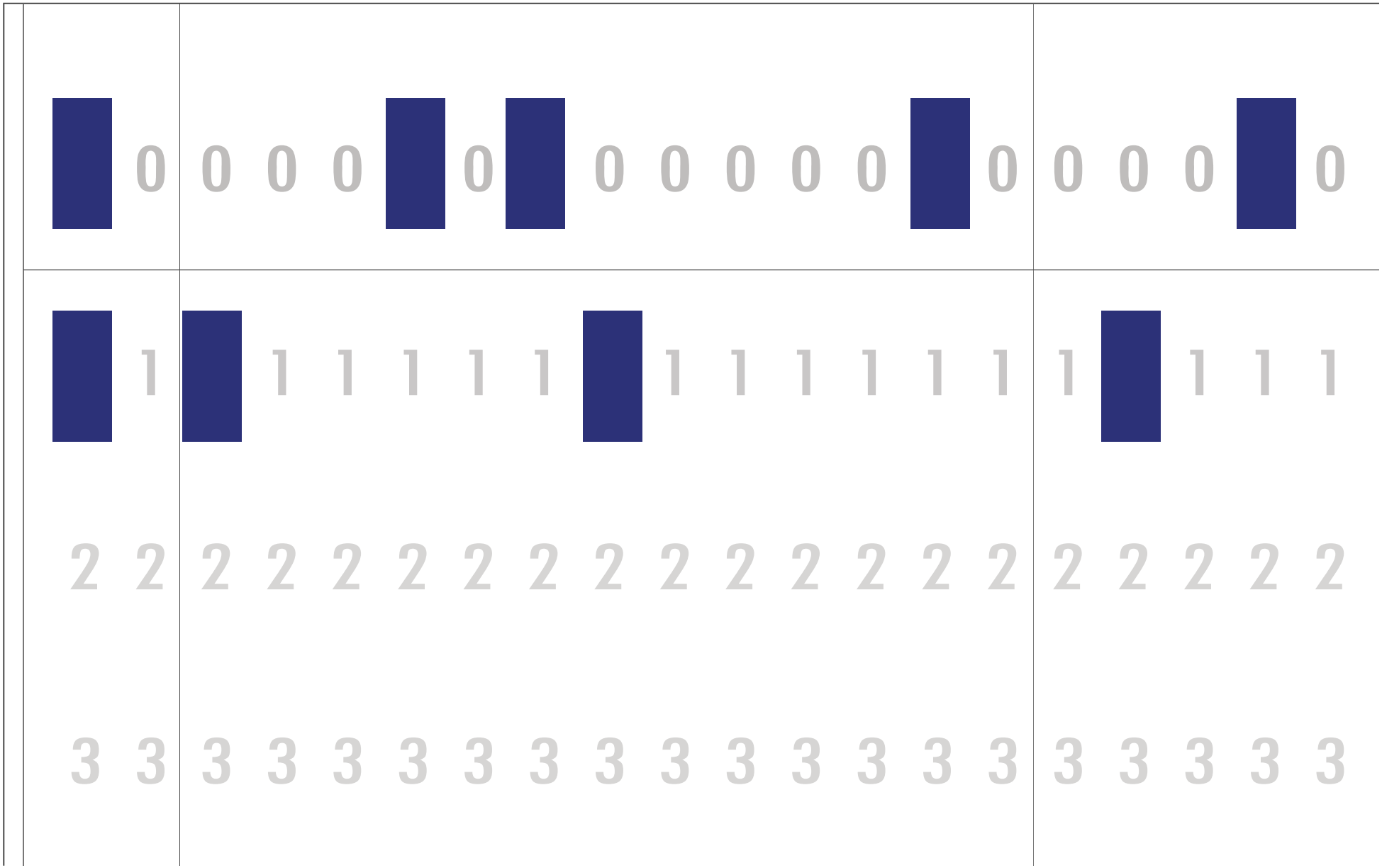
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# The Frontier University: Michigan in the Information Age

*A Virtual Museum of the History of Information Technology at the University of Michigan*

Exhibit Proposal by:

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University of Michigan Museum Studies Program, April 2008

# 1.0 INTRODUCTION TO *THE FRONTIER UNIVERSITY: MICHIGAN IN THE INFORMATION AGE*

## 1.1 Project Description

> "Frontier democracy and frontier materialism combined to create a new type of institution, capable of serving all of the people of a rapidly changing America through education, research, and public service."
>
> — James Duderstadt, "The Michigan Saga"[1]

Since its establishment in 1817, the University of Michigan has had a firm sense of pride in being on the cutting edge. While Michigan is no longer on the geographical frontier of the United States, there continues to be a strong institutional investment in maintaining the frontier spirit of innovation and advancement on which the University was founded. It is in keeping with this pride in pioneership, that the University of Michigan Provost's Office has initiated a project to build a virtual museum, devoted to documenting and displaying the history of a field in which Michigan has made significant contributions: information technology. John King, the Vice Provost for Academic Information, has enlisted the help of Museum Studies students to gather information and address the possibilities for developing this virtual museum. The report that follows is the result of a semester of work researching the museum's subject area, reading and developing ideas on the meaning and structure of a virtual museum, and discussing the project with community members around the University.

## 1.2 Museum Scope

The virtual museum will present stories from the history of information technology at Michigan in which the University has shown unique strength, and which demonstrate the impact of technological innovation within the IT community both nationally and internationally. Rather than providing a

[1] James Duderstadt, "The Michigan Saga" http://umhistory.dc.umich.edu/history/publications/saga/index.html (Accessed on April 6, 2008).

comprehensive survey of the history of IT, it will offer exhibits devoted to specific events and subject areas, organized around broad themes. Within these themes, stories may be added or modified according to the curator's desires.

### 1.3 Museum Audience

The museum's target audience includes:

1. The University community, with particular focus on students and faculty
2. Other universities with whom Michigan has partnered in developing information technologies
3. University of Michigan alumni
4. Prospective students
5. Former participants in IT development at Michigan (retired professors, researchers)
6. Non-University constituents interested in the history of information technology

### 1.4 Museum Objectives

***To remind.*** There are three primary goals of this exhibition. One is to make tacit knowledge explicit. There is a discernible need to present a history that situates the University of Michigan within the larger realm of IT development. John King stated in our first meeting, "We can never allow it not to be the Golden Age." While the museum's content focus will articulate the history of Michigan's leadership, the museum itself will also be an expression of its continued commitment to this field. The museum should demonstrate this leadership both in content and in approach.

***To teach.*** A second goal is to actively create knowledge about the history of Michigan's involvement in IT development where none existed before. There is the sense that many people both within and outside the University community have no idea that many of the digital tools and services they use every day have Michigan 'roots'. The museum will therefore hope to educate visitors about the University's role in making IT history by presenting some of the lesser known or recognized aspects of this involvement.

***To commemorate.*** The final objective of the museum is to preserve and commemorate tacit knowledge. The people involved with IT development are aging, and there is a need to preserve their stories. There is also a desire to memorialize the lesser-known University affiliates who played crucial roles in the history of information technology.

## 2.0 DEFINING THE VIRTUAL MUSEUM

### 2.1 Ideas on Virtual

In *The Frontier University* we have taken an approach to idea of a virtual museum which we hope will break with convention and introduce new life into the existing frameworks for the museum online. The most important characteristics of virtual which we have considered in planning the museum structure are:

1. Distributed access
2. Independent of physical objects
3. Independent of a physical place
4. Utilizing digital technologies

In pondering strategies to address these key aspects, it is immediately apparent that there is no one answer. And why should there be? The physical museum employs a wide variety of methods to display collections and engage visitors. As Kotler and Kotler write, "The most successful museums offer a range of experiences that appeal to different audience segments and reflect the varying needs of individual visitors…successful museums provide multiple experiences: aesthetic and emotional delight, celebration and learning, recreation and sociability."[2] The virtual museum must similarly avoid a monolithic approach to display. *The Frontier University* will play with the idea of virtual, employing different virtual strategies based on each exhibit's theme and story. In many ways the formats of the exhibits are part of their story, and are contributions to the general goal to create knowledge of the history of information technology at the University of Michigan. This virtual museum will be part of that history, and it is thus important to strive for the same creativity and innovation that has marked IT development at Michigan in the past.

[2] Kotler and Kotler in Graham Black, *The Engaging Museum: Developing Museums for Visitor Involvement* (United Kingdom: Routledge, 2005), 271.

### 2.2 A Frontier Museum

The specific virtual media which will populate the initial three modules of the museum are explained in detail in Section 3 (Exhibit Structure) of this proposal. Here some comments on the thinking behind these media choices will help future curators to develop the virtual exhibit space in a manner consistent with its original content. At the highest level, *The Frontier University* will retain rather than discard many of the features of the physical museum:

1. ***Space.*** Virtual exhibits will not be 'aspatial'. They will seek to define space virtually, through the use of terminology such as 'galleries' and the availability of tours. Although visitors are not physically *in* a museum, they should have a sense that they are in a particular kind of space, engaging in a particular kind of experience, different from the world around them—other webpages, etc.

2. ***Meeting and interacting.*** We do not want people to be *viewers* of *The Frontier University*; we want them to be *visitors*. Virtual media will therefore require a certain level of interactivity, engaging visitors with the exhibits and their content. Exhibits must require a small effort, or action, to access so that they are visited with a purpose.

3. ***Organizational Identity.*** Virtual exhibits should be distinctly innovative, but should also share a common aesthetic identifier, or style which will tie them to the museum as a single organization. Distributed access must result in disembodied experiences.

4. ***Access and Clarity.*** The virtual strategies used in the museum will have direct relevance to the story or theme of the exhibit. Technology for technology's sake would be confusing and inhibit access and understanding. The virtual aspect of exhibits should be a tool for expressing meaning in the museum, not a burden to its content.

As mentioned above, the varied approach to the virtual should not lead to a decentralized and discombobulating museum experience. It will be important to create a cohesive identity for the museum, and to incorporate wayfinding devices which will orient visitors to different facets and features. For this purpose, a webpage containing up-to-date information on the exhibits, practical information about how to use them, and details on the museum's development and purpose will be the central 'gateway'. This webpage will also serve as a tool to encourage contribution, discussion, and comments through a wiki function and message boards. Features of this webpage are discussed in Section 3 (Exhibit Structure) and Section 5 (Community Interaction).

### 2.3 "It ain't easy being virtual"

There are several challenges that should be recognized in the creation of a virtual museum. Ross Parry, in his book *Recoding the Museum* writes, "Over the past four decades digital technology has moved increasingly towards greater levels of connectivity, mobility and personalisation…In particular it has been this dynamic content, this liquidity, of new media that has appeared (inviting addition and amendment), that seems to have been at odds with notions of fixity or closed authorship in the

museum."[3] That is, virtual media threaten the idea of curatorial control, and thus the authority of the museum's voice. For *The Frontier University* this is a particular problem, given that we are trying to sponsor a sense of heritage and tradition in Michigan's IT history where none existed before. How to create this heritage virtually and give it the institutional authority which it will need in order to be taken seriously by visitors, especially those outside of the University community?

In addition to the issue of authoritative control expressed by Parry, there is also the question of tangibility and fixity. Virtual media have a reputation for being ephemeral. Webpages are fast obsolete, technologies come and go and change over time, and remaining up-to-date becomes a major challenge. These issues work against the goals of the museum, which seeks to create a solid and lasting interpretation of the past.

Finally, the virtual museum must contend with the much quoted maxim of technological innovation best exemplified by Moore's law, that prescient assertion that computing power increases exponentially over time and at ever diminishing prices. While Moore was specifically talking about semiconductor chips, his idea has come to embody the generally accepted notion that it is very difficult to remain cutting edge for very long. Today's new and fancy is tomorrow's old and clunky. For museums, already stigmatized with the label of the old and stuffy, the use of technology in a manner consistent with a spirit of innovation is a particular challenge. And for a virtual museum, one dependent solely on the communication of its content through technology, the issue of being outdated is one that must be continually addressed by its curatorial staff.

These short indications of the potential pitfalls of the virtual museum have no easy answers. It will be an exciting challenge and venue for creativity for the virtual museum staff to create exhibits and programs that keep these concerns in mind. In formulating our proposal and preliminary museum structure discussed in the next section, we have tried to create a framework which will effectively navigate through these issues while embracing the virtual medium.

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[3] Parry, 107.

## 3.0 EXHIBIT STRUCTURE

### 3.1 Introduction

Our conception of "virtual" for this exhibit creates a decentralized museum space, where engagement with the materials can occur both through digital media and physical interaction. Because there is no existing infrastructure, we are proposing a flexible approach to development which will carry a virtual exhibit toward becoming a virtual museum. At this early phase of project planning, emphasis will be placed both on development of the virtual collections and on initial exhibit experiences. We are, therefore, proposing a framework for developing and exhibiting collections instead of a completed exhibit configuration. To get the museum off the ground, we have drafted an initial policy, which will guide future work in acquiring and documenting the stories that will comprise the collections (see Appendix B). These documents should be considered preliminary drafts, open to amendment.

We have developed three distinct "modules", that each offer a unique means of interpreting the University of Michigan's contributions to the field of information technology. Each module was developed to provide engagement for visitors with multiple interests, while emphasizing two underlying exhibit themes. The first deals with the "human side" of technology—looking at the accomplishments that would have been impossible without IT advancements. The second major theme deals with the impacts and risks of pioneering in technology. Michigan's most significant contributions to the field have occurred as the result of being on the cutting edge—not always knowing what implications technological developments may have. (See Figure 1).

In keeping with the "pioneering spirit" of technology of the University of Michigan, it is our hope that the modules we have proposed here will allow virtual collections and displays to develop quickly and organically, while remaining grounded in the fundamental goals of the exhibit. Because one of the key goals of this project is to re-establish a network of people who have an interest in the history of IT, the exhibit structure needs to remain flexible at this stage, allowing for both story and exhibit concept contributions from the community.

The modules and associated stories presented in this exhibit proposal are to serve as the foundations of the museum, and as examples for future development. For the purposes of this proposal, each module is paired with an example story and a unique approach to exhibiting the virtual—demonstrating the possibilities for future work.

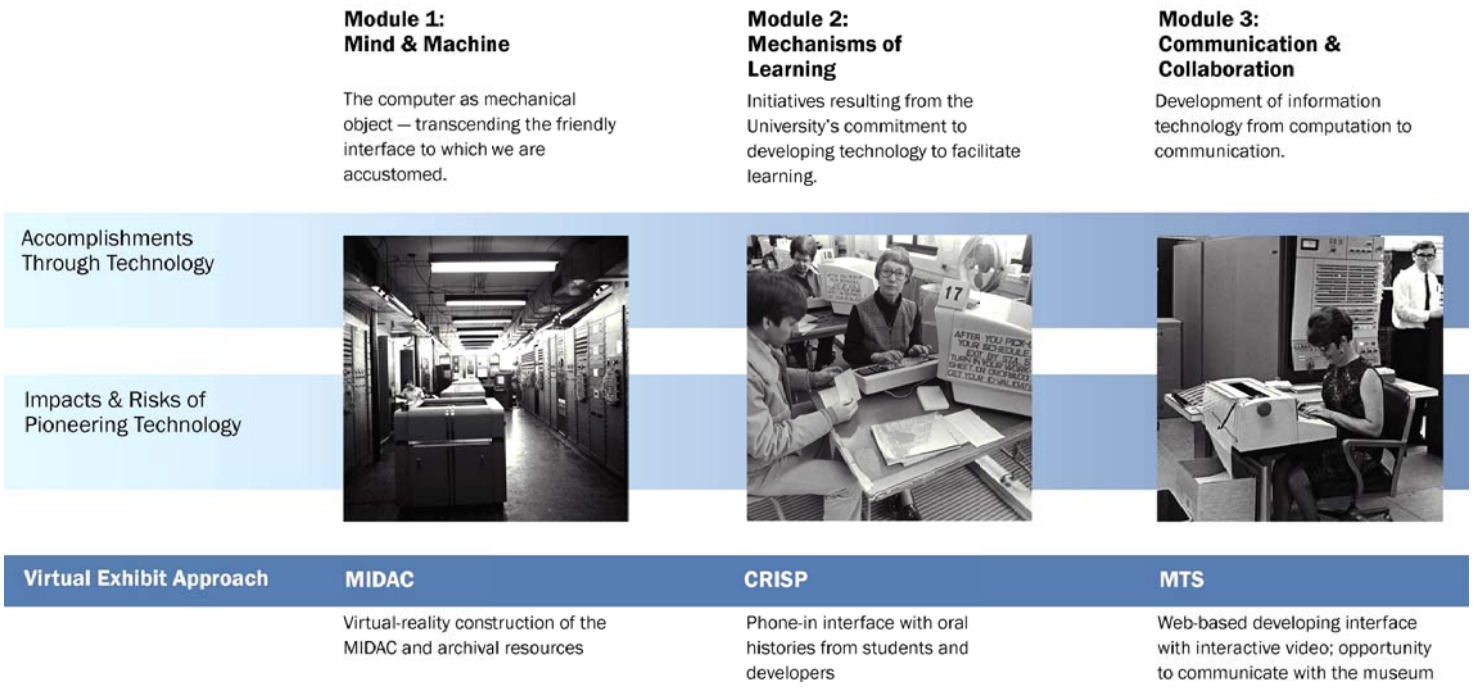



**Figure 1: Content Modules**

### 3.2 Access

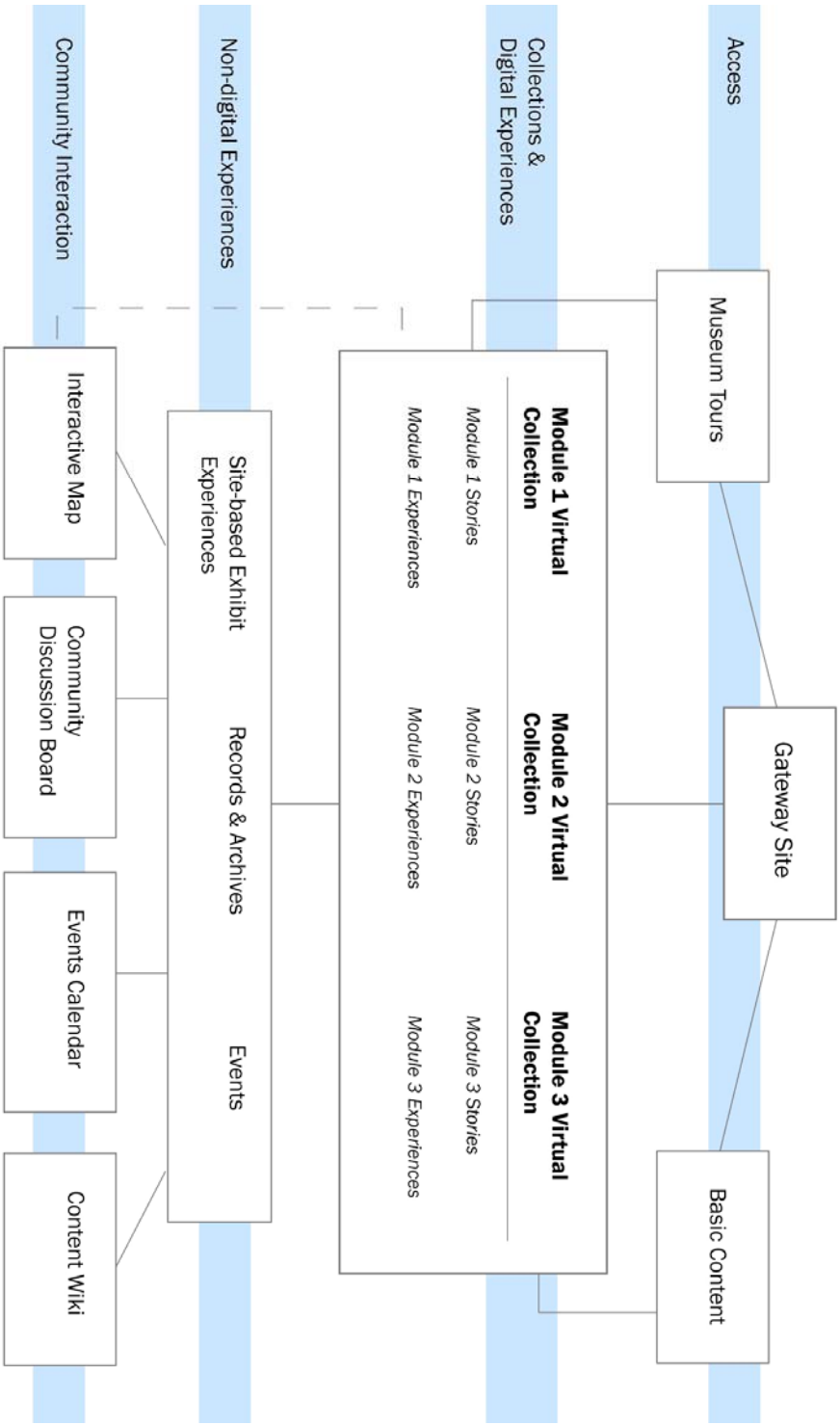
This virtual museum as a whole will be accessed through a central website "gateway" that will serve as a hub for the experiences collected around each module. Through this website, visitors will gain information about the collection of stories and experiences that the museum offers. This website will provide introductions to each exhibit module, and links to digital collections that support each theme. In keeping with our flexible framework, visitors will be able to access the web-based content in a several different ways. Featured stories, presented on the home page will provide entry points. Users will also be able browse the collection by module, choosing to further explore stories within their area of interest. Most importantly, the website will direct visitors to experiences that involve participation with other members of the museum community and participation with physical exhibit experiences. Interpersonal engagement is a feature valued by many museum-goers, and it provides rich opportunities for learning—both social and content (see the work of Falk & Dierking, Silverman, etc). In this sense, we are not providing just a computer-based museum experience to our visitors; instead, we envision a virtual experience that incorporates the benefits of traditional museum-going.

In addition, the museum gateway will hold information on relevant events—both local and international. Guest speakers, lectures, seminars and other opportunities for engagement will be featured on an events calendar, which can be openly edited by participants in the field. Posted events, locations, and discussion topics will link to exhibit components. The website will also host a "community discussion board" where discussion of museum advancement can occur. Here, potential exhibit topics and contributions to the collection can be vetted before the IT community. A third web-based component will be an interactive map, where museum visitors can contribute sites of significance and trace the global impact of technologies that originated in Ann Arbor. Finally, the website will feature a "basic content" area, where newcomers to the subject of IT can access the definitions of common terms, and view an abbreviated timeline of historical events--all supported with examples from the museum's story collection. For more on the website's features, please refer to Section 5 (Community Interaction).

As Harold Skramstad emphasizes, generating a "presence," and establishing institutional authority for an upstart museum is of utmost importance.[4] Therefore, this website will be the first component of the project to be realized, and will serve as a means of generating support for further exhibit development. Through it, contributions to the collections, exhibitions, and events can be made—ensuring that the museum develops in conjunction with its community of constituents. (See Figure 2).

[4] Harold Skramstad, "An Agenda for American Museums in the Twenty-First Century" *Daedalus* 128 (3): 129-62.

**Figure 2: Exhibit Structure—Visitor Access & Navigation**



### 3.3 Module 1: Mind and Machine

The first exhibit module is entitled "*Mind & Machine*." In this module, we focus on the computer as a mechanical object. The target audience of this module is current and prospective University of Michigan IT developers and researchers, although technology consumers, interested in history, will also be drawn to it. *Mind & Machine* will focus on the ways in which IT developers worked to make early analog computing processes emulate human thought, laying the groundwork for digital computers we use today. It will also detail advancements in interface design, moving from interfaces requiring expert knowledge to the more user-friendly systems that are now commonplace. The movement from abstract functions, conceived by IT developers, to useful technological tools, accessible to consumers is at the core of this module. Being at the forefront of IT development has placed Michigan in a role where developers had little notion of how their advancements would be eventually be applied. Content will be conveyed through oral histories of IT developers and users of emerging technologies. Additionally, access to physical objects and documentation will give visitors a feel for the scale of early computers, and the expertise required to interact with them. Collections chosen to be acquired for and interpreted in this module will provide examples of the computer's transition from mechanical object to digital device, and the Michigan contributors to such advancements.

***Virtual Approach***

For the purpose of this proposal, we have chosen the story of the MIDAC (Michigan Digital Automatic Computer) for inclusion in the *Mind & Machine* module. In 1951, under collaborative sponsorship from the Wright Air Development Center and the United States Air Force, the Willow Run Research Center of the Engineering Research Institute, University of Michigan began development of the MIDAC with the intention of producing a machine to assist with "the solution of certain complex military problems."[5] The MIDAC was created to streamline design processes, allowing scientists to "test" mathematical models that had been previously too complex to undertake. However, using the MIDAC was no simple task—a team of scientists and researchers were required to determine even if a problem could be solved using the

[5] *MIDAC Booklet*, (Ann Arbor, MI: University of Michigan Engineering Research Institute Publications, 1951), 3.

MIDAC. Problems required complex programming, and the results required expertise in interpretation. Perhaps the most striking feature of the MIDAC was its shear size and mechanical components. Photographs of the Willow Run facility reveal that the MIDAC occupied two expansive rooms, dwarfing its operators. The MIDAC required 12 tons of refrigeration equipment to cool its 500,000 connections and tubes. Additionally, its main memory storage device was a rotating magnetic "drum," which could store just 6,000 "words," or short segments of data. The MIDAC became functional in 1953, and was operated by Willow Run's Digital Computation Department under the leadership of John Carr III until 1958 when the Air Force removed the equipment.[6]

Our virtual approach to presenting the story of the MIDAC is through a combination of web-based experiences, and a virtual reality "tour" of the equipment. Visitors will initially access the story through the museum web site, via the gateway of the *Mind & Machine* module. From there, visitors can explore access to the Bentley Historical Library's online collections of information on the MIDAC. A key experience will be an opportunity to browse the original MIDAC manual, which vividly expresses the mechanical nature of this early digital device. Photographs, available for tagging and discussion on the museum website will provide further documentation of the system. A site marked on the web-based interactive map shows where the Willow Run facility was, and the locations where the MIDAC was moved as the technology eventually dispersed. These introductory experiences will then lead visitors to an opportunity to interact with the MIDAC system first hand. While the digital documentation provides historical context, it does not fully allow visitors to engage with the *Mind & Machine* concept. A web-based "game" will allow Museum visitors to explore the complex MIDAC interface, and will provide information about a virtual reality "tour" of the equipment available at the Duderstaadt Center on the University's North Campus. Using the Center's virtual reality lab, visitors can walk around and attempt to operate a virtual section of the MIDAC. More information, presented in both the virtual setting and in print, on key MIDAC developers and operators will be available at this site. This virtual experience is critical to the story; it is both an opportunity for virtual reality technologies to be developed for the Museum and an opportunity for visitors to experience the computer's transition from large, mechanical object to portable, digital device.

### 3.4 Module II: Mechanisms of Learning

The second exhibit module is entitled "*Mechanisms of Learning*," and it focuses on the initiatives that have resulted from the University's commitment to developing technologies to facilitate learning. The primary audience of this module will be current University students, both in IT and in other academic disciplines, and University alumni. Secondary interest will come from the larger University

[6] Deromedi, N., & Goff, A. (2007). *The History of Computing at the University of Michigan* [Online]. Available: http://bentley.umich.edu/exhibits/computing/ (Accessed on April 8, 2007)

consortium interested in developments that originated at Michigan. *Mechanisms of Learning* will focus on instances where the University has created technologies to enhance the student experience—both on an off campus. This module will not be limited to advancements in technologies for the classroom, but will also encompass technologies that enhance access to information or resources that have supported students in navigating the University environment. The University has a long history of developing technology to serve students, but it has also demonstrated an unprecedented commitment to developing technologies with students. Often, major technological advancements have their origins in student coursework. Professors who led such courses did so to develop future leaders in IT, demonstrating a vested interest in developing not just technologies, but technology leaders. Learning technologies, both for and by students, have also enhanced academic accomplishments, allowing for improved access to collections at University libraries, access to course information, and numerous conveniences to enrich study. Stories and experiences in this module will come from students who both helped to design technologies and who were end-users. Each contribution will demonstrate how the University has engaged students with technology, and how such technologies have had impacts beyond the campus setting.

***Virtual Approach***

We have chosen the CRISP (Computer Registration Involving Student Participation) as an example story for the *Mechanisms of Learning* module. The design of the CRISP system began as part of a computer course (CSS 673) taught by Professor Bernard Galler. In this course, students conceived of a computer system that would allow them to register for courses, ending the long lines, confusion, and paperwork associated with analog registration. In 1975, the University initiated CRISP as its official registration system. Initially, colonies of CRISP computer operators in sites at Angell Hall and later at the Chrysler Center assisted students with the registration process. Students wishing to enroll in courses were issued a CRISP appointment—a window of time in which they could complete the registration process. The term "CRISPing" also became part of the campus vernacular. In 1994, a new phone-in CRISP system was launched, allowing students to access the computer registration system via touch-tone telephone. Within a few years of its launch, all students registered for courses via the telephone system, but CRISP appointments were still issued, keeping the system from becoming overloaded while ensuring

that upper-classmen maintained registration priority. Ironically, Wolverine Access—the web-based system through which students currently register was launched in the same year. Students could access course database information via Wolverine Access to view their course schedules, but all changes were conducted through the dial-in interface. The CRISP system remained a campus staple until 2000, when its capabilities were fully replaced by registration processes available on Wolverine Access. Nonetheless, nearly 30 years worth of Michigan students have memories of the CRISP system—everything from getting life-changing advice from the computer operators in the 1970s to spending countless hours on the phone with the "CRISP Lady" in the 1990s.

As with the MIDAC story, visitors to the Museum will be first introduced to the CRISP story via web-based content. But, our approach to virtually exhibiting this story centers on sound—itself a virtual object. Instead of merely transcribing stories from CRISP users, and the students who developed it, we propose a re-created the touch-tone CRISP interface through a phone-in audio experience. Here, visitors can either use their computers or cell-phones to dial into a simulated CRISP call, navigating the interpretive options via numerical selections. Because we aim to not only preserve the stories of IT development in this exhibit, but also the voices behind them, it is critical that audio recordings become part of the collection. Such recordings lend credibility to the stories, and provide further examples of the importance of human interaction in both the development and use of technology. Additionally, recorded audio brings an element of materiality back to the virtual collections, engaging visitors beyond the written and visual. Web resources and links to archival materials will support the CRISP story, while photographs show the changing process of student registration—from paper forms to completely digital.

### 3.6 Module III: Communication and Collaboration

The third module in our exhibit concept is "*Communication & Collaboration*." This module highlights instances where Michigan has been a leader in transitioning the computer from computation device to communication device. Michigan has been a continual presence in technology dialogue and *Communication & Collaboration* investigates the University's role in vastly expanding the capabilities of technology. While many thought only of the computational value of the computer, leaders at Michigan were developing technologies that would allow for some of the first digital collaborations. The target audience for this module is the University consortium, as Michigan's contributions are most significant and most often under-represented in this area. Developers who helped make this significant change in computing will also have a vested interest in this module. Capturing and preserving instances where communication initiatives begun at Michigan have grown into other significant advancements is central to the exhibit. Communication technologies grow rapidly often leaving little evidence of their past, and they have been developed in a highly collaborative nature. Therefore, to establish Michigan as one of the leaders in future communication development it is important to collect examples of past contributions—without them, there is no reference point for being on the technology "frontier." Another essential component of this module is to use the model

of communication technology to build a community of exhibit patrons and contributors. Each story and experience within this module will originate from within the IT community, and will portray the significance of Michigan's collaborative contributions to the continuing communication technology legacy.

***Virtual Approach***


For this module MTS (Michigan Terminal System) will serve as the example story. In 1967, senior staff member Michael Alexander developed this timesharing system for use on the University's central mainframe computer, the IBM 360/67. Initially designed to allow collaboration across the campus, MTS became widely used by the mid-1980s, as more University terminals were added to the system. MTS was eventually installed at Wayne Sate, the University of British Colombia, Simon Fraser University, and several Universities in the United Kingdom. MTS remained at the core of intra-University communication until its functionality was phased out in the mid-1990s. MTS laid the groundwork for the development of inter-campus communication, with the MERIT computer networking system, linking computers at Michigan and Wayne State in 1971. As an example of cutting-edge technology, the development of MTS also sprouted several applications, each of which pushed the system away from its initial role as access device. MTS capability was significantly expanded when Robert Parnes developed the CONFER application in 1975. Originally conceived to allow MTS developers to communicate across campuses, the application became one of the first conferencing softwares. Parnes dubbed his creation, "an alternative to face-to-face communication"[7] without necessarily realizing that he had laid the groundwork for future video-conferencing applications. With the addition of more MTS terminals, CONFER also quickly became a way to for students, faculty

[7] Deromedi, N., & Goff, A. (2007). *The History of Computing at the University of Michigan* [Online]. Available: http://bentley.umich.edu/exhibits/computing/ (Accessed on April 8, 2007)

and staff to communicate with each other; it remained in use at the University until 1999. The $MESSAGE command was added to MTS in 1981, allowing users to send, reply to, and check the status of messages to other system users. $MESSAGE was the predecessor to now-common instant messaging applications. It, too, remained in use until 1999, and its functions are still missed by those who used them.

The MTS story will be presented digitally, through a recreation of the interface and an accompanying video. Visitors can access the story through the module gateway or via the interactive map, which will display significant MTS sites. This web-experience begins with the initial MTS terminal interface on-screen and a video running along the bottom. The video incorporates photos of early MTS terminals and interviews with developers. In an effort to conserve the virtual objects on this topic, footage from videos of MTS workshops will be interspersed in the video presentation and oral histories will also be presented by the people involved. At the beginning of the presentation, visitors can interact with only the early functions that would have been available at an MTS terminal such as data-access and rudimentary word processing. However as the video content progresses chronologically, additional functions are added to the MTS interface, allowing visitors to see how the technology evolved. By the end of the program, patrons will be able to interact with other museum visitors using both simulated CONFER and $MESSAGE interfaces. Filtered conversations between exhibit visitors will become part of the live content of the display, facilitating community building while giving visitors a forum for contributing to and expressing thoughts on MTS content.

## 4.0 ADMINISTRATIVE STRUCTURE

### 4.1 Administrative Structure

A home department for *The Frontier University* will need to be determined. This department will take responsibility for the museum's development, providing staffing resources, physical office space, and administrative oversight. Initially, oversight will remain with John King, Vice Provost for Academic Information. Eventually, the permanent host will devote one full-time curator to the museum in order to keep it up-to-date, as well as to organize ongoing activities and future exhibitions. In addition, up to three part-time graduate student workers and faculty advisers will also contribute to day-to-day operations, support, and special projects. Their input will also help connect the museum to the academic life of the University. To assist the museum in establishing an administrative structure, we have also created a preliminary mission statement for the institution. (see Appendix A)

Possible collaborators for *The Frontier University*:

***1. School of Information***
Contact Martha Pollack (Dean): mpollack@umich.edu

***2. Provost's Office***
Contact John King (Vice Provost for Academic Information): jlking@umich.edu

***3. College of Engineering***
Contact Farnam Jahanian (Chair, EECS): farnam@umich.edu

***4. Bentley Historical Library***
Contact Fran Blouin (Director): fblouin@umich.edu

In addition to curatorial support, faculty supervision, and a host department, the museum will rely on the input of a variety of community members, who will form and advisory committee. These participants will be determined through meetings with the IT Commons group, currently scheduled for mid-April, and through connections with other interested faculty and staff members.

### 4.2 Timeline

To promote community participation and engagement with the exhibit's continued development, we are proposing that this virtual museum be made available to the public incrementally. This will generate initial interest for funding the exhibit, while allowing for contributions that will further advance the museum's content. Early launches of the exhibit modules and stories will also allow museum staff to "test" audience reactions, and tailor virtual experiences to reflect the interests of museum visitors. This type of collaborative process, involving a community of participants is a step toward sustainability of this exhibit. As such, we have proposed an initial timeline, which places the official museum "opening" in the Fall of 2009. At the time of this opening, all three initial content modules will be in place, along with the virtual experiences suggested in the Section 3 (Exhibit Structure) of this report. Student and faculty participation in this project is central to the development of *The Frontier University*; therefore, we are adhering to an academic calendar. The schedule that follows describes major milestones for each semester of work. (See Figure 3)

### 4.3 Budget

The cost of the virtual museum will be largely dependent on the extent of its structure, the availability of University resources, and the commitment of the community to its development. It would therefore be preemptive to speculate on an exact budget at this point. However, primary costs will be accrued in the following major areas.

***Museum management ($60,000)***
Full-time curator/director
3 student curators/researchers

***Museum infrastructure ($10,000)***
Office space
Equipment

***Museum development ($5,000)***
Fundraising
Promotion

***Web programming and design ($10,000)***
Gateway website
Digital collaborative tools

***Virtual experience development ($100,000)***
Experience technologies (virtual reality, audio technology, video interface program)

***Collections research, acquisition and management ($15,000)***

Our proposed exhibit structure, based on flexible modules, allows for exhibit development to occur as funding becomes available, but an initial capital investment of $200,000 will ensure that, by the

Winter of 2009 the museum has established management, initial story collections, a credible web presence, three cohesive virtual experiences under development, and the ability to continue both financial and exhibit advancement.

### 4.4 Funding Sources

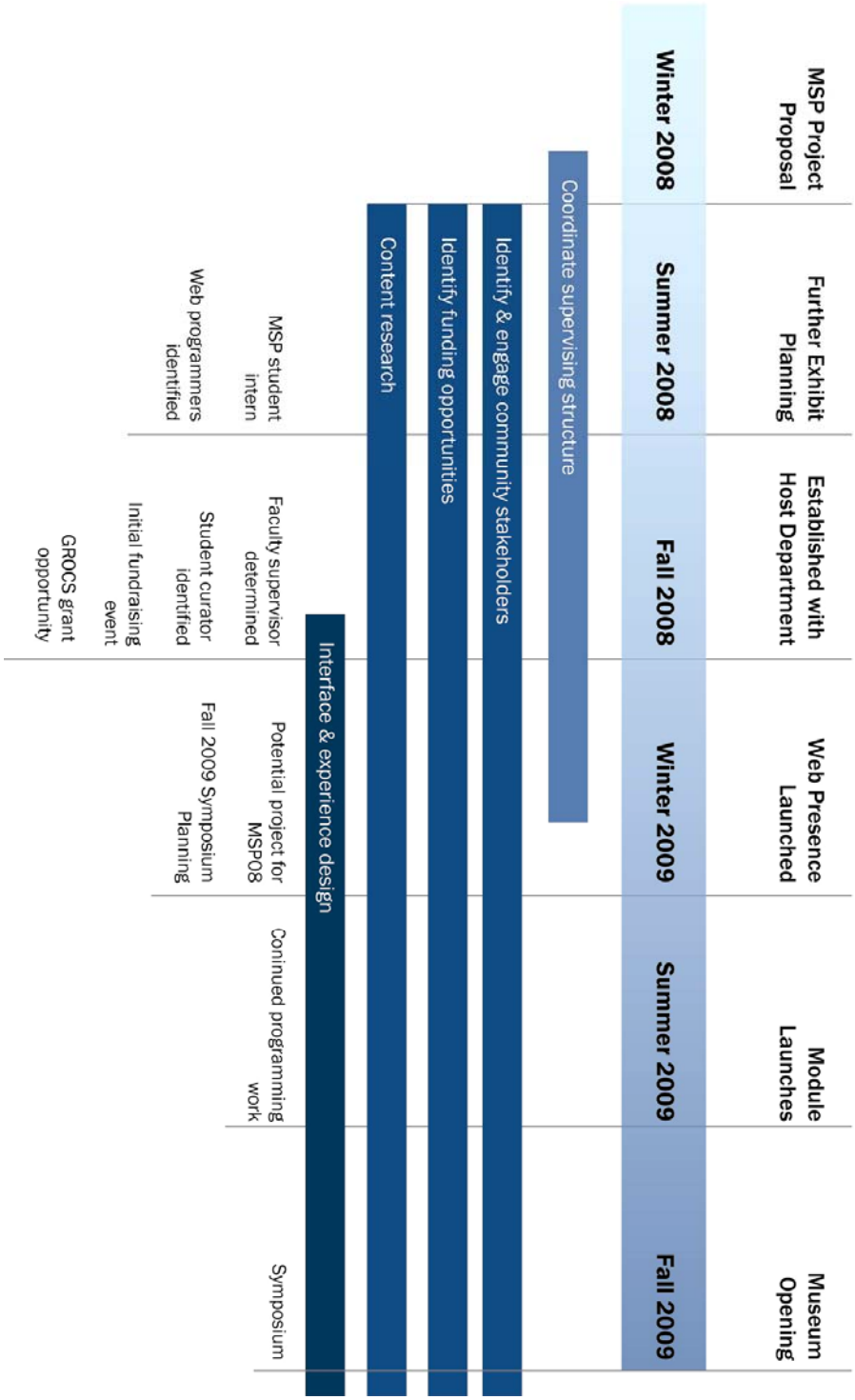
Potential sources for exhibit funding are as follows:

1. ***Michigan IT Community.*** The best possible sources for funding this project are individuals who will contribute stories or experiences to the museum. This includes Michigan alumni (particularly those still working in the technology field), and those who have a vested interested in preserving the history of technology. Additionally, corporate funding for development of exhibit technologies may be available.

2. ***Grants.*** Research grants often include public outreach requirements, and by partnering with technology researchers on campus, the virtual museum can serve as vital public forum for cutting-edge research. The University of Michigan will be an important resource for the museum through its many funding opportunities. GROCS, Grant Opportunities for Collaborative Spaces, is a program that would fit especially well with the goals of the virtual museum. GROCS funds student-initiated and faculty supported projects that deal with interdisciplinary research using digital media. Applications are due in November for funding in the winter semester. For additional grants opportunities, see Appendix D.

***3. Fundraising events.*** While not always the highest-grossing way to raise funds, events will serve to both generate interest in the project, while re-connecting the Museum with the Michigan IT community. Refer to Figure 3 for suggested intervals for fundraising.

**Figure 3: Project Timeline**



## 5.0 COMMUNITY INTERACTION

Given the challenge of creating a museum which has a strong organizational identity in the virtual realm (see Section 2.3) community programming will be of primary importance to the solidity and credibility of the project. While its primary exhibit space will exist only virtually, live real-time events will provide a crucial link between the virtual and the real. Through these events, *The Frontier University* will strive to create and sustain the dialogue and interaction so valued by physical museum audiences. This 'real-life' programming should include lectures, colloquia, symposia, and other events that bring people together in a specific location at a specific time. The needs for such public events will arise as the museum takes shape. However, one event that should be anticipated and planned well in advance is the museum opening that coincides with the release of the modules. This event will be an opportunity to generate publicity for the virtual museum, help curators to collect information on the most active and engaged constituents, and encourage community participation. Such an event may be a good forum for a symposium featuring campus computing figure-heads and solidifying the relationship between past and current leaders in Michigan information technology development. The museum opening event will also provide an opportunity to work with co-sponsors, and establish a precedent for collaboration between the virtual museum and other campus departments.

### 5.1 Inviting Participation

*The Frontier University* will encourage community interaction through its highly interactive gateway website, described in Section 3 (Exhibit Structure). In our meeting with Harold Skramstad, he pointed to the importance of the web as a tool for listening, rather than just projecting and displaying. Through at least two permanent interactive features, as well as the feedback devices built into the modules, the website will be the ear of the museum, facilitating and responding interaction with the museum's content and keeping curators apprised of community sentiment and awareness.

1. ***Discussion Board***. One central discussion board, with theme areas devoted to each module, will host an online conversation about exhibit content, as well as providing a venue for general visitor feedback and input. The discussion board will be as important to visitors as it will to museum staff, as it will provide information on how people are interacting with and responding to the museum.

2. ***Wiki.*** Due to the extent of the community-based knowledge that contributes to the history covered by *The Frontier University*, a tool is needed for visitors to express and share individual expertise. A wiki devoted to the history of information technology at Michigan will provide a structure for a community-authored repository of information.

### 5.2 Tours

Museum tours will be a way of helping visitors makes sense of the disparate attractions of *The Frontier University*, while facilitating active interaction with museum content. Two types of tours will be offered:

1. ***Virtual Tours.*** Borrowing on the strategy of the physical museum community to provide tours tailored to target the audience's specific needs and interests, *The Frontier University* will offer programmed tours through its virtual exhibit space in accordance with specific themes that transcend individual modules. A virtual tour for currently University of Michigan students might take them through exhibits which relate to technologies that have particularly featured student participation. These virtual tours will suggest an order to proceed through exhibits, supplying appropriate links to web-based experiences, and appropriate information for non-web-based experiences.

2. ***Physical Tours.*** These tours will feature non-web-based exhibits as well as other University of Michigan, Ann Arbor sites which relate to the history of IT development. They will target on-campus community members, in particularly current students and class groups. Through physical tours, visitors will be encouraged to enrich their virtual museum experience with a geographical understanding of the content presented in exhibits. Physical tours will operate through online interactive maps, hosted by GoogleEarth. These maps will contain information on each site, but will also be printable so as to promote actually touring the sites, individually or as a class.

It is our hope that the intensity of the programming schedule we have outlined here will serve a primary goal of the virtual museum: the development of a virtual collection consisting of stories meeting the criteria outlined in the collections policy (see Appendix B). While collection development is an aspect of museum administration that seldom reaches the public eye, the collection development of *The Frontier University* will be an instrument of outreach, and the establishment of an active presence in the community, sponsored by programming and facilitated participation, will be essential to its success.

## 6.0 CONCLUSION

In our initial project meetings we established that part of our goal was to create a framework for a virtual museum which prompts visitors to says, "Wow, that's cool." For a museum devoted to a subject through which it also operates, technology about technology, the innovation of the media and techniques of display must excite, inspire, and surprise. While this was a useful initial goal for coming up with creative ideas, it is clear that more than the wow-factor will be needed to sustain this museum over time. Our goals must include not only the production of wonder in our visitors through the use of technology, but also encourage interaction with exhibit content and curiosity about the history of information technology at the University of Michigan. Through the many venues for involvement and interaction outlined in this proposal we hope to create a museum which will be deeply rooted in and valued by the University of Michigan community, and by other constituent audiences.

The ultimate success of this museum will be measured by its ability to sustain itself. The ideas and interests of the initial curatorial staff will determine the initial stories that populate the modules. However, once the museum has a presence it will ideally generate contributions from visitors for new content areas. The dialogue between museum staff and audience will be critical to developing the museum's virtual collections and ensuring that the museum remains dynamic and active over time.

In section 1.3 we proposed several objectives for the virtual museum which respond to the question, "What should *The Frontier University* do for its audience?" These goals are based on the desire to create a certain kind of defined impact within multiple communities. These objectives are very important, but the nature of the virtual format causes us to have objectives relating to the tentatively emerging genre of virtual museums. Critical to the success of the Museum will be an adherence to our guiding principle that "virtual" does not constitute a single medium, nor a single kind of methodology of display. The strategies for exhibiting virtually are as diverse as those for exhibiting in physical museums. We hope that through this project we will not only educate and inspire our audiences to think in new ways about information technology, but also to think in new ways about the museum, and its place in our increasingly digital age.

## APPENDIX A: Mission Statement

To guide initial development of the exhibit we have proposed a working mission statement. Mission statements are imperative to institutional development, establishing the museum's relationship to its visitors as well as its operational ethos.[8] What follows is a full mission statement to be used in more extensive publications, and an abridged statement to be used where space is limited.

### A.1 Full Statement

*The Frontier University: Michigan in the Information Age* is an exhibited collection relating to the history of technology at the University of Michigan. This virtual museum is dedicated to preserving and presenting stories in which the University has shown unique strength, and demonstrating both the local and global impacts of technological innovations. Visitors embarking on this virtual museum experience are reminded of the historical contributions Michigan has made in the field of technology, and the ongoing spirit of innovation that drives the University's commitment to research and development. The museum exists to educate, by inspiring students, faculty, staff and IT professionals to continue developing empowering technologies, despite the risks and uncertainties of working at the threshold of knowledge. Collections in the museum commemorate tacit knowledge and preserve historical accounts of technology. *The Frontier University* is a pioneer in developing exhibition technologies while creating a community that contributes to the museums collections and experiences.

### A.2 Abridged Statement

*The Frontier University: Michigan in the Information Age* is the an exhibited collection dedicated to commemorating and preserving historical accounts of information technology at the University of Michigan. The museum exists to inspire students, faculty, staff and IT professionals to continue developing empowering technologies, despite the risks and uncertainties of working at the threshold of knowledge.

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[8] Harold Skramstad, "The Mission of the Industrial Museum in the Postindustrial Age" *The Public Historian* 22:3 (2000): 25-32.

## APPENDIX B: Collections Policy

With the exhibit in early development, we felt proposing a collections policy would be useful. This is intended to be a working document, suggesting ways in which to handle contributions to the collection. When the exhibit materializes it will likely be met with an insurgency of suggestions for what to include; this document suggests ways to determine which stories to include, while remaining true to the museum's mission. As with other aspects of the museum, it is our hope that this document will evolve along with the project.

### B.1 Nature of the Objects

Because this museum aims to exhibit and preserve stories rather than material objects, "object collections" must be carefully considered. These museum acquisitions are not singular objects or accounts, but rather series of collected examples that are amassed with the intended purpose of exhibition.

### B.2 Collections Criteria

What follows are some initial guidelines for evaluating the quality of a proposed acquisition. While there will most certainly be exceptions, the following are criteria which, ideally, all new acquisitions should meet. A story chosen for accession:

1. Encompasses multiple perspectives
2. Includes a physical component
3. Makes significant contributions to exhibit goals
4. Contributes to an interpretive module
5. Is relevant to the museums audience
6. Contributes to the building and preservation of technology history

***Multiple Perspectives.*** To prevent the exhibit from becoming a showcase for the most vocal contributors, it is important that each story include multiple perspectives. Both developers and users made significant contributions throughout the history of technological development at Michigan. Therefore, it is important to include accounts from instructors, students, University staff, and professional developers. This type of inclusion will also ensure that visitors to the exhibit can identify with the stories presented

***Physical Component.*** In keeping with our construction of the "virtual" for this exhibit, there are two important reasons why each story must include a physical component. The first is that is to establish virtual objects with the same presence as physical objects. The second is to engage visitors with physical experiences—ensuring that participation with the collection goes beyond the computer screen. Physical exhibit components may include, but are not limited to: public lectures or events, pieces of hardware, photographs, archival records, print documents, other exhibits and significant sites.

***Significant Contributions to Exhibit Goals.*** This virtual exhibit exists to remind visitors of Michigan's contributions to IT development, and to teach our audience about this history. It also serves to commemorate the efforts of leaders in the field. Acquisitions must meet be able to be used in a manner that supports all three of these goals.

***Contributes to an Interpretive Module.*** To keep the larger narrative of the exhibit intact, each initial story acquisition should fit within one of the three interpretive modules. Within each module, story acquisitions should provide evidence of the exhibit's overarching interpretive goals: first, to demonstrate accomplishments made through technology and second, to show the impacts and risks of pioneering in technology. We anticipate that more modules will be added as this project progresses; new acquisitions will have to fulfill the interpretive goals of their respective modules.

> *Module I:* These stories will provide examples of the computer's transition from mechanical object to digital device, and the ways in which Michigan has contributed to such advancements.
>
> *Module II:* These stories will come from students and faculty who both helped to design technologies and who were end-users. Each contribution will demonstrate how the University has engaged students with technology, and how such technologies have had impacts beyond the campus setting.
>
> *Module III:* These stories will originate from the IT community, and will portray the significance of Michigan's collaborative contributions to the communication technology legacy.

***Relevant to the Exhibit's Audience.*** Because this exhibit is designed to reach a wide variety of diverse patrons, collections must be acquired with them in mind. Each audience will have different interests, and each new acquisition should meet the education, preservation, and commemoration needs of at least one of the following identified groups:

1. The University community, especially including students and staff
2. Other universities with whom Michigan has partnered in developing information technologies and strategies
3. University of Michigan alumni

4. Prospective students
5. Former participants in IT development at Michigan (retired professors, researchers)
6. Non-University constituents interested in the history of information technology

***Building and Preservation of Technology History.*** Primary acquisition consideration will be given to stories that are in danger of becoming "lost" with current methods of documentation. It is not our intent to collect and exhibit stories that are "common knowledge" both in and out of the technology field; instead we aim to help the IT community at Michigan re-build its unique history.

### B.3 Deaccessioning

Because the objects in this exhibit are stories, deaccessioning will naturally occur when stories are absorbed into larger narratives, or are replaced by more relevant or more complete stories. Because this project is not designed as a repository for information, stories that are removed from the virtual exhibit will no longer be considered part of the collection. Stories should be removed from the collection if it is determined they no longer meet the criteria above.

## APPENDIX C: Survey of Virtual Museums on the Web

Undoubtedly the largest challenge in this museum project is to conceive of and structure a successful model for a virtual museum. Preliminary research into existing virtual museums indicates that there is no agreed-upon definition of what a virtual museum should constitute. Research into several different kinds of virtual museums has, however, had an impact on our approach to virtual in *The Frontier University* concept. Following is a sampling of the virtual museums we visited online, and notes on their content, strategies, and organizational structures.

### C.1 The Virtual Museum as Showcase for Physical Museum

***The Oriental Institute Virtual Museum, University of Chicago***
http://oi.uchicago.edu/museum/virtual/
John C. Sanders, Head
Oriental Institute Computer Laboratory
University of Chicago
(733) 702-0989
jc-sanders@uchicago.edu

This virtual museum was developed in 1996 by the Oriental Institute Museum at the University of Chicago in order to provide digital access to galleries while they were closed for renovation. The virtual museum consists of 360° panoramic photographs of the Institute's gallery space. Viewers can zoom in on objects, and manipulate the rotation of the image, but they cannot advance through the space. Instead, multiple files, in Apple Quicktime format, allow viewers to situate themselves at different points in the galleries. In total this amounts to approximately 51 movie files. Each gallery contains a detailed inventory of objects, as labels are illegible in the movie files. Brief introductions also explain the themes of the galleries. Tours through the movie files are also made possible by sorting like-themed galleries by subject.

## C.2 Virtual Museums as Online Documentation Collections

***The Virtual Museum of the City of San Francisco***
http://sfmuseum.org
Gladys Hansen, curator
sfmuseum.org
PMB 423
945 Taraval Street
San Francisco, CA 94116
curator@sfmuseum.org

*The Virtual Museum of the City of San Francisco* is an example of a virtual museum which serves as a digital repository of documents pertaining to its exhibit subject areas. Each exhibit aggregates text of historic documents, photographs, and sound recordings in several major areas of San Francisco history, which is presented as a linked inventory. The virtual museum might best be classified as a digital archive, consistent with the main curator, Gladys Hansen, who is the Archivist Emeritus of the City of San Francisco. Besides exhibits, the museum provides a register of victims of the 1906 San Francisco earthquake, and solicits for artifacts, oral histories, and biographies of people involved in that event. The virtual museum also sorts their digitized documentation by subject category and is keyword searchable. The virtual museum also has an online museum shop. It also hosts the websites for the preservation of the Old SFFD 21 Firehouse Landmark, and the Musee Mechanique.

## C.3 Virtual Museums as Simulator

***The ENIAC Museum Online, University of Pennsylvania***
http://www.seas.upenn.edu/~museum/
Moore College of Engineering
Jan Van der Speigel
jan@seas.upenn.edu

*The ENIAC Museum Online*, hosted by the University of Pennsylvania is arguably not a virtual museum at all—it hosts few of its own exhibits. Text and limited photos cover the basic theme areas relating to the development of the ENIAC digital computer, designed at Penn in 1944. The core of each exhibit theme is the technological devices which demonstrate the new abilities under discussion. For example, in the *Pre-ENIAC* exhibit, the webpage links to sites which showcase the abacus, the slide rule, etc. hosted by other organizations. The central attraction of the ENIAC Museum Online is the ENIAC simulator, also developed outside of Penn at the Free University in Berlin, Germany. The simulator, developed as a Java application, allows visitors to manipulate the ENIAC's various controls, to perform a series of pre-programmed calculations, or to upload and execute their own. The simulator shows the circuit connections being made as the computer operates. The digital replication of the ENIAC interface is thus elaborately recreated and a genuine sense of the mechanics

of the highly complicated object is possible, with considerable patience.

### C.4 Virtual Museum as Fancy Website

***Computer History Museum***
http://www.computerhistory.org/
1401 N. Shoreline Blvd.
Mountain View, CA 94043
(650) 810-1010

The *Computer History Museum* is not necessarily a virtual museum, but rather the very sophisticated web presence of a physical museum, with extensive virtual exhibit content. Both this exhibit content as well as its subject area makes it a relevant subject of study for the Frontier University project. Some of the online exhibits complement actual exhibits on the floor of the museum, while others are designed exclusively for the web. Each exhibit design is somewhat different, but they follow the general multi-page approach, where topics within the exhibit topic are addressed on separate pages. Navigation between pages is possible in any order the viewer chooses, but the page content suggests an order in which to go through things. Pages are mainly text based, but also feature photographs of collection objects which can be enlarged with caption content. Another important feature of the *Computer History Museum* online exhibits is the online forum, employed on many of the pages. Viewers can post comments and form discussion threads.

## APPENDIX D: GRANTS

***Grocs (Grant Opportunities for Collaborative Spaces)***
Deadline: November 1, 2008.
Sponsor: University of Michigan Digital Media Commons
GROCS provides funding for student-iniated and faculty-supported projects which investigate innovative uses of digital technologies in an academic environment.
http://www.dc.umich.edu/dmc/grocs/

***Advancing Knowledge: The IMLS/NEH Digital Partnership***
Deadline: March, 2009
Sponsor: National Endowment for the Humanities, Institute of Museum and Library Science
Advancing Knowledge provides funding for "innovative, collaborative humanities projects using the latest digital technologies for the benefit of the American public, humanities scholarship, and the nation's cultural institutions." Successful proposals will feature a technology as a means of sharing information in the humanities across and between cultural institutions.
http://www.neh.gov/grants/guidelines/Digital_Partnership.html

***National Leadership Grants***
Deadline: February, 2009
Sponsor: Institute of Museum and Library Science
National Leadership Grants fund projects put forth by museums or libraries which aim to develop tools, research, models, services, practices, or alliances which have applicability across cultural institutions and which demonstrate innovation, collaboration, and strategic impact.
http://www.imls.gov/applicants/grants/nationalLeadership.shtm

***Digital Humanities Start-Up Grants***
Deadline: October, April 2009
Sponsor: National Endowment for the Humanities
Start-up grants fund projects fun innovative new work in the planning or initial stages of development, focusing on any of the NEH's areas—research, publication, preservation, access, dissemination, etc.
http://www.neh.gov/grants/guidelines/digitalhumanitiesstartup.html

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