1 Acknowledgement

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At last a big appreciation to my family who has encouraged me to studied overseas for my master degree. Without all of you, I could not complete the studies.

2 Introductions

2.1 Research question

This project is to investigate what is the appropriate architectural mode for the Chinese academic library in order to meet the trends of the Chinese academic plan and this model may be seen as an information researching platform for a large community concept under information age.

2.2 Background

NanHu campus of WuHan University of Technology, surrounded with Nanhu residential communities, is located in Hongshan District, WuHan, China. At the beginning, In order to adapt the trend of development of university education and increasing numbers of students in the future, the Ministry of Education agrees to set a NanHu campus of 133 hectares south of Ma FangShan old campus as a result of strategy of WHUT.

Currently, the preliminary image of NanHu campus has begun to reveal. Road system, main lecture building, partial laboratory buildings
of different faculties, student apartments and student canteen has been finished gradually. At present, sport center of WHUT has been constructing. It is supported and managed by both university and WuHan city. The Center will plan to build a 20,000-seat open air stadium; a main stadium and a heated swimming pool and also plan to make it open to the public after Wuhan Olympic Games the ninth. But other buildings do not come out.

In order to achieve the overall functional planning of campus, optimize resources disposition further and perfect public service system of campus. The overall campus also wants to achieve digitalization. The WHUT has prepared to set a new library of 30000 square meters in NanHu campus. According to the analysis of new campus overall strategy, all large sports facilities after the 9th national Olympic game will be open to the public. Furthermore, The WHUT pays very attention to moral expression of regional culture, campus culture and reasonable landscape arrangement in the process of campus planning. The purpose is to let readers make better approach with university campus especially the public and to know the influence of campus culture.

The project is to plan to set a modern library in the new campus, and as we know, the function of the library building is very strong. So design of library building is not only to cater to the whole campus planning idea but is in accordance with its functional requirements. So the supposed new library might be a multi-functional, open, advanced management of modern library.

2.3 Aims/objectives

The purpose of my project is to promote the idea of a regional service platform for information communicating and searching. This will be achieved by designing a kind of academic library which serves for both the local community and the users within NanHu campus of the WHUT. The final design solution is to set up an appropriate model for the Chinese academic library where the traditional academic library still can be traced and the future one will be promoted.

In designing a building to fulfill this purpose, there were other issues and related architectural problems which had an influence on the design proposal. These issues are: how to appropriately accord the design of library with the strategic plan of NanHu campus? Which is the way to go for merging the functions of academic library and public library in the future direction of academic library and how to successfully combine these western theories with Chinese characters and local culture in my design?

When design architecture, there are usually two kinds of thinking, one is that building itself has strong personality with less consideration of its context and historical and cultural background. The other is that building almost fits to its broad context and is a member of large family buildings. Nevertheless scientific and functional issues in library design must be guaranteed. In front of two ideas, I personally tend to the latter one. Our current site is in a planned new campus which already has been very cultural and environmental. So my design might represent part of
the whole university’s history or culture and the proposed design might show the growth and future of academic library. Therefore how to find an appropriate concept which not only fits the large context but also supports its functions to grow was challenging.

Different types of library have different spatial and environmental emphases, and it is only too easy for an architect to assume that the experience of designing one type of library can be used, with only small adjustment, in designing another. Fundamentally, a library is not a building but a service organization. It also needs to be borne in mind that, in recent years, there has been a growth in multi-functional libraries, for example, combined university and public libraries, and the combining in Local Authorities of libraries with other council services as “one-stop shops”. This is the approach adopted in the Idea Stores concept.¹

In my vision, as well as being the academic library of WHUT, the library also functions as public library serves for residents around campus. As academic and public libraries normally take on different roles, the question of how to architecturally help the combination of these roles needed to be raised. How to keep a balance between the normal use by students and teachers and participation by the public? The design of areas of the library will depend on the philosophy of the service and the needs of the community to be served. Many needs may appear to conflict, for example: Study versus storytime, Privacy versus safety and Procedures versus physical barriers.

It is important to think creatively about reconciling apparently conflicting needs, most obviously through use of different zones or timing of events. Alternatives to traditional library issue or enquiry desks should always be considered, for example, “pod” style desks, which avoid a barrier between customer and staff. The problem for the architect is how to bring the library and non-library functions into a coherent whole.²

The future of libraries is a very argumentative issue. It is basically agreed that libraries will continue to contribute to our community, but some of the functions they already have will change. These changes have been keeping developing over the last 10 years as a result of the progress of technology and the digital age. But as library, the traditional functions such as storage of collection, study and so on can’t be lost with the advent of digitalization age. How to keep a balance between the traditional mode by paper and the modern one by digital medium is also a challenge.

3 Define project

3.1 Brief

The project is to plan to set a modern library in the new campus, and as we know, the function of the library building is very strong. So design of library building is not only to cater to the whole campus planning idea but is in accordance with its functional requirements. And the library is not only serves readers within campus but local surrounding communities.

The university decided to make an academic library of 30000 m² in preliminary planning. According to the design code of library

building and regulation of planning area of normal university, it is easy to get the basic referenced design data of library. Rough quantities of people within NanHu campus is 10000.3

According to the method of determining numbers of population served by library, rough total quantities of readers is summation of people belong to region served by library and ones which are out of region. Usually, calculating numbers of people out of region accounts for 20% of the total.4 We assume that the rough total numbers of people living in communities around the NanHu campus is 10000. Thus, the rough total numbers of reader actually served by this library is 12000.

In comprehensive university which has more than 5000 students, Area per student is 2.03 m²/per.5 Therefore, theoretical calculating area of academic library is 2.03 × 120000=24000 m². Thus the rough construction area of this library ranges from 20000 m² ~30000m².

In comprehensive university which has more than 5000 students, numbers of seat normally accounts for 25% of the total, so theoretical calculating numbers of seat should be 0.25 x 12000 = 3000.6

Compare with quantities of seat among similar scale universities and in order to achieve the sustainable development of the library in the future, the rough total numbers of seat might be 3600.7

Table1: academic library data of some similar scale universities in China (drew myself)

<table>
<thead>
<tr>
<th>Name of University</th>
<th>subject</th>
<th>Construction area</th>
<th>collection</th>
<th>seats</th>
</tr>
</thead>
<tbody>
<tr>
<td>HuXi campus, Chong Qing University</td>
<td></td>
<td>32861m2</td>
<td>150万</td>
<td>3600</td>
</tr>
<tr>
<td>Guang Xi University</td>
<td></td>
<td>32338m2</td>
<td>200万</td>
<td>3600</td>
</tr>
<tr>
<td>NanJing Normal University</td>
<td></td>
<td>20800m2</td>
<td>120万</td>
<td>4000</td>
</tr>
<tr>
<td>Jiang An campus, Si Chuan University</td>
<td></td>
<td>25300m2</td>
<td>100万</td>
<td>4000</td>
</tr>
<tr>
<td>Wei Hai campus, Shan Dong University</td>
<td></td>
<td>20000m2</td>
<td>100万</td>
<td>3000</td>
</tr>
<tr>
<td>Shan Shui campus, Guang Dong business institute</td>
<td></td>
<td>21000m2</td>
<td>130万</td>
<td>3300</td>
</tr>
<tr>
<td>Bei Jing Forestry University</td>
<td></td>
<td>23400m2</td>
<td>100万</td>
<td>3258</td>
</tr>
<tr>
<td>Hu Bei University</td>
<td></td>
<td>42051m2</td>
<td>180万</td>
<td>4200</td>
</tr>
</tbody>
</table>

In comprehensive university which has more than 5000 students, quantities of collection per student is 100/Per. Therefore, a theoretical calculating quantity of collection is 1200000.

Basic rate of open collection is 58% around, so the rough numbers of open collection is 696000.

Basic rate of closed collection is 42% around, so the rough numbers of closed collection is 504000.\(^8\)

Area per seat in general is 1.8~2.4 m\(^2\)/per seat, so the rough total reading area is about 1.8 x 3600=6480 m\(^2\).

Quantity of collection per 1m\(^2\) is 160~210/ m\(^2\) (open collection) and 250~350/ m\(^2\) (closed collection), so the rough area of open collection is 696000/180=3800 m\(^2\), the rough area of closed collection is 504000/300=1680 m\(^2\), the anticipated total area of collection is 5480 m\(^2\).\(^9\)

Simply, the most important two functional areas of library are reading area and collection area. According to the American research, it is generally believed that mixing used function space should account for 20% ~ 30% of total construction area. But recently it, being more significant in the future, will account for more as a result of direction of digital library in the future.\(^10\)

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All the theoretical referenced data above, concerning some important functional area within academic library, is large consideration. The following data, concerning about each specific functional area of the Beijing forestry university library, is provided to have some practical reference on my design.\textsuperscript{11}

**Reading area**
- Professional reading area: 4200 m\(^2\)
- General reading area (including news paper): 1360～1400 m\(^2\)
- Foreign reading area: 1500 m\(^2\)
- IT plus media center: 1400 m\(^2\)

**Collection area**
- Open collection area: 2100 m\(^2\) (professional-1530 m\(^2\), general-570 m\(^2\))
- Closed collection area: 1500 m\(^2\)

**Book management**
- Purchase: 36 m\(^2\)
- Catalog: 120 m\(^2\)
- Binding: 36 m\(^2\)
- Advertising: 36 m\(^2\)
- Information process: 36 m\(^2\)
- Staff rest room: 36 m\(^2\)

**IT control**
- IT plus building control: 36 m\(^2\)

**Entrance reception**
- Clothing store: 60 m\(^2\)
- Information/catalogue searching: 500 m\(^2\)
- Consulting and library knowledge training: 60 m\(^2\)
- Lecture hall: 300 m\(^2\)

**Administration and management**
- Library business lab: 36 m\(^2\)
- General office: 48 m\(^2\)

\textsuperscript{11} Jingshan Liu, Fenglei Cui, Xinling Gao, Thinking and Dialog: Construction of New Academic Libraries in China (Beijing: National Library Press, 2010), p.124-128
Multi-functional meeting rooms: 60 × 2 = 120 m²
Curator room: 36 m²
Associated curator room: 36 m²
Assistance function
Power control: 100 m²
Facilities: 48 m²
Pump: 48 m²

3.2 Site

3.2.1 Site location

The new NanHu campus is located beside the XiongChu main street in HongShan district which is secondary commercial centre. From the aerial photograph (figure 1) we can see that Front gate (north gate) faces toward the XiongChu main road. Back gate (south gate), west gate and east gate closely contact with residential areas surrounding the campus. If fences of university campus are open in the future, almost the entire campus will apparently integrate with community life, which can certainly promote the cultural and fitness development of local communities. Residential area and Commercial Street are located beside the front gate, which results in that its environmental context is complex. From the perspective of school education function, it is better to cut off the direct link between area near the front gate and centre education area. Front gate is the starting point of inclined axis of the NanHu campus. A mountain landscape node is the end point of inclined axis. The gravity of the whole campus should be expressed as a north-south axis starting from the largest multiple lectures building on the north and ending to the back gate on the south.
The large contexts:
3.2.2 Site investigation

The overall concept of landscape planning of the NanHu campus is made up of four parts. (Figure 3)

A sound of waves of two rivers (waterfront culture of WuHan city)
B quiet of garden (garden culture of China)
C horse spirit (historic culture of campus)
D the melody of ages (contemporary culture all over the world)

According to this concept of campus planning, the whole campus was designed into 4 themes.

Two axes: one is middle axis from north to south, the other is inclined axis (middle axis is where the gravity of campus is and is also the axis of the largest multiple lectures building. A largest square and a long green landscape belt are lined on this axis. Inclined axis, ending to BoLe Mountain, is the axis of front gate.)

Two mountains: Plum Flower Ridge and BoLe Mountain

One region: landscape region of waterfront culture

Eight blocks: eight ecological landscape gardens which contain a lot of vegetation and recreative facilities.

The largest square, being on the middle axis, is the closest outdoor space to the area of administration and main lecture building. It is called as “ShuYuan square” where the highest intensity of people for assembling takes place. A long green landscape belt, opposite the “ShuYuan square”, consists of the vegetation zone, culture sculpture and recreational facilities and so on, which shows the meaning of freedom, harmony in nature. (Figure 2)
Figure 2 – “ShuYuan square” on the middle axis
http://tieba.baidu.com/p/1660167015

Figure 3
http://tieba.baidu.com/p/1660167015
3.3 Literature survey

3.3.1 Trends on designing of academic library

Increasingly discussion today is not how to play important role of the modern information technology in the existing mode of library, but to search how to create new mode of the library to adapt the digital age. Some even say libraries are going to disappear. Boss, a expert in library science, have stated that the library will still reserve a lot of print in preserved value, but most of materials or information can be obtained through computer terminals.12

Future library is heading for a kind of direction of "digital library". Digital library has some characteristics as follows:

1. Zero distance effectiveness: More and more people can sit at home, acquire knowledge through software terminals.
2. Transmission of information without carrier: In the digital library, information transmission is realized through the computer network. It is a kind of virtual carrier.
3. The cooperation between man and machine: That means reader is influenced not only by space of library but some kind of integration of modern technology.13

Influence on library building under digital requirements is very apparent. Some intrinsic changes in library architecture result in ones in form of library. Development of information technology has changed the library service mode, also has led to changes of library architectural space. It is actually addressed in the following aspects:

1. Traditional card-searching way disappears: At present, searching information and catalogue is achieved by computer system.
2. Collection space become smaller: Capacity of digital carrier is much bigger than print one, which will lead to smaller collection space.
3. Functional diversification in reading space: Reading space afford more functions under digital age. For example, a single seat area should provide network interface, add more personal learning space and group discussion space.
4. Increase more extra function of entrance space: Entrance space should provide information consulting services, all kinds of information and catalogue searching, sign identification and so on.
5. Add more communication space: One of the most common changes is a stronger focus on community and sharing of knowledge. Libraries are becoming more like community centers and a place to gather and socialize – the new town square. Just providing

access to books and other information is no longer enough. Libraries are becoming a place of learning, not just a place for store of materials for learning. Libraries are providing communities classes and workshops and so on.14

6 Realize networking between different libraries: the library modernization is to achieve network connection between different libraries, eventually forming a regional open network structure.

7 Library has a good relationship with large context and also has beautiful landscape.

Rather than leading to the obsolescence of the library, new technology has liberated the library from increasingly unpopular stereotypical forms, and altered the fundamental assumptions behind their design. One such is the requirement for silence in all but designated areas. The strategy today is to encourage the sharing of knowledge and to welcome the use of the spoken word either between individuals or in groups. Since the library is often used for teaching and learning within the community, silence is expected only in private study areas. Elsewhere, the pleasure of discovery and exchange is welcomed, as is the talking computer and the tapping of keyboards. Restricting silence to special areas allows the remainder to become a place for sharing ideas and jointly pursuing knowledge.15

Another significant shift over the past two decades has been the increasing role of libraries in life-long learning, in providing community information, and in supporting the needs of the elderly. By 2020, 50% of Europeans will be over 50 years old, and here the library has particularly important services to provide. This has ramifications for the design and provision of such things as toilets and disabled access. For people who do not possess English as their first language, for the poor seeking welfare support and for individuals who are newly arrived in an area, the library is often the first point of contact with a neighborhood. Hence, the qualities and values expressed through architectural design leave a lasting impression. For these reasons, the library today is seen as a gateway to learning and a shop window of both knowledge and community services.16

3.3.2 Learning from traditional library

Another issue is the assumption that book is dominant: although books remain vital to the library, the first point of contact is often the computer screen. The interaction between digital knowledge and the printed word is a dynamic one, which requires space characteristics different from the traditional library reading room. Many modern libraries place the computer screen at the front door thereby encouraging the reader to pass through a diversity of knowledge types as they navigate the library. The role of library staff is to aid navigation through modes of knowledge rather than exercise security or merely sit behind a desk stamping the books as they are borrowed. In directing readers to the material, there is a great deal to interaction both verbal and digital, which inevitably affects the interior layout.17


16. Ibid.

17. Ibid.
3.4 Precedent survey

3.4.1 Chinese cases

Over the last 20 years, Chinese academic libraries follow the international modulus design method. "Modular planning" means column-grid block layout without courtyard. Modular design follows two points: one is to make closer relationship between readers and books, implement open collection way, the other is that space has the flexibility of use in order to meet the needs of the development in the future. This modular library is usually a huge planar layout, composing of neat column grids. Traffic and equipment well are more concentrated. Realize three unified principle including height, column grid and floor load. Module library has become popular in western countries, especially American. But there are still limitations in the design of modular library in China. But there are still limitations in the design of modular library in China. But there are still limitations in the design of modular library in China.

Firstly, one-time investment, operation and maintenance cost are very high. Academic library of ShenZhen University is a good example. (Figure 4)

![Figure 4 – plan of ShenZhen University library](image)

Secondly, spatial organization is disordered. Although modular design can guarantee flexibility of library function arrangement, to some extent this kind of unified large space is unfavorable for circulation organization.\textsuperscript{19}

Thirdly, Modular design must lead to lack spatial diversity. The modern library is not only limited to meet basic services but to play a role of education and training. Thus a single modular library, considering as unification of large space, is difficult to meet various demand of readers.\textsuperscript{20}

The last, Modular design must lead to lack organic relationship with environment. The difficult to reflect diversity of library building is apparent, which results in international boring box building.\textsuperscript{21}

On the basis of design of modular library on the traditional mode, someone puts forward a new mode: modular functional partition library. Partitions, having their own modular structure system, depend on different functions of library.\textsuperscript{22} The reasonable functional partitions are shown in the figure below: (Figure 5)

\textbf{Figure 5 – bubble diagram of modular functional partition library}

19. Ibid.  
20. Ibid.  
21. Ibid.  
There is another example of modular functional partition library design. It is Shan Tou University library. Some floor layouts are showed below: (Figure 6)
Although some details are not dominant factors, to some extent they dedicate the whole quality of space no matter indoor or outdoor. For instance, the disabled channel must be considered (Figure 7); In ShanTou University library, each desk has one or two elegant and classic desk lamps. (Figure 8) The effect of desk lamp can not only provide complement artificial lighting while daylight is not sufficient, but can create “private light space” for readers. Designer of ShanTou University library, RuiXian Chen, is good at dealing with light and shadow change, he also transfer direct light into soft diffuse light like many architect did. Beautiful landscape simultaneously is necessary. (Figure 9) ShanTou University library surrounded by water likes water building. (Figure 10) SangPu Mountain far away, water nearby and the academic library itself compose a picture of traditional Chinese painting of natural landscape. Reasonable landscape sketch, a group of bamboo in courtyard, adds more traditional flavor.  

23. “Shan Tou University library” http://wenku.baidu.com/view/2164b7de6f1a900bed51e7e.html
3.4.2 Seattle library

In particular, digitization has created a situation where media is now not only a means by which we understand the world (as with traditional media like newspaper), but increasingly the means by which we experience it. At present, the larger experiential potentials of architecture, as well as media, more often than not become diminished.

Rem Koolhaas’s centre library in Seattle try to provide visually engaging urban experiences in real time and space without demoting architecture to mere backdrop for other more immersive digital media, their architects also reveal a common intention to confront the dilemmas of producing architecture in an age of digital media by using spatially and temporally exciting visual strategies rather than simply decorating a building’s surface. The essence of this contradiction is how to solve the co-existence of the digital and the real. So the modern library, especially in a cyber city such as Seattle, must transform itself into an information storehouse aggressively orchestrating the co-existence of all available technologies.24

Yet, in Seattle, Koolhaas has attempted to find a new relationship between the virtual and the actual. This is clearly illustrated by the somewhat unprecedented containment of all books on a long ascending ramp and the centralization of all resources (digital, human and the traditional) in a fifth-level “Mixing Chamber”. Koolhaas’s intent was to make the central library more than a building “exclusively dedicated to the book”, it would be “an information store”. But there has also been a constant critique about this orchestration of multiple experiences within one large tent-like enclosure as a result of a common set of issues: complaints of noise due to the open structure; the continued dilemma of co-existing with the homeless etc. Even Koolhaas seems to have realized these inevitable functional critiques, such as the signage problems and the need for a broader social-service solution for the homeless population.25

In traditional civic architecture, buildings are organized more pictorially. With most of their civic-mass portrayed externally, the viewer looks in from outside the “frame” at the icon itself. By contrast, in Seattle, the civic object is intentionally mute on the exterior, requiring one to be “ingested” into it.26

As an interface to the urban, the Seattle central library is somewhat unprecedented architectural object. Its skin does not portray a solid separation between itself and the city. It tries to be both autonomous urban object and a complex microcosm of urban fabric and the digital world beyond.27

The library’s exterior objectifies it as a place in the city, a civic destination, yet, the inside is conceptualized as a fluid intersection of spaces through which as social actors move, rehearsing their role in civic life. It is interesting that the rhetoric surrounding our new technology also has begun to promise the same idealized ambitions as past forms of public architecture: utopia. In simple terms, an architect can respond to this reality by representing more pictorial images of our shared utopian ideals.28 As in the case of the Seattle library, an architect can

26. The choice of the word “ingest” makes reference to John Hedjuk’s claim that the difference between architecture and sculpture is that architecture ingest people.
try to avoid the utopian and offer a liberally “platform” or series of platforms on which we must collectively negotiate ever-present issues of class, race and gender.\textsuperscript{29} Thus, one of the most striking spaces found in the Seattle centre library is the tall void that skewers through several of its levels in order to regulate our actions through the presence of another’s vision. Through the sectional layering of many visually connected spaces it formally orchestrates many of the exciting qualities of simultaneity, vibrancy that Benjamin mentioned to documentary data-base structure, montage, and even multi-image collage.\textsuperscript{30}

And just many contemporary film – makers continue to explore the city-symphony style using multi-screen database formats to increase interactivity and more closely represent the temporal structures of urban life, the Seattle library pushes the simultaneity of experience by multi-visual exposure of different program elements. (Figure 12)

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{library_image.png}
\caption{Figure 12 – form follows function}
\end{figure}

Figure 12 – reading area with good natural daylight

Figure 12 - reading area consists of rest area
Figure 12 - mixing chamber in Seattle centre library
3.4.3 The new library of Alexandria, the Bibliotheca Alexandrina

The new library of Alexandria, the Bibliotheca Alexandrina, is truly very beautiful building whose design at the architectural levels merits our attention and would repay our study. The dominant image of the library is the elegant slanted disc. The symbolism of the rising sun is an apt choice. The sun disc has many echoes in Ancient Egyptian mythology. The rising sun is apposite for the emergence of a new beacon of learning. The unique roof structure is also reminiscent of the contemporary computer.\footnote{Ismail Serageldin, “A landmark building: Reflections on the Architecture of the Bibliotheca Alexandrina” \url{http://www.bibalex.org/a2k/attachments/references/refileh150fxqxs2lld55djrkderc.pdf}}

We can analyze this building into these levels below

The building as a building:

Despite its size is too huge, it does not crush the visitor who approaches its main entrance. Once inside, the transition to a larger scale is gradual. The entrance hall is surprisingly austere and still does not give an impression of the grandeur to come. After crossing the closed door of the “threshold” to the library proper, one glimpses the open space beyond. As one move closer to the main hall, the soft indirect light and the well-positioned electric lights imbue the scene with a special ambiance. Then, a few steps further take one onto the viewing balcony, named in honor of Callimachus who was a great poet. There, one is overwhelmed by the great space of the reading hall: spectacular, soaring, elegant, out of this world, are some of the expressions that come to mind. The most important spaces in library are still reading space and open collection space. This design of open large space in The Alexandria library is nearly the same as the “big box” in Seattle centre library, which is based on theory of modular functional partition design to provide a visual communication and multi-function large space where change of space form takes place. This experiential sequence is the mark of truly great architecture. It engages you at both the emotional and intellectual levels. One is constantly engaged by the roof structure, the elegant columns, the books and the exhibits. You feel that you are liberally at the center of an amazing space that engages the reader and visitor alike. Despite the enormous size of the hall, the architect has combined to make this space attractive, modest and human in scale by splitting the vast reading hall into seven levels. The cascading effect of this design means that while one glimpses the other levels, he does not have the feeling of being in a large hanger.\footnote{Ibid.}

The building in its physical setting:

The scale of the bay (the large context of this library) is suited to the human psyche. It is neither overwhelming nor too small for the visitor to be impressed and yet feel welcomed and “at home”. The library complex will be an important magnet and an “anchor” for the visitors.\footnote{Ibid.}

The building in its cultural setting:

As I mentioned early in the part of “the building as a building”, the different spatial feeling between entering into the lobby and crossing the lobby into the reading hall, which is related to a part of the great tradition of muslin architecture in Egypt. It is common in many
parts of Mamluk Cairo to enter large and beautiful buildings through a relatively discreet and/or broken entrance that does not reveal the full size and splendor of the space inside, allowing for the impact of discovery. Especially the building form of sun disc has many echoes in Ancient Egyptian mythology and its typical decoration of wall about Egyptian calligraphy pattern. All this can help people remind of cultural issue nevertheless it is absolutely a modern architecture.\(^{34}\)

The building as intellectual statement:

Modernism with a difference is one way of thinking of the new building. The building makes a very bold counterpoint to the tired and tiresome debate between modernity and tradition. Here the Bibliotheca Alexandrina makes a bold and uncompromising statement. It is for the future by the boldness and simplicity of its vocabulary. The last issue is great architecture always engages us to rethink the meaning of architecture and the Bibliotheca Alexandrina certainly does that. It reminds us that great architecture is more than function, more than form, it can interpret an idea. That is space spirit on which the architecture and its context both take.\(^ {35}\) (Figure 13)

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   http://www.bibalex.org/a2k/attachments/references/refileh150fxqxls2lld55djrkderc.pdf

35. Ibid
Figure 13 – larger open space divided into different interesting partitions in different height
4 Library design development

4.1 Design stage one: initial conceptual consideration from site possibilities

4.1.1 Location of the library

According to my previous idea, the library is not only to serve readers within campus but also outsiders from local communities around campus. At very beginning, the library was to set up on block B near the back door in order to achieve this. (Figure 14)

Main service objects of academic library are readers within campus. So choosing the location of site depends on not only the distance between library and educational, living area but direction and flow of different kinds of readers. If directions of all kinds of readers are almost the same, appropriate location of academic library is in the middle of educational and living area. In theory, it is reasonable to spend 5-10 minutes arriving library from lecture buildings or apartments. The largest square, being on the middle axis, is the closest outdoor space to the area of administration and lecture buildings. It is called as “ShuYuan square” where the highest intensity of assembling takes place. Therefore it is logical to settle my library on this square and make this library as one of the most important buildings in campus. (Figure 15)

According to the location of educational area of NanHu campus, the overall concept of campus plan and another reason that is a road, linking both the west and the east gates, will be the main street after fences of campus are open in the future, eventually, the best location of library should be on block A. (Figure 16)
Figure 14 – local communities around the back gate

Figure 15 – the library service radius and a potential blue main street in the future
4.1.2 Library entrance

The entrance of site should be considered by 4 aspects below:
1 The Site is surrounded by lecture buildings of different departments. For students flow, 4 main façades of library should have a channel to go through.

2 The back gate (the south gate) is very close to communities. This library intends to serve the public to some extent. Additionally, the southern street on the site, linking the east and the west communities, will be the main street in the future.

3 There is a green landscape belt to the south of the site, so this library can make use of the environmental feature.

4 The campus is planned to have the north-south axis direction scheme. So the main entrance should be in the north-south direction.

In conclusion, the southern direction of the site should be more public, open and symbolic. Therefore, it is reasonable to settle the main entrance in the south of the site. (Figure 16)
Figure 16 – supposed location of the main library entrance
4.1.3 Landscape connection

The academic library aims to be appealing towards readers from campus and the public. Important factors, attracting people here, are perfect function, architectural design and landscape design. Many libraries with its unique shape and beautiful landscape attract thousands of teachers and students and become a new symbolic landscape in campus.

The building itself is to become part of the landscape. The roof of the Delft University of Technology library in Holland has a gentle slope. This slope, adhered with sward, touches the ground. This enables people to have free activities on it. The whole interior space is a large open space in the middle of which there is a cone construction stretching out of the roof. Interior space of the cone is circular. Sunlight drops down from the upper louver which is on the top of the cone. The entire library has an extraordinarily organic presence. (Figure 17)
There is a green landscape belt to the south of the site. So I supposed that library can integrate with it through some architectural way. Potentially, part of the south side of the site might be taken away and added to the park, which may contribute a small bridge to connect site and opposite park. (Figure 18)
4.1.4 Initial site layout and building boundary

The axis of educational area is the north-south direction. The two main traffic roads lie on both the east and west of the site so pedestrian's main line of sight is basically in the north-south direction. This is to let pedestrians see the whole volume of library from main entrance direction while passing through. The library must set back a certain distance from the south boundary. However, the east-west distance is only 150m around. According to the whole construction area on ground floor, we suppose that it is impossible to make the library set back an enough distance from east-west direction and it is unnecessary to do so. According to the visual theory, Square or street is also a kind of common architectural space. Its meaning and the quality are reflected by the degree of being closed and also is identified through the enclosure force of space elements. Space effect also depends on the proportion between width and depth which can be perceived by visual perception. Square should leave some kind of suspense for human visual perception. So the scene of the whole square should not be perceived in one glance and also it is unadvised to be not perceived at one time. Therefore appropriate ratio of depth by width should range from 2:3 to 1:2. That means the visual angle of observer ranges from 40 to 90 degrees. So the rough rate of the southern square near main entrance is about 1:2.36

Moving on to initial site layout, as the library aims to be use by both people within campus and the public. It is sensible that the site might be roughly divided into northern and southern parts. The southern part near the main entrance should focus on the public and mixed usage. The northern part opposite the main lecture building should be more private and concentrated on professional use. An excessive space is to be connected with two parts by a kind of architectural way. It will make sense that penetrability between these two parts of space is a positive result what the future academic library could be. (Figure 19)

36. Yu Zhao, Landscape Design of urban square and street (Chong Qing: Southwest Normal University Press, 2011), p.58-60
Figure 19 – library boundary, initial site layout and open public space
4.1.5 Semi-open air public space

The library is intended to become part of its landscape, which is favorable to create a public open space into the library. It is assumed that the semi-open public space can link the two large northern and southern functional partitions together. It is mentioned in the previous section. Part of the open public space needs to be sheltered from the rain to make it usable at all times. It is known that in Wu Han city, comfortable ventilation is an important factor of cooling, it is because of the extreme high temperature in summer. The flow of air and sunlight can enter into the interior space easily through the courtyard. Therefore, the design of the courtyard within library can contribute the library to be part of landscape. (Figure 19)

4.1.6 Site analysis conclusion

The following issues are obvious after basic site analysis

1 This library is a modern architecture, it is better to cater for the style of other architecture built within campus and it is unnecessary to consider regional history and historic architecture elements as well.

2 Library building and its context might be developed with sufficient attention to an overall effect that including traffic, access, link to its surroundings.

3 Library design must be based on a process in concept generating, the Library, as one of the most important buildings in educational area, must be symbolic and outstanding. From this point, the principle of function follows form and then fit and compromise between each other should be considered, achieve the aim of creating the space spirit.
4.2 Design stage two: how architecture form generate from a appropriate concept

4.2.1 Concept iteration one

Library design should explore the origin of the design concept from four directions. Firstly, look for some old architectural elements from Chu culture. Chu, located where the current region of WuHan city is, is small country among different small countries in China long time ago. Secondly, find the concept from an object from “single tradition”. Thirdly, explore the concept from carrier of the campus culture in order to follow it. The last, discover the idea on the ground of future function organization.

The essence of Chu architecture can be achieved by the following aspects, beauty of lines, beauty of openness, beauty of majesty, beauty of colors. The most of two prominent features are the beauty of openness and the one of majesty. The beauty of openness means the change of space and mutual penetration between indoor and outdoor space. The beauty of majesty means the art of Chu often uses exaggerated scale to express objects. Chu architecture is usually built on much higher foundation. Therefore Chu architecture in tall height embodies that people like pursuing infinity of the universe.  

In WuHan, some ancient and modern artworks closely contact with People's Daily life, these objects reflect the social fashion and aesthetic intention. We can extract the available element characteristics from them. Such as the stone-chime, incense burner etc. These objects using the simple model reflect beautiful geometric shapes. (Figure 21)

And there are some sketches below, showing one kind of architecture form from this concept (Figure 22)

Figure 21 – the stone-chime, incense burner
University is a place for training talents. Talent cultivation is not only in the classroom but depends on influence of campus culture which plays an unsubstituted role to students. The representative expression of university culture includes spirit culture, regulation culture and campus environment culture. And excellent architecture and landscape design within campus is the physical level of university culture. The spirit culture of the WHUT, seen as unity, rigorous, realistic and innovative, is like the symbol of fly horse sculpture (Figure 23) in the main square in old campus. So design concept derived from the carrier of campus spirit culture of fly horse sculpture and it is decided as horse hoof footprint where is a variant. It symbolizes the pragmatic spirit in the work and study. (Figure 24)
There is a new way of designing the university library today. Different departments have their own independent branch of library to provide professional reading and collection and the central library provide in addition to general reading and collection but more extra functions as sociality, communication and training center. (Figure 25) Consequently a form was inferred as showed below: four prominent corners (suppose to be branches of library of different departments) are around the comprehensive centre multi-functional area. (Figure 26)
4.2.2 Concept iteration two

Because the library mainly serves teachers and students in campus, so it is the best way to reduce the concept scope into campus. Finally the third concept was chosen. This concept form based on the theme of campus culture, producing a more harmonious place spirit, might continue on campus culture better. The picture below is an initial conceptual model. Original thinking is the profile of the library prefers to be in accordance with the shape of the site and the style of buildings around the site. Thus on this start point, the profile of model was so blunt and also has little relationship and logic with the site, which seems to lose our approach of being part of the landscape. (Figure 27) (Figure 28)
Figure 28 – initial horse hoof footprint model
4.2.3  Concept iteration three

Now that concept is horse hoof footprint, force can make some extrusion on soil surrounding the hoof when a hoof steps on the soil. The picture below is the horse footprint analysis. Two kinds of deformation of the soil are very obvious. One is some apophysis of soil in front of hoof, the other is slope of delve bottom. Eventually the profile of model of iteration two have become gradually smooth. Gentle slope of façade was generated in order to blur the definition between façade and ground. Gentle slope which is lower in the southern direction and higher in the northern direction was formed within delve bottom. So this kind of mutual participation between library and readers would be enhanced through this way. (Figure 29)
4.2.4 Concept iteration four

Chinese architecture has always made the most of close relationship with natural environment. There is a green landscape belt to the south of the site. It is possible for this library to make some connection with it by some kind of architecture way. It was first brought into the design with the intention that some parts of library can cross the street to the park where people can integrate with the nature. (Figure 30)
4.2.5 Concept iteration five

There was another variant form under the scheme of iteration four. There was a bridge between library and green belt towards the southern façade of library. (Figure 31)
4.2.6 Decision of basic acceptable appropriate form

The picture below shows the basic acceptable form made of clay in free small scale. The northern façade of slop is much smoother. Two volumes of petal on both left and right sides in the south were added to balance the back part in the north. Two paths of slope were added on the two petals and also added one slope near the supposed main entrance in the south. People can come up to the roof through these gentle slopes, which increases interaction between readers and library. Finally the protuberant part inside delve bottom cut into two pieces, which increases permeability of the courtyard. People can walk down to the back semi-open public space from the roof above main entrance in the south. (Figure 32) (Figure 33)
Figure 32 – acceptable concept model

Figure 33 – acceptable concept model 1:500
4.3 Design stage three: dealing with some typical architecture issues within project

4.3.1 Mixing chamber (the public, students and teachers)

The library, being designed to be inviting and welcome, is not only a symbolic one but a digital library in the future. So the information communicating area (mixing chamber) should combine open compatible communication space with virtual space media. Basic assumption is that the petals on both left and right sides may be used as an open general reading area and the middle space under slope should be for information searching, consultation and exhibition. Because the height of middle upper slope decreases gradually and touches the ground at last, it will develop the central information hall to the underground one in order to better use of the centre space below the middle slope. (Figure 34) (Figure 35) (Figure 36)
Figure 35 – general reading area in two petal volumes
Figure 36 – ramp above mixing chamber hall
4.3.2 Building functions / layout

The basic layout of the library of the NanHu campus depends on the method of modular functional partition library, mainly divided into several large functional partitions.

**Main entrance hall (the southern gate of the library)**

Information communicating partition – ground floor consists of mail reader service area, lecture hall, café shop and specific reading room. The first floor consists of multi-functional meeting rooms (sometimes used as training rooms), activity rooms and curator and associated curator rooms.

**General reading partition** – General reading area and general foreign material reading area

**The secondary entrance hall (the northern gate of the library)**

The secondary reader service partition – It is mainly used for student readers to consult, borrow and return books.

Professional reading partition – Professional reading area and professional foreign material reading area.

Basic dense collection partition – closed collection of books (underground)

Staff working partition – it is used for library staff to manage and catalog books (underground).

Both east and west sides of the library also have side entrances into the library. Especially, although the entire interior space is open large space, but this kind of curvilinear flowing space forms a set of integral public spaces by penetration and changes of structural interface. It is an effective way to break traditional single open large space through this way. (Figure 37)
Figure 37 – basic library functional partitions
4.3.3 Environmental concerns (landscape)

The exterior space of library is the only way where people can approach. Therefore the function of exterior space includes architectural link, landscape and cultural inheritance.

Architectural link function: Firstly, readers from all departments around the site, have convenient access to the library. Secondly, as the southern square is in front of the main entrance of the library, an appropriate layout of the southern square should be more open and grand. A strip of dry fountain and an abstract fly horse sculpture are laid on the north-south axis of the southern square. Furthermore, all springs are shaped like horse hoof footprints, which are in accordance with design theme. Two recreation corridors are arranged on the east and west side of the southern square for socialization, rest areas and outdoor reading space for users.

As the northern square is closer to the core of educational area in campus, it is reasonable to create an outdoor communicating space which is quiet and beautiful. Inspiration also comes from the design theme. Square is composed by some small horse hoof footprints, which forms some open and independent shelter spaces. Pieces of grass slope are opposite these shelter spaces in order to provide a healthy green environment for readers. (Figure 38) (Figure 39)
Figure 39 – final landscape and outdoor shelter space
Dry fountain

Abstract fly horse sculpture
4.3.4 Choice of structure----contradiction between the structure and indoor space

Creation of space is the eternal subject of architecture. Architects not only dedicate to create wonderful architecture but also create interior space of individual character and charm. It is possible for creativity of space shape and material interface with the development of modern architecture and technology. The various interior space forms appear in our vision. The structure system of this library is truss and column, which is very popular in large spans. A good design concept of blending architecture in Japanese Tama Art University is that every intersection of arch frame with soft curvilinear line breaks up a large open space. The sight line can be led to infinity by this frame system. Simultaneously a set of special arc form of bookshelves make the flexible space to the second division and also different shapes of chairs and tables are strewed among the whole place. Finally all these make the interior space both unified and continuous.\(^{38}\) (Figure 40)

Figure 40 – heavy truss and column system
4.3.5 Design stage three critiques

At this point, it is clear that several issues in the design needed to be stated. As mentioned before, the mixing chamber above which the middle slope is located has a problem. Firstly, since the upper slope height gradually decreases and eventually touches the ground level, a large space below the middle slope is difficult to arrange. Whereas developing the centre information hall into the underground hall would affect the circulation on professional reading area behind and this long slope also could block the layout of semi-open public space. So this part should be redesigned.

Secondly, the design of the main entrance in the south is difficult for this project. As the design of main entrance directly affects the overall unity and harmony, impacting the circulation of mixing chamber and also the extent of interaction between library and readers. Because the first place where the public come to contact in library is likely to be the main entrance part, what a fun of the main entrance nearby tends to strengthen the public participation.

After redesign the centre space below the middle slope, meanwhile the area, dimension and shape of excessive grey space behind (semi-open public space) should be adjusted automatically.
4.4 Design stage four: development

4.4.1 Development in designing of mixed area

The height of the protuberant two parts inside delve bottom is low. Radian is larger at the same time in order to match the unity of the overall model and the radian of two petals’ volume. Firstly, the area of two lecture halls cannot meet the requirements when arrange two underground lecture halls in information communicating space. Secondly, the height of the upper multi-functional meeting rooms cannot reach the requirements either. Thirdly, it is difficult to form narrow transparent hall on both sides of the protuberant two parts. So the profile of two protuberant parts near the middle slope has no radian, only maintain the radian of profile of two protuberant parts near both left and right slope.

Mentioned about 3 design critiques in the third step, supposed information communicating hall below the middle ramp cannot be used efficiently due to the change of slope height. Therefore the rear part of the ramp was removed and two stairs which can go down to the semi-open public space behind from the foreside roof were remained. Relative to the semi-public open space, the effective area of information communicating hall has maintained. And readers can see the back professional reading area through the northern glass of information communicating hall, which increases the permeability among spaces significantly. Some black spaces in both the west and east side of general reading area have natural light due to the removed parts of slope. (Figure 41) (Figure 42)
Figure 41 – improvement of two parts above the middle slope
Figure 42 – improved mixing chamber
4.4.2 Development in designing of entrance

The first place where the public come to contact in library is likely to be the main entrance part, thus what a fun of the main entrance nearby tends to strengthen the public participation. The original design concept is to make the library as part of the landscape, so readers can closely approach the library. It is apparent that readers can go up to the foreside roof above information communicating hall through 3 paths on the slopes, which can be seen from the initial model. Roof also became outdoor place for reading, so this original concept, adding a middle ramp to the roof, should not be abandoned. Therefore, going through the library should be on both side of the ramp. The final design of the entrance is showed on the picture below by comparison of several rounds of scheme. Two entrances on both side of the ramp tended to hollow, their radians match the overall model and the most important thing is to remain the ramp to the foreside roof. (Figure 43) (Figure 44)
Figure 43 – different types of main entrance design
4.4.3 Development in semi-public open space

As mentioned before, the effective area of the back semi-open public space is creasing since the back slope was removed. So some natural landscape and leisure chairs can be arranged in this courtyard for outdoor reading. Two angle parts of courtyard in both the east and west corner were not convenient to use, thus two pools were placed on two corners. It can benefit from two reasons. One is echo of waterfront culture in campus; the other is to adjust indoor and outdoor microclimate. Because this semi-open public space should also undertake the connection between professional reading and communication hall, there must be some places within courtyard completely enclosed to prevent direct sun and rain. So I added a glass corridor and this transparent space also plays another role of exhibition, and transportation. (Figure 45)
Figure 45 – semi-open public area is increased
4.4.4 Integrating with structure and indoor space character

As mentioned before, each intersection of arch frame with soft curvilinear line breaks up a large open space which is the main character of this library space into several areas in small scale. The sight line can be led to infinity by this frame system. According to the quality of indoor space from digital model, although curvilinear structures played a guide and division role, they were too abrupt. Meanwhile the column grid system in the back professional reading hall was too dense, which seems to overwhelm the original quality of interior space. So the scale of structure system should be adjusted to an appropriate scale. (Figure 46)
Figure 46 – quality of interior space mostly depends on the form of roof
4.4.5 Final design

There are some rough pictures showing the final design of the library. (Figure 47)
Pictures below are the final drawings.
Perspective 1

Figure 48
Section plan 1

Figure 50
Section plan 2

Figure 51
Interior design 1

Figure 52
Interior design 2

Figure 53
Figure 54

Interior design 3
Interior design 4

Figure 55
Figure 56
Interior design 8

Figure 59
Floor plan layout

Figure 60
Physical model

Figure 61
5 Conclusions

The purpose of my project is to promote the idea of a regional service platform for information communicating and searching. This almost has been achieved by designing the WHUT library in NanHu campus which serves for both the local community and the users within campus. The final design solution is to set up an appropriate model for the Chinese academic library where the traditional academic library still can be traced and the future one will be promoted. Although it is a mixed use academic library, its design tended to an academic library.

Logically, it is centrally placed on the campus. There is often a plaza at the centre of campus where other academic institutions and department buildings are located such as refectory, gymnasium and student activity center. This provides an opportunity for the formation of a student-centered academic mall, which ties together the key shared facilities with links to the separate faculty building further afield. Hence, one role of the academic library is to define the centre of the campus both spatially and in terms of building hierarchy.39

The new library is appropriate for continuing its large context. This design proposal successfully combines the culture of campus and provides characters for the future. It effectively houses both academic and public library functions.

This is not just another international modern library in China but is designed through the culture of the WHUT and is able to let the public from communities around campus has chance to access knowledge and university itself to some extent on campus spirit.

6 Bibliographies

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6.1 Appendix

Figure 61: NanHu campus master plan of WuHan University of Technology Resource from Wuhan Iron and Steel Design and Research institute, Ltd.