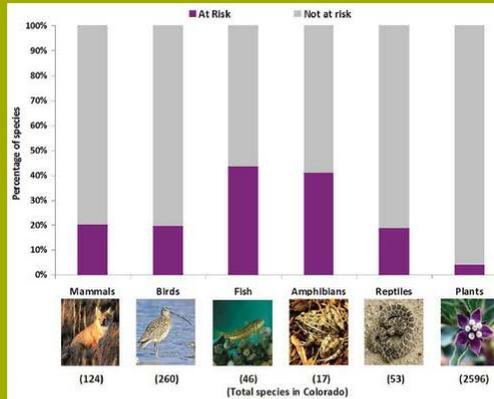
quiz

interactive feature

Biodiversity

Some text to introduce the chart below, because that's important. Lorem ipsum: I once spent a hell of a long time trying to get a gobby Australian to Heathrow airport. Oh, and something else I don't have: anything to lose. So, if you're sitting up there with your silly little spaceships and your silly little guns and you've any plans on taking the Pandorica tonight, just remember who's standing in your way. Remember every black day I ever stopped you and then, and then, do the smart thing. Let somebody else try first.

Biodiversity is cool but hard



[Close]

The Archive

Natural Areas

Digital Dome



Mud Wagon

Words words wordsiness for the old folks. I thought all children despise effort and enjoy cartoons. I'm a comfortador also. Can't call to mom, can't say a word. No, Angel, it's not you. The only time you were ever at peace in your whole life was when you were dead. Love keeps her in the air when she ought to fall down. She alone will stand against the vampires the demons and the forces of darkness. Start with the part where Jayne gets knocked out by a ninety-pound girl, 'cause I don't think that's ever getting old. Freedom is life's great lie.

Pack your wagon!

Stuff



Moar Stuff



Stuffer



[Close]

Funky F

Biodive

infographic

game

quiz

interactive feature



Beet Shack

A bit of text about how beets are super important to the region. Also probably something about the Beet Shack in the museum itself, and how if you want to learn more and/or pass the quiz, you should actually go in and check it out. Lorem ipsum: There are fixed points throughout time where things must stay exactly the way they are. This is not one of them. This is an opportunity! Whatever happens here will create its own timeline, its own reality, a temporal tipping point. The future revolves around you, here, now, so do good!

Test your knowledge of beets' yummy history

What country did most of the migrant workers come from during the sugar beet boom of the early 1900s?

- France
- Russia (pick this one)
- Chile
- China

Beets are heavy.

- True (pick this one)
- False

submit >>

[Close]

Big Drum

interact

Beet Shack

video

game



Big Backyard

Some text about what the Big Backyard is, and about how you can click on the critters to hear the noises they make. Lorem ipsum: Yes, well, it's a brilliant noise. I love that noise. Frightened people. Give me a Dalek any day. Come along, Pond! Overconfidence, this, and a small screwdriver. I'm absolutely sorted. Oh, I always rip out the last page of a book. Then it doesn't have to end. I hate endings!



Blue jay



Broadwinged hawk



Chipmunk



Elk



Prairie dog

Hear the critters of the area

[Close]

Big Drum

interact

Beet Shack

video

game

Final Prototype URLs

Source code repository

<https://github.com/lisagumerman/thesis>

Working example

<http://lisagumerman.github.io>

APPENDIX E: RECOMMENDATIONS TO THE MUSEUM



Web Application

Research, Recommendations, Plan for Release

Document by Lisa Gumerman

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Personas and scenarios	p. 4
Content type recommendations	p. 9
Technology recommendations	p. 10
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Introduction

This web application focuses on user experience in order to increase engagement with the Fort Collins Museum of Discovery and their website. As discovered in interviews with stakeholders such as Terry Burton, Ben Gondrez, Sierra Tamkin, Cathy Jones and Jason Wolvington, the needs of the museum are as follows:

- Need to appeal to a broader audience
- Need to portray breadth and depth of museum
- Need to illustrate interactivity and dynamic nature of museum

A frequent theme across all of the interviews was the problem of being perceived as a "children's museum," which was the case in website design, marketing efforts, and in the audience as a whole, which proved, similarly, to be a problem with the design of the web application itself. Another challenge was to portray that there the museum has content on both science and history, and a lot of both, and how to get that across to the community and on the website. The final need was to show how interactive and dynamic the museum is, because it is apparent from the museum itself but less so from the museum's web presence. The goal of the web application was to address all of these needs.

Observation periods within the museum revealed themes that would need to be addressed in terms of demographic differences, interaction habits, and content display.

- Kids willingly interact with exhibits more than adults
- Males seem to be more enthusiastic than females
- Interaction doesn't always happen in intended or expected ways
- Methods of interaction can be hard to determine without help
- Museum-goers can become overwhelmed easily

Because of the wide audience of the museum, the web application needed to be tailored to adults as well as kids in a way that the physical museum might not be. It also needed to be welcoming to females as much as males. In the physical museum, interaction with exhibits does not always occur in the way it might be "expected" to,

which meant that the web application needed to be more interactive than just the exhibits themselves. Furthermore, the fact that methods of interaction could be hard to determine in the physical museum meant that in the web application, plenty of affordances needed to be given so users could figure out what to do. Because in the physical museum users could become overwhelmed easily, the web application needed to be very simple and streamlined so users felt able to engage with it.

The prototype is hosted on github (<https://github.com/lisagumerman/thesis>) so it can be cloned or branched for later implementation and expansion.

Personas and scenarios

The Diligent Student



Name: Chloe

Age: 10

Job Title: student

Education: 4th grader

Environment: at home on the family computer. Has access to a medium-sized monitor and a mouse.

Technical Expertise: familiar with using a computer and the Web for basic entertainment, also some familiarity with Word for school assignments. Typically supervised by an adult.

Goals: complete a school assignment

Scenario: After a field trip to the museum, Chloe has a follow-up assignment to get specific answers from the museum website. She has a series of 10 tasks which she has to complete and answer questions about thoughtfully. She searches purposefully for what she needs, informed slightly by what she retained from her museum visit. Once done with her actual work, she spends most of her time on the very interactive features, but also spends some time consuming animal-related content.

The Determined Teacher



Name: Jada

Age: 28

Job Title: Elementary school teacher

Education: Master's in Education

Environment: On her work laptop. Always uses a small screen, frequently only has access to a touchpad to navigate.

Technical Expertise: familiar with using computers and the Web for professional tasks and for entertainment. Tech-savvy.

Goals: Inspire interdisciplinary efforts at her school by exposing administration to what the museum does

Scenario: Jada is interested in interdisciplinary, experiential education and is trying to persuade the administrators at her school to shell out the money to go see the museum. She wants a tool that will show them how valuable such a trip would be to students. Her time on the application is spent getting a good idea of what the museum has to offer, and how it's different from other experiences the students might have. She checks out the games, but also spends time on the videos and slideshows, getting more in-depth information, which she intends to show to her superiors.

The Resourceful Father



Name: Reinaldo

Age: 42

Job Title: Mechanic, Father

Education: High School diploma

Environment: At home on his smart phone, flanked by his two children. Small screen with only touchpad capability.

Technical Expertise: familiar with using apps and browsing the web on his phone, though he sometimes has difficulties managing the screen

Goals: Help entertain his children and educate them outside of the constraints of school

Scenario: Reinaldo wants his children to do well in school, but knows they tend to be more interested in playing than in schoolwork. They also frequently like borrowing his phone to play games, since they are not yet old enough to have their own smartphones. He prompts them to go to the museum website, which he heard about through a friend. He "drives" while the children guide him through the web application. Together they click on everything, spending more time on areas where there are more chances for engagement, and thus more clicking. While there, he also takes advantage of the web application's content to learn more about the issues in the region.

The Working Grandmother



Name: Danielle

Age: 56

Job Title: Business manager, Grandmother

Education: Bachelor's in Business

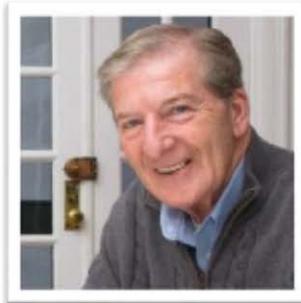
Environment: At home on her tablet, with which she occasionally uses a mouse and keyboard.

Technical Expertise: accustomed to using the Web and other standard programs for work, but does not think of herself as tech-savvy

Goals: Prepare for a visit to the museum with her grandkid this weekend

Scenario: Danielle is on grandchild duty in a few days, and wants to retain her reputation as being totally cool in her grandson's eyes. Danielle has not been to the museum before, always imagining it to be a children's museum, but now that she has a child to go with, she wants to know what to expect when she is there. She navigates to the web application from the museum site's main page. She doesn't think of herself as tech savvy or a gamer, but the design of the application makes her feel comfortable using it. She stays on the application long enough to get a good idea of what the content is and to determine that in fact the museum is a good, interactive place to take a kid on a weekend afternoon before getting back to her other work.

The Curious Retiree



Name: Brian

Age: 73

Job Title: Retired Engineer

Education: PhD in Engineering

Environment: At home on his laptop. Always uses a mouse or has a terrible time navigating.

Technical Expertise: Not as tech-savvy as he would like to be, but working on it. Accustomed to using computer software, and learning to navigate the Web more effectively. Gets baffled by how things work occasionally.

Goals: entertaining himself and learning more about the museum

Scenario: Brian heard about the Fort Collins Museum of Discovery through his grandchildren and wants to find out more about it, while also passing the time. He pulls up the site while sitting on the couch on his laptop. He slowly pokes around at things. His initial experience is mostly aimless, clicking through each section in turn, but he ends up focusing on areas with more readable content because it is a medium he is more familiar with. He later shares some of what he learned with his wife, who is also retired, and they consider going in to the museum with friends.

Content type recommendations

Currently the project features videos, a slideshow, games, interactive audio features, and an infographic. Other types of features could be developed in different topic areas, as well.

More interactive:

Because the museum is so interactive, switching out less interactive content like the Biodiversity infographic and the videos would be more indicative of the dynamic nature of the museum itself. Instead, other interactive features could be added, including interactive charts and graphs. A section that allowed for user-submitted content or actively user-modified content would also be in line with the goals of the museum.

Less audio-reliant:

This iteration of the project has a strong reliance on audio capabilities – both for the videos and for interactive features such as Big Drum and Big Backyard. Although this is part of what makes those interactive features special, users do not always have audio availability. That said, users really liked the audio in sections like Big Backyard, so it should not be removed completely.

Less video-reliant:

In prototype testing, many users gravitated away from videos unless they were short and animated. Making sections that currently use video, like Funky Forest, Reactable and Animal Encounters, use some other form of content instead would engage more users.

Technology recommendations

Technology used in current prototype:

- Normalize.css (<http://necolas.github.io/normalize.css/>) and Modernizr (<http://modernizr.com/>) aid in making designs browser friendly and consistent across browsers.
- FlexSlider (<http://www.woothemes.com/flexslider/>) was used in the prototype for The Archive, and is a quick and convenient way to do responsive slideshows.
- jQuery UI (<http://jqueryui.com/>) has a host of different widgets and interactions available, and the slider widget was used in the prototype for Mud Wagon.

Technology to aid in responsiveness:

- Magnific Popup (<http://dimsemenov.com/plugins/magnific-popup/documentation.html>) would be an alternative to the hand-written modal windows in the digital prototype because it is easily responsive both to content size and to screen size.
- FitVids.JS (<http://fitvidsjs.com/>) is used to help make the typically difficult-to-work-with iframes for videos responsive.
- FitText (<http://fittextjs.com/>) would be helpful in scaling header sizes appropriately in smaller screen sizes widths.

Technology to aid in future designs:

- Masonry (<http://masonry.desandro.com/>) is a popular framework for grid layouts that doesn't assume standard heights across elements in order to work. It could be used in a redesign of the home screen interface.
- Metro UI CSS (<http://metroui.org.ua/>) is a comprehensive set of styles and JavaScript to help facilitate flat design, and might also be used in a redesign of the home screen interface as well as some of the modal elements.

Technology to aid in extending the project's functionality:

- AngularJS (<https://angularjs.org/>) is frequently used in the creation of web applications, and would make this project more scalable to allow easier additions of content to future iterations.
- CSS 3D Flip Box (<http://css-flip-box-3d.firchow.net/>) makes html content appear to flip different directions and could be used in the creation of future content types, or to make the already-existing buttons appear more dynamic.
- jQuery UI (<http://jqueryui.com/>), used in the digital prototype, has interactions like draggable and droppable and widgets like tooltip could be used in future content types.
- D3.js (<http://d3js.org/>) is excellent at data visualization and could be used in the creation of future content types to create interactive charts and other graphics.

Implementation recommendations

Finalize content:

Additional collaboration between programmers and content specialists is needed before this project can go live, as the initial design and prototypes were done with dummy content.

Make responsive:

The design of the home screen is natively responsive, but the modal windows and the content within them – particularly the iframe content – need more work before they will be properly responsive for all screen sizes.

Minify:

JavaScript and CSS also needs to be cleaned up and minified before release in order to decrease load times and HTTP requests.

Design files and source code

Design files and source code can be found at <https://github.com/lisagumerman/thesis> and the live prototype can be found at <http://lisagumerman.github.io>. The screenshots below are a sampling from the live prototype.



Instagram

Instagram is a mobile social media application that allows users to share photos and videos with their friends and followers. It is one of the most popular social media apps in the world.



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Animal Encounters

Animal encounters are a popular activity for many people. They allow you to get up close and personal with various animals, such as lions, tigers, and bears. These encounters can be educational and fun for people of all ages.

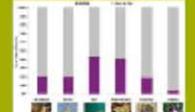


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BlackBerry

BlackBerry is a mobile operating system and a line of smartphones. It was developed by the Canadian company Research In Motion (RIM). BlackBerry is known for its secure email and messaging capabilities.



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Mad Wagon

Mad Wagon is a mobile application that allows users to track and manage their inventory. It is designed for businesses that sell products in bulk or have a large inventory.



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Best Book

Best Book is a mobile application that allows users to discover and purchase books. It features a wide selection of titles and offers personalized recommendations based on user preferences.



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Big Bazaar

Big Bazaar is a mobile application that allows users to browse and purchase products from a large online marketplace. It offers a wide variety of goods at competitive prices.



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