UNIVERSITY OF CINCINNATI

Date: 5/20/2009

I, David Michael O'Connell, hereby submit this original work as part of the requirements for the degree of:
Master
in Architecture
It is entitled:
Information Convergence: Technological Space in the 21st Century Library

Student Signature: David M. O'Connell

This work and its defense approved by:
Committee Chair: Vincent Sansalone
Elizabeth Riorden

Approval of the electronic document:
I have reviewed the Thesis/Dissertation in its final electronic format and certify that it is an accurate copy of the document reviewed and approved by the committee.
Committee Chair signature: Vincent Sansalone
Information Convergence

Technological Space in the 21st Century Library

A thesis submitted to the
Graduate School
of the University of Cincinnati
in partial fulfillment of the
requirements for the degree of

Master of Architecture

In the School of Architecture and Interior Design
of the College of Design Architecture Art and Planning
by

David Michael O’Connell

B.S. Architecture, University of Cincinnati, June 2007

Committee Chair: Vincent Sansalone
Second Chair: Elizabeth Riorden
Technology and information play a critical role in society today. The public library systems in the United States, formerly the centers of information and learning for many communities, have fallen behind in these areas due to an outdated methodology that is incompatible with the ever accelerating rate of technological advancement. New ways of interacting with information such as the Internet, wireless communication, and digital media have been forced into a 20th century model of information storage and interaction that does little to benefit either the libraries or the content itself. Rather than treating all media the same, the history of libraries and information technology must be used as a guide to inform how the contemporary library integrates the three topics of space, technology, and information. Through an exploration of the relationships of virtual information space and architectural space, this thesis proposes a radical intervention into the public library in order to transform it into a place focused on technology, learning, and enriched social interactions with information.
Special thanks to my wife, Meghan, who has stayed by my side cheering me on through all six of my years at the University of Cincinnati.

Special thanks to my parents, Ray and Lisa O'Connell, who have always supported me in all of my endeavors, academic and otherwise, and without whose loving guidance and support I would not be where I am today.

And special thanks to all the teachers, professors, and fellow students who have positively influenced my education over the years, and who are too numerous to list here.
<table>
<thead>
<tr>
<th>TABLE OF CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
</tr>
<tr>
<td>Acknowledgements</td>
</tr>
<tr>
<td>Image List</td>
</tr>
<tr>
<td>0. Introduction</td>
</tr>
<tr>
<td>1. Libraries and Society</td>
</tr>
<tr>
<td>2. Libraries and Control</td>
</tr>
<tr>
<td>3. Libraries and Architecture</td>
</tr>
<tr>
<td>4. Information Convergence</td>
</tr>
<tr>
<td>5. Thesis Precedent</td>
</tr>
<tr>
<td>6. Building Precedent</td>
</tr>
<tr>
<td>7. Site/Context Analysis</td>
</tr>
<tr>
<td>8. Building Program</td>
</tr>
<tr>
<td>9. Design Methodology</td>
</tr>
<tr>
<td>Appendix A. Presentation</td>
</tr>
<tr>
<td>Appendix B. Bibliography</td>
</tr>
</tbody>
</table>
LIST OF ILLUSTRATIONS

Cover Image: Visualization created in Processing by the author.

Figure 1.0: Detail photo of rare books. <http://www.piratesofthepublicdomain.com/wp-content/uploads/2009/01/old-books.jpg>


Figure 1.2: Illuminated manuscript. <http://upload.wikimedia.org/wikipedia/commons/d/d2/LindisfarneFol27rIncipitMatt.jpg>

Figure 1.3: Public domain engraving of early printing press, ca 1520 CE. <http://commons.wikimedia.org/wiki/File:Press1520.png>

Figure 2.1: Book burning in Opera Square, Berlin, May 10, 1933. <http://www.ushmm.org/museum/exhibit/online/bookburning/burning.php>

Figure 2.2: Iraqi National Library Destruction. <http://www.iraqnla.org/fp/tour/efire.htm>

Figure 3.0: Photo of Bibliotheque Sainte Genevieve by Flickr user Doctor_Casino. <http://www.flickr.com/photos/>
LIST OF ILLUSTRATIONS (continued)

Figure 3.1: "Burning of the Library at Alexandria." detail of an engraving from the Nuremberg Chronicle (1493). <http://marcus.whitman.edu/~paulusmj/communication.htm>

Figure 3.2: Seattle Public Library Interior. <http://www.majorojo.com/photos/public_library/DSC_0503.JPG>

Figure 3.3: "Out of Order." Corryville Branch of PLCHC. Photograph by author.

Figure 4.0: "Convergence #4." Photograph by author.

Figure 5.0: "Idea Store, Whitechapel." Photograph by Flickr user Oli Wheatley. <http://www.flickr.com/photos/oliwheatley/388260922/>


Figure 6.0: Architecture monumentale. Photo by Jean-Yves Romanetti via Flickr. <http://www.flickr.com/photos/jyromanetti/3263545502/>

Figure 6.1: Bibliotheque Sainte-Geneviève. Photo by flickr user hael1234. <http://www.flickr.com/photos/hael1234/2362385074/>

Figure 6.2: Bibliotheque Sainte-Geneviève. Photo by Ann Chou via Flickr. <http://www.flickr.com/photos/annminan/2648927814/>

Figure 7.0: Norwood Public Library Exterior. photo by author.

Figure 7.1: Aerial photography via Windows Live Maps.

Figure 8.0: Boston ICA Computer Room. Photo by author.

Figure 9.0: Diagram by author.

Figure 9.1-9.3: Visualizations in Processing by author.

Figure 9.4: AquaBrowser Library © - Queens Library. <http://aqua.queenslibrary.org/>

The 20th century saw more innovations in the ways that people interact with information and each other than any other one hundred year period in human history. From the mechanical typewriter, to the personal computer, to the cellular phone, advancements in how people create, store, and send information have had a significant impact on the way society has developed. As society moves into the 21st century, the culmination of all these technologies has created a situation in which information can be accessed from anywhere at any time. This is a shift that is as significant as the development of the alphabet in ancient Greece or the invention of the printing press and movable type in the 15th century. In spite of these incredible innovations, the spaces that society uses to interact with all this newly available information have changed little in the same time period.

The public libraries of the United States maintain a worldview that is distinctly more suited to a time when information was gained solely from books, newspapers, and word of mouth. That is clearly no longer the case, as instant access to information and the ability to contact almost anyone
around the world from anywhere has become the norm. While some libraries are beginning to take steps in the right direction, recognizing that the system must be changed to accommodate advancements in technology and new media, the efforts are slow to develop at best, and misguided at worst.

It is for these reasons that this thesis takes an in-depth look at the history of information storage, access, and communication. The intention in doing so is to come to a greater understanding of the direction that the public library systems must take if they wish to stay relevant. This will be attempted through an analysis of the current strategies of the Public Library of Cincinnati and Hamilton County, and a proposal for design intervention in the physical and virtual spaces of a select set of branch libraries. The chosen architectural sites are representative of the vast collection of buildings that house the forty branch locations of the library system. These buildings in the system range from those constructed with endowments from Andrew Carnegie as early as 1906 to a branch completed in 2007.

Taking a broad view towards intervening in the entire system rather than simply proposing a single new branch library speaks to the necessity for the library system to work together as a networked whole, rather than a series of individual locations. There are many precedents on the Internet of how many people working together can achieve results much greater than any one person or system can alone. The library patron of 2009 is accustomed to this level of interconnectivity and efficiency, and the library systems need to be able to meet that expectation.

In addition to changing views of technology, society’s view of the book is evolving as well. No longer the most efficient way to gain information, the concept of the book is evolving into something new. The printed page is becoming a valuable cultural commodity, an artifact that provides an experiential quality that is noticeably missing from the technological means of accessing information. And with more and more people able to self publish and create their own books, the determination of what types of material a library should contain must be questioned as well. The library, as it moves forward, must treasure the book as an artifact, and provide appropriate storage and access to these physical volumes of information in their collections.

It is only through the synthesis of these two contrasting views of information that the library will avoid sliding into irrelevance, and prosper in the new technological age in which it operates.
With the introduction of the earliest forms of writing between 4000 and 3500 BCE, human civilization faced a new problem: what happens to those writings after they have been created (Wright 49; Harris 17)? This problem had not arisen with the prior oral traditions of many cultures, as the information was simply passed on to the next generation through storytelling and cultural traditions. The clay tablets used in early writing required systems of storage and organization that ensured future generations would be able to access and understand the writings. Some of the earliest recordings were of a non-permanent nature, as writing materials were expensive or hard to come by, and would be cleaned or smoothed over so that they could be reused. Thus the problem of archiving the writings did not apply, and the fact that many of the earliest writings were recordings of simple business transactions meant that this was not a primary concern. As more writings became important enough to keep for the future, there came a point when it began to be worthwhile to store those business transactions, laws, or religious precepts that were being recorded so that they could be
referenced at a later time. It was at precisely this point in history that the library became a vital part of society (Harris 4). The exact date when that occurred is not clearly known, however over the many years since the early days of recorded information, the library has maintained this critical role in society, even as its specific goals and functions may have changed (Wright 49).

These early literate cultures faced an uphill battle as the world at large did not always share their respect for the written word. As can be found at many points in history, times of religious or political struggle often ended with the destruction of many, if not all, of the historical records of those who were conquered (Wright 57). Because of this the historical record of human civilization holds very little information about many of the peoples and societies who lived during ancient times, as more often than not invading armies would literally wipe an opposing society off the map and out of the history books.

**Greece: An Alphabet and the First Public Libraries**

It was still mainly the documents and records of the upper class that were being collected and subsequently destroyed during this time. It was not until the Greeks in the ninth century BCE that writing and literacy was made available to a larger number of people through the invention of the alphabet (Wright 61). With this development in hand, the Greeks moved into their Golden Age in the 4th century BCE, and the principles of democracy that they had cultivated over several hundred years of literacy opened the door for the public library to become a significant institution in their society. By providing a resource that allowed for the betterment and growth of the individual citizen, they reasoned, they could create an ideal form of government in which everyone had an equal say and could take part in the governing of their own society (Harris 42). It is here that the first connection can be found between the public library system and the idea of democratic government.
While the Greeks initiated the concept of the public library, the Roman Republic advanced it, as it did with many other inherited Greek cultural traditions. The ways the Romans advanced the idea of the library came in the development of the social aspect of the library. Libraries were often connected to the Roman baths that had become such a large part of the lifestyle of the citizens of that age, and the focus became less on informing the citizens and more on entertaining them (Krasner-Khait). This was not to last forever though, as the Roman Empire began to disintegrate in the third century CE. The instability of the government and the economy contributed to a decreased output of new writings and an increase in illiteracy, and by the 5th century Rome was a shell of its former self, and subsequently was overtaken by Germanic peoples from the north (Lyon 96). This began the Middle Ages, a time when information and learning was hard to come by, and libraries as an architectural space ceased to exist in mainland Europe.

**Connecting Rome and the Renaissance**

Although this was a major setback in terms of information and library progress, there were still pockets of learning that kept the traditions of writing and information organization alive. These pockets were in the monasteries that developed in the countryside, and also in the Islamic regions of Spain, Northern Africa, and the Middle East. In these locations the works that survived the cultural decline of the fall of the Roman Empire were collected, translated, and protected for several hundred years until the rebuilding of institutions of learning during the build up to the Renaissance.

The work of monks during the Middle Ages in collecting and transcribing existing works led directly to the value that began to be placed on written documents during this time (Harris 89-104). That fact, combined with the scarcity of books and the lowered levels of literacy, greatly increased the value of the written word. It was also around this time that the codex began to be widely used as a more efficient replacement for the scroll. The
codex was a bound collection of parchment or vellum sheets, and became a radical new way to interact with information. No longer limited to reading in a linear fashion along the length of a scroll, a reader could pick and choose any point to begin in the work, a major departure from previous ways of thinking (Wright 79).

The transition out of the Middle Ages and into the period of cultural rebirth known as the Renaissance began to gain steam around the 11th century CE with the beginning of the Crusades (Lyon 246-250). These battles pitting Christian Europe against the Islamic Turks in the Middle East, while certainly destructive, did have beneficial side effects. Because there was now a restored connection to the Arabic world, more and more classic written works were making their way back into European collections. These works slowly began to influence society, and by the time the printing press was invented in the 15th century, the stage was set for another information explosion, this one even larger than what had happened in Greek society following the alphabet.

Another societal structure that was in place for the Renaissance to take place was the development of early universities and the strength of the Christian church. The universities functioned as centers of learning that were once again beginning to create original works and research which had been noticeably lacking during most of the Middle Ages (Harris 100-104; Lyon 96-98). The churches were simultaneously growing and collecting more works, which led directly to the need for more architectural spaces for storing the books.

**Printing Revolutionizes Society**

These other developments are surpassed in importance by what is arguably one of the most important events in human history: the invention of movable type and the printing press. This development allowed for an exponential increase in the speed and efficiency of distributing information, which in turn allowed more people access to information. With more
widely available access to books came growing literacy rates, and this ultimately fueled many of the cultural revolutions that happened towards the end of the Renaissance. One particular example is the segmentation of Christianity as Protestants broke away from the universal church, aided in large part by the ability to disseminate information at a rapid pace with the new printing technology (Wright 110-121).

Following these social changes, technological advancement continued to accelerate and the world moved into the industrial age facilitated in part by the new ability to distribute information on a massive scale via printing. Mass production of books and written works challenged the traditional handicraft traditions that societies previously held, and suddenly a multitude of people could afford access to learning through books. These people had previously been excluded from an entire aspect of society because they could not afford to own books when they were extremely rare cultural artifacts, but that was no longer the case.

It was during this time, concurrent with the rise of representative democracy, that public libraries began to boom and grow towards what they have become today. Those in power at the time saw libraries as a safe and affordable source of entertainment for their citizens, and this contributed to their growth during the time of the industrial revolution. Another boost was given to the developing libraries in the United States by tycoon and library benefactor Andrew Carnegie, who paid for the building of a library for practically any community that requested it and showed an intention to sustain information availability for their community. Carnegie stated that the reason he chose libraries for his philanthropic efforts was because “they give nothing for nothing” and “they only help those who help themselves” (Harris 246). These gifts allowed many smaller communities to build collections and provide services in areas that would otherwise have not had public access to books and learning materials, and the course of library history was altered as a result.

**Democracy and Libraries**

These factors (mass production of written works, endowments of public libraries) combined with the rise of capitalism as the prevailing economic theory in the Western world, created an environment similar to the one that existed during the Golden Age of Greece, when libraries were seen as essential in developing an informed and educated populace. On the other hand, socialism, the opposing economic theory that was gaining power in the world at the time, held very different ideals for why to create a library system, but was working towards a similar goal. Libraries in socialist countries such as Russia rivaled the best in the world, but their massive collections came with a price: the government maintained complete control over the content of the library. Quite often this was used to their advantage by censoring and monitoring what information their citizens would be allowed to access (Harris 225). The explosive growth of library systems in the 19th and 20th centuries can be at least partly attributed to the competition of these two opposing socioeconomic systems, as was the case in many scientific and cultural endeavors.

**Contemporary Libraries**

This brings the timeline up to contemporary libraries, many of which were developed in the atmosphere described above. The system that is in place today was designed prior to the personal computer revolution of the late 20th century, and has yet to significantly take this drastic cultural change into account in the way the spaces and organizational systems are designed. Computers have been inserted into the current system to some extent, and there are libraries that do a passable job of using technology for the benefit of library patrons. Yet just as the invention of the printing press revolutionized the way people were able to access information, the internet and personal computers have changed society’s perception of how information should be made available. Currently, many people forego the library altogether as they can access cultural and historical information
from the comfort of their homes. Consumer culture also plays a role in this, as retailers have made it easy for people to simply purchase any books or media that they require. If this is the case, what steps can the library take in order to adapt?

The attempts up to this point have been limited to little more than an increase in the circulation of non-book media. Items such as music recordings on record and compact disc, videos on both VHS tapes and DVD, popular videogames, and in a few cases digital media have been added, but not in any way that significantly alters the way the library is used. The adoption of new media is an admirable attempt at keeping up with the rapid pace at which technology advances, but the library system always seems to be slightly behind the curve when it comes to these updates. These new types of media are being considered as simply more books added to the system in the way that they are organized and catalogued, when that is clearly not the case. These new media types (i.e. DVD videos, digital downloads, audiobooks, etc) each have specific advantages and disadvantages when it comes to how they can be stored and accessed, and organizing and storing them in the same way as books negates many of their more interesting and advantageous qualities. These collections would benefit greatly from the library reworking its organizational and spatial systems to increase the efficiency of how they are accessed and used. But while these new media types have some great advantages over traditional books, they are still just as susceptible to being controlled and perpetuating other societal problems, issues that have a long history in the way societies have used information.
After tracing the evolution of libraries from their ancient roots all the way through to present day, it is important to take a step back and again examine history, this time with an eye to how libraries and information control are related throughout history. This account begins again with the earliest ancient libraries, those used for business records and government regulations. While it was efficient for those societies to store their information this way, it also opened up a major vulnerability when a new ruler or governing body took control of a society: the new ruler could simply destroy all previous records and have complete control over the people. As there were often only single copies of the tablets or scrolls, it was easy to erase from the records anything that was deemed unfit to be preserved. This makes the historical record of the time understandably spotty, and also shows the vulnerability of having a single source for the information, rather than previous oral traditions that relied on many people passing the stories and ideas from person to person to keep them alive.

Parallels can also be drawn to the fall of Rome and the beginning
of the Middles Ages, as literacy levels dropped off due to the loss of educational and information infrastructures that were lost in the fall of the Roman Empire and subsequent Germanic occupation (Wright 78-79). Those lower levels of literacy and the lack of creation of original works mentioned earlier kept European civilization at a relative standstill for several hundred years (Lyon 97).

Transition from Middle Ages to Enlightenment

Of the events that occurred towards the end of the Middle Ages to bring on the Renaissance, the first two were crucial developments that are still used, albeit in more advanced form, today: paper and the printing press. Both were extraordinarily vital in empowering people to redevelop the skills of reading and writing necessary to spur the Renaissance that was to come. Paper had been around for centuries in the East, but in the 14th century it finally made its way to Europe in usable form. It impacted the way people communicated by providing them with a low cost and plentiful material on which to learn writing and to exchange information across time and space. Previously the only available materials for writing were vellum and parchment, both made from animal skins and taking varying degrees of difficulty to prepare for writing, only to end up with a surface that was less than ideal for writing without a great deal of effort put into making it a usable surface. Paper was the opposite in almost every way, made from cheap materials, relatively disposable, renewable, and available to be bound into books that could be purchased by the growing middle class of merchants.

The invention of the printing press in Germany in the 15th century had a similar effect, but this time in regards to the quantity of written works available to be created and distributed. By setting whole pages of type at a time, a printer could make as many copies as he wanted with relative ease, and soon books were available to an exponentially wider audience than they had been just a few years before. Both of these developments transferred the control of reading and writing from churches and monasteries and into the public realm (Wright 110-116).

A third event was the reopening of communication channels to the Islamic world, which had been busily growing its library systems during the time that Europe was recovering from the fall of the Roman Empire. The libraries in the East were stocked with classic works from before the fall of the Rome, as well as original works (particularly in the field of mathematics), and they were brought back at just the right time to have maximum impact on society (Harris 121).

Once the works began to stack up following this reopening of communication with the East and paper and printing were in place, it was now possible for the masses to have access to the works that had built the strong societies of the classical world, and many took advantage of this new access to knowledge. Empowered by these new ideas and abilities, the people of the time overthrew the feudal systems of governing and reformed Christianity through the various Protestant branches that broke off from the Catholic church. With the printing press on their side, these groups could quickly spread their message across mainland Europe, although violence was ultimately often involved as the leaders in power were not eager to give up their positions.

France in particular felt the sting of a newly empowered citizenry, and the long history of revolution in the country is a direct result of this. The power to learn and communicate around sanctioned government channels on a massive scale was an unprecedented new ability, and even governments that professed to be all in favor of freedom of speech would eventually take notice and begin to take steps to control the practice.

Governments React to Information Revolutions

Having seen the power of information access in empowering citizens to revolt against their government, rulers in the 19th and 20th centuries took advantage of their ability to control what information their
citizens knew in an attempt to head off any unrest. The most effective examples of this can be found in the way socialist and fascist governments operated. Socialism in Russia created many libraries with huge collections due to regulations that required copies of every book printed in the country to be sent directly to the libraries. This strict control over all the books published in the country allowed the government to censor and selectively remove any works that it felt unsuitable for the citizens to have access to, which is a dangerous way to operate a government (Harris 225). These dangers were made extremely apparent during the fascist rule of the Nazi Party in Germany in the 1930's and 1940's, when Adolf Hitler's government went on a spree of book banning and burning that made it illegal to own certain pieces of information. The Nazis even went so far as to attempt to remove whole races and events from the history books. (Rayward, Merveldt 523-525)

When looking at the literature of the same time period it becomes apparent that fear of an information controlling government was at the forefront of many peoples’ mind worldwide, not only in the countries where it was so openly practiced. Novels such as George Orwell’s 1984 and Ray Bradbury’s Fahrenheit 451 led the wave of stories about not-so-distant future settings where the government had banned the freedom of speech and maintained strict control on the freedom of citizens to learn and communicate anything that was not officially sanctioned. This fear of information control was bred from the actions of the socialist and fascist governments, but also from the realization of how a government’s ability to control information particularly during times of war could be a powerful weapon. Both sides in the two World Wars, for example, specifically targeted libraries and cultural centers in major European cities as a way to demoralize the enemy and their citizens. It is unfortunate that many great works of art and literature were lost as a result, however due to admirable actions by citizens on both sides of the war a great number were also saved (The Rape of Europa).
Fear of the public library system by tyrannical governments and their attempts to control it gives strength to the argument for using the public library as a fundamental part of the democratic process. Many of the ideals of democracy such as freedom of speech, freedom of information through the press, and the availability of learning and knowledge to everyone are all elements of the ideal public library system. The library is also complementary to the process of democracy in that an informed populace is the ideal way for citizens to have their say in the governing of their nation. It also can provide checks against abuse of power by those who have been elected to represent the people. If the citizens do not have these avenues of access to free information, it is very difficult for them to be informed and to have their opinion heard in the running of the country in these fast paced technological times. First in Greece, then in the Roman Republic, and today in the United States, democratic government has arisen with the help of a public library system for the empowerment of the everyday citizens, and each time the complexity of both the government and the library systems have grown.

**Democracy and Control**

It must also be pointed out that there are a fair number of examples of democratic governments disrespecting the freedom of people to access and record information. One famous incident from the last decade was in 2003, during the invasion of Iraq by the United States, when the Iraqi National Library was razed and looted by the invading forces. When questioned about this egregious act against the cultural heritage and knowledge of the Iraqi people, Donald Rumsfeld, the United States Secretary of Defense, replied by simply saying “stuff happens” (Rayward 361).

There is also a history of book banning in libraries when a particular work is felt to be inappropriate for whatever reason, an action that clearly goes against the freedom that the United States Bill of Rights is supposed to provide to everyone. It is this disrespect for information and knowledge
that has driven many people today to go around the existing media and government structures to find information, and the internet has facilitated this process in an unprecedented way.

In the past decade the role of the internet has grown to become a vital element of the democratic process, as it is a way for individuals to speak either directly to one another or to large groups with little of the effort or expenditure that was required in the past to disseminate a message. It is perhaps still too soon to say exactly how profoundly this has changed the way people view their world, but comparing the information that is available to the current generation with what the previous generation had access to shows a tremendous disparity.

Wikipedia and Information Collaboration

Comparing democracy, libraries, and the internet inevitably leads to what might be considered the most truly democratic platform yet developed, the online user-managed encyclopedia “Wikipedia.” The service was often derided early on as being unreliable and full of falsified information due to the fact that anyone with an internet connection could access and edit the information found on its pages. Yet over time it has become perhaps the most expansive database of information on a multitude of subjects, much of which is incredibly difficult to keep up to date and relevant in other forms, like books. In recent months Wikipedia has been updated with accurate information minutes after events happen around the world, allowing people to have a constantly updated source of information even while the events that are being recorded are happening. All of this is accomplished without a central authority over the content of the articles, only the users who submit the information and the users who browse the articles. Those same users in turn have the ability to flag and mark for correction (or even correct themselves) any content that they find to be inaccurate.

Resources such as Wikipedia have given the average citizen access to an amount of unfiltered direct information that has not existed up to this point in history. Other services provide additional ways for people to get their information from sources other than the traditional methods of printed papers, radio, or television broadcasts. Some of these are the free video distribution services on YouTube, the vast instant communication available on social networks such as Facebook, MySpace, and Twitter, and the near ubiquity in the last few years of web logs, or “blogs” as they are colloquially known, which allow any person to write and publish their opinions or reports of current events online. This change in the way people give and take information is a significant shift in the way people perceive the world. It is as important as the shift that was caused by the move from hieroglyphic and cuneiform writing to alphabetical writing, or even the information explosion that was created by the invention of paper and the printing press.

The fact is, however, that even though the ideas created by this change have begun to shape the views that people have towards communication, not everyone has equal access to it. Although the abilities of computers and communication technology are expanding exponentially, they still have yet to reach many in this country who do not have the economic means to pay for the luxury of having the internet in their home. This is another reason why the library is still a critical part of the infrastructure of society. In addition to the entertainment provided by popular books and media, there are also many ways people can use the library to better themselves, through programs such as employment services or after-school learning programs for children. The upper middle class has access to many of these resources in the home, and therefore tend not to take the time to visit the physical library. On the other hand, a rising unemployment rate and slowing economy may push more people from the middle class into a position in which they need to rely on the library for access to information.

Pitfalls of the Internet Model

The efficiency of the Internet and other new communication
technology does not come without its own new set of problems. Particularly when discussing civic life and how people interact with their government and their fellow citizens, the Internet is not quite the utopian ideal it may seem to some.

Peter Levine, director of the Center for Information and Research on Civic Learning and Engagement (CIRCLE), is a leading writer about technology and society, and has written an essay concerning what he sees as some of the main dangers of an Internet society. Of the many points he makes in his writing, three of them are directly applicable to the development of a strategy for developing new library spaces.

The first idea that needs to be kept in mind is social inequality. The fact that the Internet is a service that requires first a computer, an expensive luxury, and second a monthly subscription, means that the cost of entry is prohibitively expensive for many families. This puts them at a disadvantage to those who can afford Internet access, and serves to widen an already growing gap. This is also an area that the library fits squarely into, as it can act as the intermediate step between those without and those with the Internet.

The second problem of a connected society is a decrease in real personal interactions, and the resultant weakening of social bonds. When Internet users do not have to move out into the world and have dealings with others in person, there is a net loss of social value for all. Children and teens who spend more time interacting with others through the impersonal means of online chats and social networks develop a skewed sense of relationships, which carries through into society as a whole. The library can attempt to be a mediator to this problem by providing a place where people can utilize technology while still being in a social setting, if the resources are correctly managed.

Leading directly from weakened social bonds is the fear of decreased public deliberation due to the narrowing of experience allowed by the Internet. Accurate search engines, custom news filters, and the creation of virtual spaces for discussions about specialized topics are all factors that have made people on the Internet perhaps more knowledgeable about a few specific topics, but poorer in knowledge about unrelated areas. This knowledge in unrelated areas helps people adapt when unforeseen situations arise, and contributes to a well roundedness that benefits society and public discussion. The term for this voluntary segregation of interests is balkanization, where groups diverge farther and farther apart due to opposing interests, and never come together to advance knowledge by combining their ideas. This is something that could potentially be helped by appropriate mechanisms in the library system, as there is the potential to introduce people to opposing and divergent ideas even while they are searching for specialized topics on the efficient search engines of the library catalogues and the internet.

Economic Hard Times

While the current economic recession has caused the libraries to see a sharp upswing in patronage, there are difficulties that come along with a struggling economy. More patrons coming in, particularly those who are visiting precisely because they have been hit hard by the slowing economy, and using the computers or checking out books, does not necessarily translate into more income for the public library system. Expected to do more with the same amount of resources, or in some cases even less resources, the library systems find themselves in a precarious position. Many public libraries are forced to run the branches with a less than optimal amount of librarians, and are forced to restrict their hours in order to deal with funding issues. Increasingly the libraries of the future will be expected to do more with less, competing with other sustainable business models and sources of information, while still relying on the tenuous business model of operating almost solely through donations and taxes allocated from the state.

Just as the public library vanished following the fall of the Greek and Roman societies that supported creating an informed populace, it is
of vital importance to redesign the public library system to weather the
torm of a struggling economy and a changing world. One way that this
can be done is through a reprogramming of the ways people interact with
the space of the library, both physically and virtually. The goal is twofold:
to create library spaces that act as centers of stored knowledge by archiving
and protecting the books that will become artifacts as digital distribution of
content increasingly grows in popularity, and secondly to function as access
points to the various technological resources on the internet for those who
do not have the means to access them in their homes.
The spaces that books and information are stored in have changed drastically over the history of the library, and in order to fully understand the origins of many of the systems that are in place today it is helpful to start with the ancient one last time. The first libraries, as discussed earlier, were mainly resources for the support of a specific enterprise, whether that was business, governmental, or religious. Because of this, early libraries were not designed as individual buildings but rather they were placed into spaces within existing structures, often palaces or temples. This allowed the resources of the library to be close at hand for those making use of them. This did not pose a problem for public access of the collections, as they were strictly private enterprises at this point. Their placement inside existing buildings, without their own architecture or design, means that there is little record of how exactly the spaces were arranged. Even though little is known about the specifics of the organization of these spaces, it is nonetheless important to note their existence as the origins of the library as an architectural space.
The Lost Libraries

Over time libraries began to gain prominence in society, as signified by the occupation of scholar or scribe becoming a valued position in many societies. What is widely considered the first major library in the world was subsequently built in Alexandria, Egypt, circa 300 BCE. Through the collection of scrolls and tablets of works from around the world they were able to create a collection of unprecedented size that required two new things: a clear organization system, and a space designed specifically for the keeping of these works. The library at Alexandria drew scholars from around the civilized world, and became a great center of learning in the ancient world. Unfortunately beyond these basic facts, little more is known about the spaces of the library or the exact numbers of works contained and organized in the library (some accounts put the number as high as 600,000 scrolls) (Harris 45), as it was completely destroyed by invading armies around 88 BCE (Wright 42). Neal Stephenson, a respected novelist and writer on technology, sums up the situation well: “It is inherently difficult to get reliable information about an event that consisted of the destruction of all recorded information.”

The Romans carried on the torch of library architecture following the destruction of Alexandria, with a variety of libraries being built in and around Rome during the 1st century BCE and 1st century CE. These buildings were open to the public and stored popular works in Greek and Latin, yet they still catered to the scholars and other highly educated and privileged people. A new idea was needed if the public was to become literate and informed.

Libraries as a Social Space

That idea was a movement that began in the 1st century CE to allow better access to the knowledge and literature of the time by other classes. The way that this was ultimately accomplished was to integrate the library into a social and architecture space that most all Roman used
extensively, the baths. The prime social space of the time, Roman baths provided citizens with a place where they could bathe, relax, exercise and play sports, and now, with the addition of the libraries, educate themselves. This methodology ties back to the Greek ideal of an informed decision-making public, and even as Rome became even more autocratic over time the result was information access for a much wider range of people than merely wealthy and educated intellectuals (Krasner-Khait).

The Roman Empire and its systems of libraries and information access were not to last forever. As the Gothic peoples moved in and overtook the empire, in some cases they destroyed information institutions and resources, but often they simply had no use for them and they fell into disrepair. Thus the progress of the architectural spaces of libraries ground to a halt with the onset of the Middle Ages, as did many other cultural developments.

Following the decline of the Roman Empire in Europe, the Christian church became the sole holder of knowledge in the Western world. Monasteries kept mainly religious writings through the centuries, and some cathedrals collected not only religious books, but also some that were of a more educational nature for use in classrooms. Since the book collections of the time were often very small, it was common for a closet or other small room to be designated as the storage space for the library. This recalled back to ancient times when libraries were subordinate spaces to a larger structure. It was in this way that libraries weathered the difficult times of the Middle Ages, and came out alive and well when a culmination of many historical developments spurred to life once more society’s hunger for knowledge and information.

**Architectural Expansion**

Beginning in the 14th century book collections began to expand, helped along by the invention of paper and later the printing press. As the collections grew, so did the space required to organize and store the books, and before long churches began to build independent libraries to store the writings. Over time, these libraries grew and developed into universities, and as those centers of learning flourished, the monasteries became less important to the overall landscape of learning and information in Western society (Harris 102-103).

The development of libraries in Western Europe from that point until the 20th century consisted of an increased sense of nationalism from the various city-states and countries. This focus on growing collections had a direct impact on library architecture. Suddenly governments began to build large library structures as symbols of their literary superiority over other countries. This can be seen most clearly in Paris, where the development of the Bibliotheque Nationale signified France’s quest to collect as many works as they could, and display them in an impressive public structure. This continued growth of the public’s interest in reading and book collecting spurred the development of other libraries as well, and in 1855 Paris saw the opening of the Bibliotheque Sainte Genevieve, designed by Henri Labrouste.

The Bibliotheque Sainte Genevieve is of particular importance as it signified a new way of understanding the library, in both an architectural and a social sense. Designed as an open rectangular space with iron columns supporting the two floors, the library contained large desks for public reading and study, which created a social gathering space for the pursuit of knowledge that had rarely been seen up to that point in time. While that was the inward focus of the library space, the outward face of the building was just as significant. Labrouste used the names of famous and significant writers and thinkers from contemporary and classical literature as ornamentation on the face of the building, mimicking the organization of the stacks inside with the brick and stone outside.

**Carnegie and the United States Public Library System**

In the United States the national library, the Library of Congress,
was quickly growing towards becoming the largest in the world. However one of the most significant developments of the time was not with that one library, but with the many hundreds of libraries that were made possible by one man. That man was Andrew Carnegie, and through his philanthropic efforts many communities across the United States were able to build public libraries in the late 19th and early 20th centuries. Many of the Carnegie libraries were built in the Neoclassical and Revival styles of the time, recalling the great national libraries of Europe and the architectural styles of the Renaissance. A testament to the success of Carnegie’s efforts is the fact that 86% of the 1,679 libraries built with his funds are still standing and 78% are still in use to this day (909 as libraries and 403 as offices, museums, or other similar uses) (Skeen).

Yet while the libraries funded by Carnegie served their communities well at the time they were built, they did not and could not take into consideration the radical changes in the way people interact with information and with libraries that would develop at the end of the 20th century. Because of this, many of the Carnegie libraries have not adapted well to the introduction of the computer and new media types, and have become less than ideal public library spaces, beautiful though they may be. The situation many Carnegie libraries face is characteristic of the public library systems as a whole, stuck using early 20th century designs and mindsets in a rapidly evolving 21st century world.

**Potential for a New Model**

The public library is in this position due to the difficulty of predicting future technological advancements in the design of library spaces throughout the 20th century. But while the library system may not have been able to predict the broad adoption of personal computers and the internet, there have been few attempts since these events have come to pass to overhaul the system to allow for computers and new media to coexist on equal footing with the books in the libraries. There have been
some changes in the way the libraries, particularly those located in urban centers, are used. The addition of coffee shops, gift stores, and expanded reading space has transformed many libraries into urban living rooms of sorts, a model particularly embodied by the Seattle Public Library by Rem Koolhaas and OMA/LMN (Kubo). Many libraries have become used for public gatherings, civic events, and as a sort of nowhere-else-to-go space for those with no job, no school, or no home. The contemporary library has become less about books and more about being a technological and social space.

There are several factors that appear to have led to this shift in what library patrons expect from a library. The first is the availability of personal computers and internet access in many middle class homes. Once people started to be able to obtain encyclopedic information and other basic research information at home, the need for going to the library to educate oneself diminished. Despite this, the library maintained its status as the place for many people to get popular literature for leisure reading, yet a new service that the library itself has implemented has marginalized the need for patrons to actually visit the library to find these books. The library has a presence on the internet, with the full catalog available for search so that patrons can determine if a book is even in the library before visiting. This in combination with the service that the Public Library of Cincinnati and Hamilton County calls “Express Holds” allows library patrons to reserve a book from the website, whether it is at the desired location or not, and have the book pulled from the shelf by a librarian and placed directly adjacent to the checkout counter. Because of this the patrons accessing the catalogue from home visit the library but never make use of the space, simply entering the library and checking out their books without entering the stacks. This is not a problem that needs to be fixed, it is merely the direction that people want the library to move, and therefore the design of library spaces should be responding to this new mindset. The current designs of many libraries devote much of their space and resources to the stack areas, which with
these new express systems are rarely used by the patrons. That space which is devoted to book storage could be made more useful if it were repurposed for the advancement of the technological resources of the library.

One of the largest factors that has changed the spatial use of the public libraries is the library's use as an access point for those who do not have the internet and personal computers in their home. This is a severe disadvantage for those who cannot afford the luxury of a computer and internet service. At a severe competitive disadvantage, these citizens go to the one pace where they can obtain that access: the library. As people gather in these spaces to use the internet for entertainment, social networking, or to gather news and information, the culture of the library has changed from quiet research and learning center to social gathering space in many instances. Ultimately this change is not accommodated by the existing library architecture. The forcing of computer technology into mismatched spaces causes there to be little meaningful interaction between patrons.

It is for these reasons that the spaces of the library have evolved over the ages to the system that is in place today. In the last century in particular there have been some misguided developments that have kept the focus on books even while the world of technology passes by. The process is not irreversible, and by taking all of this knowledge into account this thesis hopes to reconfigure the architectural and social spaces of the contemporary library in a way that will suit it well moving into the future.
The three parts of this thesis, each one looking at the same period of time but each with a focus on a different aspect of library development, show that much can be learned about the future of the library by looking at its history. Analyzing how information has been valued, stored, and manipulated over the ages gives a strong framework upon which to base the future developments of the public library system. Through this analysis it has been shown that whenever there was a great advancement in information communication, information availability, or information technologies there was a subsequent expansion of library systems in that society. In the case of the Greeks that development took a few hundred years to mature into a system of public information access. In the Middle Ages it took about a century for the full effects of paper and the printing press to be felt. Now, at the turn of the 21st century, it has taken just over twenty-five years for the personal computer and subsequent digital technologies to cause a radical change in the way libraries are expected to operate and provide for their community. These examples clearly show the exponential increase in how
quickly a major information and communication breakthrough can impact society.

This most recent rapid change has not come without its fair share of growing pains for society and the library system. Instant access to information and interpersonal communication have reached new levels of importance in this constantly connected society. The library has attempted to provide these resources to those who need it, with greater or lesser degrees of success depending on the situation. Many libraries built during the 20th century, whether with funds from Andrew Carnegie or the local community, used a model of information access and storage that worked well at the time, but has not aged well with the insertion of computers and new media into the system. Internet terminals in libraries often feel cramped, incorrectly lit, or placed in areas that were designed for the reading of books rather than typing on a computer. Additionally, there is little space available for people to bring in a notebook computer to work due to a lack of power outlets or wireless internet access (although plans to roll out wireless internet access at most branches are underway as this thesis is being completed). These are features that the system is slowly working to integrate, and some newer branches have implemented them, yet when looking at the system as a whole the technology systems are woefully outdated and poorly executed.

A report released by the Benton Fondation in 1996 concerned with looking at libraries in the age of digital information shows an early awareness of these challenges that libraries would begin to face over the next decade, yet little has been done so far to address them. Some of the key observations brought up in the research study were:

1. “Instead of being caretakers of materials, [librarians] will become information navigators, aiding users to tap more effectively the resources of the Internet and other digitized collections.” (Weiss 11)

2. “Libraries are civic integrators... They provide a forum through which community members interact with each other, both through

the use of meeting space and through the collection, dissemination, and implementation of information.” (Weiss 10)

3. “...Libraries need to evolve into entirely new organizational form that take into account the digital library-without-walls and that acknowledge that information today can be gathered, disseminated, and created at any time in any place.” (Weiss 10)

Rather than using the same model of inserting old technology into a system designed for physical books and a single linear organizational system, the library of the future must take bold steps in reorganizing their spaces in ways that are in line with the way people now view information access. New designs for spaces must take into account both the usability requirements of the 21st century library patron (ergonomic workstations, comfortable places to read a book or study, and proper acoustic and lighting considerations) and the fast pace of new technology innovations that will need to be integrated as they come about in order for the library to remain relevant.

While technology is destined to be the centerpiece of the library of the future, it would be detrimental to society for the library to simply discard the printed page. The book must remain a valuable element of library collections, but rather than being viewed as a simple an object on a shelf, books need to be treated as valuable cultural artifacts. Bruce Sterling in his book Shaping Things discusses the timeline of the types of objects humans have designed and created, beginning with the artifact and ending with what he calls “spimes.” The difference between the types of objects lies in their connectedness to a larger network, with artifacts containing no connection to the internet, for example, but a strong connection to the human who created it. Spimes, on the other hand, are the fullest example of a connected object, as they are constantly connecting to a larger whole where more information and knowledge can be gained about the object itself.
Books provide an experience of the senses that technology has not been able to replicate in any way to this point, and it does not appear that it will be able to in the near future either. While some people may use the library strictly for access to information in an efficient manner, there are still those who value the qualities of the book as a way to gain knowledge or entertainment at a more relaxed pace. It is up to the library to guard these priceless cultural objects against the onslaught of impermanent digital versions of works that allow for easy organization and storage, but at the price of an extreme lack of physicality that protects against tampering and deletion. It is the acknowledgement of these differences that the library must take into account moving forward.

As for how to create these new technology focused spaces, many public library systems have an incredible stock of buildings built over the past 100 years at their disposal which can be used as the basis for this redesign. These pieces of architecture will provide the framework for the transition to a new system that works equally well for the physical and the technological through an aggressive intervention in the social and architectural space of each branch library. It is up to the new design of these spaces to tap into the potential of the existing buildings, and repurpose what was originally designed for a very narrow view of public information access (the book) into a new view of cultural communication and information archiving that will serve the library patrons of the 21st century. By allowing the nostalgic and experiential qualities of the book as artifact to influence the efficiency or information access afforded by computers and the internet, and vice versa, the public library system can reemerge as the physical centers of learning and culture in a world that is increasingly devoid of real places for those interactions.
There have been few well publicized projects that attempt to integrate technology and new functions into the contemporary public library branch. Many prominent library projects in recent years have been focused on the downtown central library, with examples such as Rem Koolhaas’ Seattle Public Library being the most obvious example. One of the few branch library designs that has gotten attention is the series of “Idea Stores” in London designed by British architect David Adjaye. These projects recognize the changing desires of contemporary library patrons and attempt to go beyond simply storing and organizing books.

Even the location of these public libraries helps to redefine the concept of a public library as a facility that is more than simply a book repository and internet terminal. Located on Whitechapel Road, a busy market and shopping center for the community, the Idea Store Whitechapel attempts to redefine the library as a space that is more in line with the consumer culture of contemporary society, as their name would suggest. Based on this concept, the library offers a wide range of services
and facilities, from dancing lessons to yoga to computer training. These “Lifelong Learning” courses, as they are called, are all open to the public, although some do have fees associated with them in order to enroll. Those fees can be waived however for those who are under the age of nineteen or have proof of unemployment or economic need (Idea Store).

David Adjaye also incorporates other nontraditional library programmatic elements in his designs in addition to the spaces for learning and physical fitness. Some of these spaces include a café on the top floor of the library (requiring the patrons to experience the other spaces of the library on the way to reaching the café), a courtyard that acts as a buffer between the busy shopping street and the quiet library spaces, and a media area that acts more like a “covered market that is easy to access and use” than a traditional shelving system (Whitechapel Idea Store 59).

In the design of the exterior of the project, Adjaye has also created a “a new point of reference for the district” (Whitechapel Idea Store 59). The use of both colored glass panels and reflective glass panels creates a visually interesting play of light and color that draws people towards the library as they move down the pedestrian thoroughfare of the High Street market. This is another aspect of the Idea Store projects that is influential towards this thesis, as the library of the future must become a beacon of knowledge and information access for the community both in virtual and urban space.

The ultimate plan for the Idea Store concept is for there to be seven separate branches built across London. This is another area of similarity to this thesis, the idea of treating the library system as an interconnected whole rather than small individual projects. By using a repeated visual language for all the projects as well as offering interaction between the different branches there is a wealth of currently untapped potential that could be used in the library of the future.

This new focus on the library as a space for not simply books, but for all manner of physical, social, and technological learning is an idea that this thesis aspires to follow. David Adjaye has been noted as saying that architecture “must be relevant to the greatest number of people” (Whitechapel Idea Store 59), and in creating spaces where people can go to learn and advance themselves architecture can indeed begin to approach this lofty goal.
The Bibliotheque Sainte Genevieve in Paris, France, designed in 1843 by Henri Labrouste, might at first glance appear to be a strange choice as the precedent for a library based on the Internet and digital communication technology. Yet when one digs beneath the surface of the project, there are many parallels of how Labrouste approached the Bibliotheque Sainte Genevieve that are extremely applicable to what must be done in the contemporary public library. The technology Labrouste was employing seems like little more than commonplace conveniences today, but at the time his use of interior lighting, iron structure, and outward projection of programmatic elements was revolutionary.

Labrouste was designing a library for a time when the idea of the truly public library was becoming more popular every year. At this point Europe as a whole, and France in particular, had been experiencing regular revolutions of the people against their government. This thesis has attributed these uprisings at least in part to the new easy accessibility of information that came about from the mass distribution allowed by the printing press.
and inexpensive paper. As national and university collections rapidly expanded, they required spaces for people to organize as well as interact with that information. With the Bibliothèque Sainte Geneviève, Labrouste was given the chance to design a library that needed to accommodate 600 students at a time, as well as several hundred thousand volumes of written works (Ayers 108).

This design problem was approached by Labrouste as an opportunity to use new technology and materials in the project. The first and most significant technological advancement used in the library was the application of exposed structural iron columns to support the dual barrel vaults that define the interior space of the first floor. The Bibliothèque Sainte Geneviève was the first monumental public building to use such a structural system (Van Zanten 89). This use of iron columns created an open floorplan free to be used as a massive reading room for all the students utilizing the resources of the library. They also allowed the exterior walls to be relatively open, and the use of clerestory windows above the shelving lit the space evenly through most of the daytime. When darkness fell, though, another solution had to be found to allow reading after dark.

This problem led to the use of the next technological innovation that was incorporated into the space, the use of gas lighting to allow reading and study late into the night. Indeed the original Sainte Genevieve library that was replaced by Labrouste’s design was the first library in Paris to use such technology. Labrouste therefore took the opportunity to incorporate the artificial lighting into the design of the reading desks (Van Zanten 89).

In looking more specifically at the architectural design of the library, Labrouste created a project that was thoroughly modern in its use of technology as described above, and also in its restraint in the ornamentation of the exterior facades. Rather than following the style of many contemporary Second Empire designs, Labrouste showed restraint in creating a very rational and straightforward floorplan and elevation. This went against the way buildings dedicated to the arts had traditionally
been treated, as excessive ornamentation was common and the use of the utilitarian material iron was looked down upon as unfit for such a cultural institution (Ayers 108). And while the classical ornamentation found at the entrance and other parts of the elevations was not as strong a break with the past as some of the material choices in the project, Labrouste made a conscious effort to “reinvigorate” the style by using it in a new way. The detailing was in service to the program housed inside, with depictions of ancient torches pointing to the new use of interior gas lighting and the carved stone festive banners that run along the elevation celebrating the value of the knowledge housed inside, to name two examples (Bergdoll 183).

Another, and perhaps more significant, way in which Labrouste applied ornamentation to the exterior of the building was in his request that the names of famous writers and thinkers be inscribed on the masonry of the main facade, stacked as though they were books on a shelf (Ayers 108). This was simply another way in which the building called out to the community that knowledge and learning were housed inside, an element of social projection that was revolutionary in its own right.

This thesis is not hoping to use the architectural form or style of Henri Labrouste’s Bibliothèque Sainte Genevieve as its precedent, but rather the mindset and theoretical concepts that were used in the design of this early modern project. Such social innovations as open space for group study and learning, the projection out to the community that this building is a center of learning and knowledge, as well as the use of advanced technology for the time, are all concepts that apply directly to the ways in which this thesis is proposing to update the contemporary library.
The Public Library of Cincinnati and Hamilton County is one of the busiest library systems in the country. This can most likely be attributed to the large number of branches in the system and the density of their distribution across the city. With 40 branches in total, it would be difficult to pick any one that is representative of the entire system. It is for this reason that in this thesis four separate branches were selected, branches that each have share similarities in demographics and size with many of the other locations in the system.

After several months of study of these four branches, it was determined that even with their small individual size it would be difficult to reach an acceptable level of detail in all four projects in the available design time. Due to this the scope was narrowed down to an extensive design project for the Norwood Public Library branch and a smaller focus on application of the process to the other branches.
The Norwood Public Library is one of the six remaining Carnegie Libraries in the Cincinnati public library system, having been completed in 1907. The Carnegie libraries are the oldest remaining in use in the Cincinnati Public Library system, and although most have been renovated in some fashion, they still retain their original focus on patron access to the books and a scattered distribution of reading desks. Some of the shelving now holds either video or audio collections, and some of the reading desks have had computers placed indiscriminately on them.

This branch of the library system is located in the city of Norwood, a struggling working class community north of downtown Cincinnati. The city has a median income of just over $35,000 a year, making it the most depressed of the four communities this thesis has investigated. A low income in combination with a neighborhood that is made up of only 55% families makes the Norwood branch a potential site for a library that focuses on adult education and job search assistance (Muni Net Guide).

The physical site itself is located along Montgomery Road, one of the main avenues through “downtown” Norwood, and is only a few blocks away from the commercial center of the neighborhood. Surrounded by a car dealership and a variety of small retail establishments with oversized parking lots on Montgomery Road, the scenery is not the most attractive. As one continues down the side street that the library sits on the corner of, the area quickly transitions to residential, with a church and single/multi family housing becoming the main building type found.
The programs of the new branch libraries must work within a framework of potential programmatic elements based on the requirements of each specific library. Varying demographics and contextual requirements necessitate this, and allow for more site and community specific libraries. The virtual infrastructure of the library also allows for some resources to be shared, allowing the information that is universally useful to all branches to be accessed from each location without having to send physical copies between branches, saving time and money. This program should be viewed as program for the library system as a whole, and depending on the needs each individual branch that program may be edited to create a library space appropriate to that community.
### CURRENT LIBRARY PROGRAM

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration/Offices</td>
<td>5%</td>
</tr>
<tr>
<td>Book Shelving (Open Stacks)</td>
<td>50%</td>
</tr>
<tr>
<td>Reading Desks</td>
<td></td>
</tr>
<tr>
<td>Computer Desks</td>
<td></td>
</tr>
<tr>
<td>Media Shelving</td>
<td>10%</td>
</tr>
<tr>
<td>Meeting Room</td>
<td>15%</td>
</tr>
<tr>
<td>Storage</td>
<td>10%</td>
</tr>
<tr>
<td>Exhibition Area</td>
<td>5%</td>
</tr>
<tr>
<td>Restrooms</td>
<td>5%</td>
</tr>
</tbody>
</table>

### PROPOSED EXPANDED PROGRAM

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration/Offices</td>
<td>8%</td>
</tr>
<tr>
<td>Book Shelving (Open Closed Stacks)</td>
<td>20%</td>
</tr>
<tr>
<td>Reading Desks</td>
<td></td>
</tr>
<tr>
<td>Computer Desks</td>
<td></td>
</tr>
<tr>
<td>Media Shelving</td>
<td>16%</td>
</tr>
<tr>
<td>Digital</td>
<td></td>
</tr>
<tr>
<td>Media-specific Browsing Solutions</td>
<td></td>
</tr>
<tr>
<td>Meeting Room (Scalable)</td>
<td>14%</td>
</tr>
<tr>
<td>Storage</td>
<td>10%</td>
</tr>
<tr>
<td>Digital [Server Rooms]</td>
<td></td>
</tr>
<tr>
<td>Physical [New Arrivals/Repair]</td>
<td></td>
</tr>
<tr>
<td>Exhibition Area</td>
<td>10%</td>
</tr>
<tr>
<td>Real-time Search Display</td>
<td></td>
</tr>
<tr>
<td>Community Created Content</td>
<td></td>
</tr>
<tr>
<td>Digital/Physical</td>
<td></td>
</tr>
<tr>
<td>“Commons” Spaces</td>
<td>12%</td>
</tr>
<tr>
<td>Community Interaction</td>
<td></td>
</tr>
<tr>
<td>Digital Workstations</td>
<td>22%</td>
</tr>
<tr>
<td>Full Access Experimentation Terminals</td>
<td></td>
</tr>
<tr>
<td>Controlled Children’s Terminals</td>
<td></td>
</tr>
<tr>
<td>Focused Use Terminals</td>
<td></td>
</tr>
<tr>
<td>Virtual Spaces</td>
<td>0%</td>
</tr>
<tr>
<td>Online Integration</td>
<td></td>
</tr>
<tr>
<td>Physical Reflections of Online Activity</td>
<td></td>
</tr>
<tr>
<td>Restrooms</td>
<td>5%</td>
</tr>
</tbody>
</table>
The design portion of this thesis project focuses on the Norwood Public Library branch as a site to test the design process that could ultimately be applied to every individual branch of the library. As a Carnegie library built in 1907, the neoclassical architecture of the existing building provides a strong contrasting backdrop for the technological and architectural intervention being proposed. The architectural form of the intervention originates from the process of aggregating the existing physical information in the library. There is also an external addition of techno-social space that allows for interaction with information and other library patrons in a flexible space in order to increase social interaction between library patrons. The external addition also functions as branding for the library branches so that passers-by can identify locations that are centers of learning and technology in the community.

**Central Information Core**

The initial step in the upgrading of the Norwood library involves
the move from open to closed stacks. The reconfiguration of the traditional open stack model into one driven by a central closed stack system will result in the availability of existing spaces to be used for the new technological program. This occurs through a process of locating and modeling the existing physical sources of knowledge in the library (the book stacks). Once these have been modeled, the information can be used to generate a form based on the initial locations of the books as they are aggregated into a central core. Using the visual programming language Processing I created a program that generates a formal response to the amount and location of information in the existing building (figs. 9.1-9.3). This visualization is translated into the physical form for the storage of the books in the central space of the library as they are removed from the open stack areas.

Changing the public library from an open to a closed stack model may initially appear to be an excessive response to the current situation, but it is a response to the developments that have resulted from the implementation of technology in the library up to this point. The implementation of an online catalogue that mimics the existing linear organization of the library and the ability to place Express Holds (where a requested book is sent directly to the front desk for pickup) are the two largest offenders. The Express Holds service in particular, while making using the library slightly more convenient, has had a detrimental effect on the use of the architectural spaces of the library. Patrons can now enter the library and move straight to the front desk to check out without utilizing any of the stack areas, because they have done their browsing before even entering the library. This is not necessarily a problem for the library or the patrons, as it is more efficient, however it has the consequence of an excess of unused space in the stack areas of the library because the spaces were designed for a time when browsing was the only way to find a book.

The removal of the books from availability for open browsing by patrons solves several problems that currently face libraries. Specifically it addresses the issues of content security, time spent reshelving books by
librarians, and inability to find books due to errors in shelving or mistakes in the catalogue. The central core of books is accessed either via interactive displays in the media browsing section of the library, a condensed area in the new technological programmed space, or through the online catalogue which allows patrons to browse either from home or from the computer terminals in the new digital laboratories. Some may lament the loss of direct physical interaction with the contents of the library when browsing. Yet this approach offers the dual advantages of providing multiple ways of sorting and visualizing the search results as well as allowing librarians to devote their time to helping patrons find information rather than organizing the books on the shelves.

The creation of a core containing all the information in the library also offers other advantages in terms of optimizing the discovery of information and customizing the library branch to its users. While these are not particularly architectural features, they do evolve from the new use of space in the library, and the movement of these actions can be observed from the spaces around the core. Over time as patrons from the branch check out items the core can track which items are popular and which are checked out together, for example, the core can build restructure the organization of the books more efficiently.

In addition to identifying emergent patterns in the way books are stored in the library (a concept that influenced the generation of the form of the core discussed earlier), the constant movement in organizing and optimizing the physical volumes stored in the library becomes an event. This movement is tied to people searching for information and represents the virtual and spatial interactions that are taking place both in the library and online as people search and browse for new materials. There are already examples of similar types of search engines being created and made available to libraries. One such example is AquaBrowser, a “search and discovery platform” (Medialab) that provides suggestions for new keyword searches while people are browsing for their items and creates a visualization of the results in order to help people find what they are looking for as well as be exposed to related topics. This platform has begun to be implemented at some libraries around the world, but this proposal pushes for full integration of these types of feature sets into the space, rather than just on the computer terminals.

**Techno-social Space**

In this design proposal the core of the library is the main representation of the new ways information is consumed and gathered in the public library system. There is also a secondary need to recognize the important role that social interactions aided by technology have come to have in society as a way to learn about the world. This space is programmed to be a flexible area that can be used for group study, impromptu performances or readings, and serendipitous discoveries of information that is being displayed in the space. A precedent for this type of user-focused space is Office dA's Fleet Library at the Rhode Island School of Design, which attempts to create dynamic spaces where users can create their own library experience, either independently or with others.

The external form of the techno-social addition draws its basic proportions from the existing building, in this case the Italian Renaissance neoclassical style. The proposed materiality of this addition would be a glazed curtain wall on the exterior, with mullion spacing matching the proportion of the existing building. Inset from the curtain wall is a secondary skin, this one a lightweight storefront system, which serves to create a layered facade from the superimposition of multiple patterns. The space between the double wall facade system provides an interstitial space that is used to route all the technological infrastructure (network cables, power, etc.). In addition to allowing for efficient upgrading of technology in the future due to easy access to the interstitial space, the infrastructure provides an additional layer of patterning that increases the complexity of the facade pattern. This infrastructure becoming part of the forming of the
architectural spaces is another instance of the virtual elements becoming experienced in the real architectural space.

This exterior projection also serves as architectural branding for the libraries, so that when someone is walking or driving by a Cincinnati Public Library branch, they know that this is a center for information and technology in the community. It is for this reason that the form of the addition attempts to use the same language of proportion and formal relationships as the exist building, yet using material and layering of patterns in order to create a distinct visual language that will be unique in every community where there is a branch library.

**Networked Technology Laboratories**

The space that is reclaimed by the reorganization of the books now becomes available for use as expanded technological interaction areas. The concept behind these spaces is to allow for experimentation with technology, in a way that goes beyond the typical restricted access terminal that is commonly found in contemporary libraries. These labs are designed in a way that allows for multiple configurations based on the desired use, whether that is in a standard lab configuration with all desks facing the front of the space, all in a circle, or individual use. These mobile desks are able to used in any configuration in the space due to a grid of outlets installed in the floor of the laboratory space. Additionally the partitions of the employ a similar double storefront wall construction that creates an interstitial space for wiring to be run from space to space, as well as easy access for upgrade and repair.

These lab spaces are directly supported by another new programmatic space, this one in the basement of the building, the data center. This is the location of all the digital information in the library, as well as the source of the connection to the rest of the public library network. Similar to the Google Books endeavor that Google has begun over the last few years, the data center over time will digitally catalogue the contents of
the library. Once stored in the databanks of the library’s digital catalogue, the data center can make all the materials available to terminals at other public library locations to take advantage of the efficiency and immediacy of sending information over the Internet from library to library, rather than always physically sending the book to another branch when it is not always needed. This new service would also allow people to view books even when they are checked out, as in some cases this could be very helpful to patrons to determine if they even need to order the book. There is a base level distinction to be made in that some people who use the library are searching for information, in which case having a digital copy of the material would be perfectly acceptable. Others want a more traditional experience, and would prefer to wait the few days for the book to be actually moved between branches. Both are acceptable ways to use the library, and with the addition of a digital center, library patrons will have the option to use the network of public library branches as they wish.

Conclusion

This thesis has attempted to call to question the outdated methods used by the public library system in Cincinnati, and many public library systems in the United States, in a world that increasingly places emphasis on information and technology. The models cultivated in the 19th and 20th centuries are no longer applicable to the way information is consumed in contemporary society, and it is only with a radical shift in the design of the library, such as the one proposed here, that the library will be able to reclaim its place as the center of public learning and information for many communities. While the proposals in this document may seem at times excessive and futuristic, it is only with this type of discussion of what the library potentially could be that society can work towards a higher ideal for the ways people interact with the information and the world.
“This thesis looks at the ways people interact with information, both in real (or architectural) space and virtual (or technological) space. Over history every significant breakthrough in information technology has caused a response from the contemporary library systems. As of 2009, there has yet to be a significant reaction to what is perhaps the greatest change in how people interact with information in all of history, the development and subsequent public availability of the Internet. Through an analysis of the contemporary library, the cultural institution where information has traditionally been stored, shared, and accessed, this thesis explores the ways in which current and future technology can be used to create spaces for interaction with information, technology, and fellow library patrons, always taking into account recent and future developments in information technology.

The design process began by looking at the Public Library of Cincinnati and Hamilton County as a system made up of many individual nodes that are loosely connected to one another. Some libraries are
geographically close to each other, which facilitates easy transfer of materials upon request, and all libraries have a connection to each other through the online catalogue which can be accessed from any branch, however beyond this they act mostly independently. The goal is to craft a process that can be applied to every branch and result in a unique result at each location while still operating within a defined visual language that will allow members of the communities within which these libraries exist as a center of information and technology. This process will also take into account both the similarities that all branches share (programmatic elements, proposed digital connections to each other branch, aging collections and methods of organizing those collections) and the ways in which each branch is more unique (demographics, size, specialty programs).

The next step of the process involved breaking down this network of library branches into those that were representative of the larger whole, in terms of demographics, location, age, and size for purposes of closer analysis. Ultimately I came down to four branches that each represented a particular section of the larger forty libraries in the entire system. These branches were the Clifton Library (small storefront library renovated in last ten years, serves semi-urban community of mainly college students/young professionals and more elderly residents), the College Hill Library (medium library built in the 1960’s next to an elementary school, serves mainly suburban families and children with after school programs), the Groesbeck Library (large contemporary library built in 2000 adjacent to a Catholic church and middle school as well as main commercial avenue, serves suburban families), and finally the Norwood Library (Carnegie Library built in Italian Renaissance style in 1907, located in working class neighborhood along several bus lines). After several weeks of investigation into these four representative branches I chose to focus in on one particular library to be able to fully develop the proposal for intervention, and the branch I chose was the Norwood as it offered the most architectural contrast to the proposed technological intervention, among other reasons. At this point the project moved from analysis of the existing sites and buildings into the design phase.

The design proposal presented here is radical intervention involving the redirection of the library’s focus away from the early 20th century model of open stack access of the physical volumes of the library. In its place is proposed a closed stacks system taking its organizational cues not from the card catalogue of the past, but from the abilities provided by emergent computer systems to track and sort information in real time in order to optimize the storage of information in the library. A closed stacks system offers many advantages over the traditional space planning of the open stacks system in terms of reclaiming architectural spaces for interactions with information rather than simply storage of information. The use of mechanized computer-controlled systems also allows for the core to be managed and accessed virtually, removing the constraints of linear ordering systems when paired with software that allows for multiple methods of sorting and organizing information. It also solves other issues of the contemporary library including time spent by librarians reshelving books rather than helping patrons find information, inability to find materials due to errors in shelving, and security of the library collection.

The form of this information core is generated by the locations of previous physical organization systems in the space, fed into a computer simulation that I created that virtually aggregates the volumes towards the center of the space. This form is then taken through 3D modeling software in order to produce a formal response to the aggregation of physical information in the library. The operation of the core is the first of several instances in the reinvented library that shows the impact that the digital world can have in architectural space. As people request books online or in the library those books mechanically are moved through the core to pickup locations, making the storage center a constant flurry of information and movement, animated the center of the library with the virtual interactions of the patrons.
This consolidation of the content of the library then opens up what was previously open stack area to be reclaimed for the purposes of technology spaces. New computer laboratories encourage experimentation and playful learning with technology, a departure from the typical locked down Internet-only terminal currently found in libraries. These spaces are designed to be flexible, in line with the desires of both the contemporary library patrons and the library branches themselves, who can offer multiple programs and learning sessions with spaces that can be adapted to multiple types of learning (individual, small group study, large group classes, etc.). To make up for the loss of the ability to browse material directly, some of the reclaimed area is devoted to large touch panel displays that visualize the search for information and provide suggestions as to possible related or similar queries, which enriches the overall quest for information. These displays are another example of the virtual interactions becoming apparent in the architectural space as they function and spatial partitions as well as browsing terminals.

This renovation of library spaces also has a direct impact on the role of the librarian in these public library branches. No longer stuck behind a checkout desk or wasting hours putting books back on shelves, the librarian can return to their original and ideal purpose of helping people search for and interact with information.

In addition to the space reclaimed by moving the books into a central core, there is also the need for an expansion of the library building to allow for more dynamic techno-social space. This space consists of an external expansion of the library that takes the proportion and massing of the existing building and buildings upon it through a double wall facade of layered infrastructure and curtainwall systems. This expansion creates a form that is visually and formally in line with the existing library, but contains more complexity that speaks to the new programmatic elements inside the addition.

Once again, as in the technology laboratories, this space is flexible and allows for multiple configurations and uses based on the current desires of the library patrons. A large seating form also resides in the space and allows for impromptu performances and events when required, and independent space for reading and social gathering when not in use for other purposes. The Fleet Library at the Rhode Island School of Design by Office dA serves as precedent for this type of flexible library space. This sort of technological and social space is a key part of the reinvention of the library as a place where information is discovered and shared, as Internet searching and filtering threatens to create a culture that only focuses on information sources that cater to their exact needs. The external architectural expression of this addition also projects to the community that the library has been reinvented as a center of technology and learning in the community, and is another place where the play between the new (virtual) and existing (architectural) is made apparent.

Finally the networking of the libraries in the public library system necessitates a new programmatic space in the form of a data center that stores the digital media of the library and shares it with other branches within and without of the Cincinnati library system. The integration of a server room into the library also has secondary benefits to the library space, as the heat produced by the constantly running computers can be used to supplement to mechanical systems in the building. This is another example of virtual interactions have a real impact on the architectural space.

Through all of these processes of intervention this thesis has worked towards making apparent the overwhelming need to update the contemporary public library branch in a way that allows for its continued relevance in the light of rapid technological advancement. The play between virtual and architectural spaces is still only in its infancy, and this design proposal hopes to create spaces and a model for information organization that is adaptable well into the future.”


