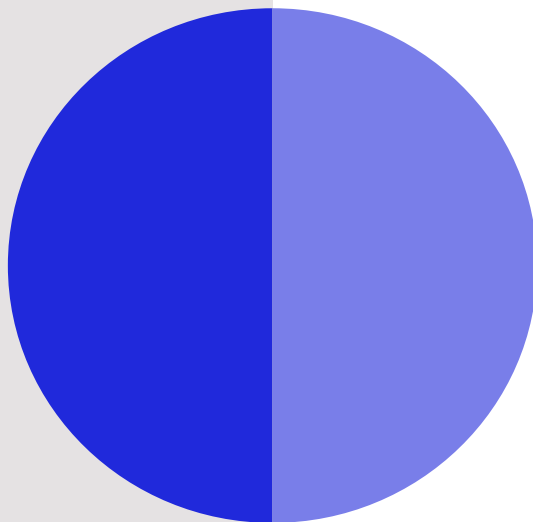


Educational spaces landscape:

Designs for formal and informal learning in Higher Education



Gómez Verdú Juan A

Tutora: Débora Domingo Calabuig

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ABSTRACT

New universities arose in 1960 due to the need of a new education paradigm. New lines of thought were being developed and an increasing number of students pursued to enroll in higher education. Therefore, a change was needed in learning spaces.

The traditional unidirectional learning concept had to change into a more cooperative system where students were fostered to participate. As a result of this changing system spaces were redefined into formal and informal learning to match the actual educational stream.

The aim of this paper is then to analyze these spaces separately and their quality and implications in education as well as their development since the 60's. To handle this analysis several study cases are to be compared.

KEY WORDS

formal education,
informal education,
universities,
educational paradigm
unidirectional learning,
learning spaces,
study cases, campus,

RESUMEN

Una serie de universidades surgieron en 1960 debido a la necesidad de un nuevo paradigma educacional. Otras líneas de pensamiento se desarrollaron, incrementando el número de estudiantes que buscaban recibir una educación superior.

El concepto clásico de enseñanza unidireccional tenía que cambiar a un sistema cooperativo, donde se alentaba a los estudiantes a participar. Como resultado de este cambio de sistema, los espacios se redefinieron en formales e informales para adaptarse a las corrientes educativas.

El objetivo de este proyecto es por tanto analizar estos espacios de forma separada, su calidad y las implicaciones educativas así como su desarrollo desde los años 60. Para ello se realizará una comparativa en un grupo de casos de estudio.

PALABRAS CLAVE

educación formal,
educación informal,
universidades,
paradigma educacional,
aprendizaje unidireccional,
espacios de enseñanza,
casos de estudio, campus

RESUM

Una sèrie d'universitats van sorgir en 1960 a causa de la necessitat d'un nou paradigma educacional. Diferents línies de pensament es desenvolupaven, incrementant el nombre d'estudiants que buscaven rebre una educació superior.

El concepte clàssic d'ensenyança unidireccional havia de canviar a un sistema cooperatiu, on s'encoratjava els estudiants a participar. Com a resultat d'aquest canvi de sistema, els espais es van redefinir en formals i informals per a adoptar-se als corrents educatius.

L'objectiu d'aquest projecte és per tant analitzar aquests espais de forma separada, la seua qualitat i les implicacions educatives així com, el seu desenvolupament des dels anys 60. Per a realitzar açò un grup de casos d'estudi es compararan.

PARAULES CLAU

educació formal,
educació informal,
universitats,
paradigma educacional,
aprenentatge unidireccional,
espais d'ensenyança,
casos d'estudi, campus



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OBJECTIVES

WHAT IS IT ABOUT?

The educational model has been the same from the early 16th century on into 19th. This sets an uneven situation where society is evolving while its educational model is not. The necessity of understanding new educational standards and how to achieve them is noticeable.

The present work is focused on analyzing the formal and informal spaces development over the years, as well as introducing current study cases that will be considered, evaluated and compared to achieve a clear mindset about the evolution of these spaces.

WHAT DOES IT AIM?

The aim is to tackle the importance of formal and informal spaces in education and how architects can influence the learning experience of students nowadays, presenting a good field of work for designers to achieve high quality learning spaces.

Also, presenting the comparative between actual study cases can ease the path to understand the relevance of informal spaces sometimes taken by designers as mere walkways. A change of attitude to deal with these spaces is pursued.

HOW TO APPROACH THE HYPOTHESIS?

An introductory study will base the work-line for the actual analysis on said study cases and the comparative elements will be set so to have well based reasoning to contrast the instances. Once the analysis canvas is well established developing the comparative will be easy and the closure will come on its own.

Thus, literature research will be a crucial part of the analysis to settle the funds of any further investigation.

WHAT FOR?

Nowadays universities are already established and there is not much place for new big equipment such as campuses. The evaluation of formal and informal spaces would allow to understand how to intervene on already existing universities to enhance their formal and informal spaces.

METHODOLOGY

The selected methodology in order to engage the analysis of the current paper is based on study cases. Five study cases would be selected and several items or architectural features would be analyzed in them. The analysis would remain strict and separated from one element to another allowing the reader to distinctly perceive the features of each element. This meticulous approach would allow later on to develop a conclusion in which different items from different study cases would be cross-viewed and compared in order to receive an outcome.

The study cases which are selected are composed by four contemporaneous buildings and one from the early 70's. This setup is arranged after a previous analysis on which study cases should be selected. Louis Kahn Ahmedabad project has many or even more of the features and virtues of modern contemporary projects, and that is the main reason for it to be selected. It is selected as a prototype of what is to come.

Further projects like Viñoly Architects Oxford Institute are selected in order to have feedback of British high end education standards, due to Oxford having the resources to build at those high standards.

UTEC reasoning is very straight forward, the RIBA and Prizker awarded Grafton Architects would be a must have. A different approach to educational architecture as well as a clear professional approach. Climate had a point in Lima also, even though next study case is also located in Peru. Barclay, with both European and South American visions of architecture, provide a different approach to the same habitat.

Finally comes Skolkovo study case, Herzog & de Meuron provide a different point of view in conjunction with a complete different climate. Moscow weather and the scale of the project would grant some points to the comparison.

The methodology to be followed would be the one of the study cases, several will be compared, and items will be analyzed. The common ground in order to establish comparison lines would be founded through the analysis of the following items:

- Pattern and floor plan
- Interior and exterior relation
- Served and servant spaces
- Light
- Section and visual relations
- Static and Dynamic spaces

It is important to note, that some items will weight more in some specific study case, since each of them is different. The agglomerate of analyzed elements would balance the differences between study cases and it would compare it in a standardized field.

Most of the elements to be evaluated are common and known features of architectural analysis, but one should not lose the focus that these aspects are analyzed in a Higher Education architecture context. All of these aspects would be strictly related to the educational space in the study cases, and the focus would be there.



INTRODUCTION

Learning is undergoing a radical transformation nowadays, hybridizing from the physical to virtual space, just like our society changes and swifts' shapes in no time so must do education. As the core of the society, learning creates an entanglement of relations in the community and it becomes an intrinsic part of it, educational aspirations become then society's and the further the first one is developed the better the second will grow accordingly.¹

In order that education and society bound together properly innovative spaces and integration between them and the rest of activities within society: work, learn, live and play, are needed. Innovative spaces exist already but they are scattered and few and a clear lack of integration between society's actions and these spaces. Learning is not always a focused process in which one's only goal is to gain knowledge, but it can be also a process of experiencing through all the aspects of life.

So that these requirements are fulfilled, two different learning landscapes need to be described and defined, these being: formal education and informal education spaces.

Formal education is the most extended form of learning, it describes education as it has always been, it is intentional, this means that its only goal is to gain knowledge. It can also be described as unidirectional with two acting factors: the instructor and the instructed. Normally knowledge is not criticized in the process and the instructed receives the information directly from the instructor. There is not feedback knowledge among the instructed themselves and so the system lacks richness.

On the other hand, informal learning is far more complex, it is not intentional, it is learning by experiencing, learning by living. People is constantly exposed to the act of learning so that the window time to acquire this knowledge is bigger than the formal learning's one, so said, the amount of knowledge people acquire through it is higher than the one from formal education. The problem lies within the design of these spaces, they are not widespread throughout learning communities and society and formal learning has a very high social acceptance while society is still reluctant for new educational models.

1. Harrison, Huton. Design for the educational landscape space, place and the future of learning, 2014

Diving deeper into spaces themselves, architects must redesign the learning space to meet society changing necessities. High quality, properly arranged, resilient and sensitive spaces need to be assessed and designed, life needs to be designed. Space is the fundamental ground where learning and life develop, and its design quality would directly impact on both.

Classrooms as an educational space have been inadequately designed as unidirectional fields, knowledge flows from the instructor to the instructed even though in higher education more permeable and accessible spaces are found, in a way higher education lays wider roots in society, shaping it and inducing it.

Further and higher education become then the topic at hand, further education can be defined as any post compulsory education and it is different from universities education both are based on work-learning and both develop formal learning as their main source of apprenticeship. Higher education lies within further education but with the requirement of being official such as university studies, being this last one the aim of the study at hand.

Higher education development roots lie in the 60', universities arose due to a high demand during the post-war period, this added to a huge population increase lead to the creation of many university campuses. These universities were designed accordingly to the needs of their time, nowadays though education faces a deep crisis that can only be avoided by redesigning and rethinking the learning landscape. This crisis cannot be faced with nowadays educational systems and spaces grounded sixty years ago; a change is needed. "Today's buildings "as they are hopelessly unsuited and totally unneeded" 97' Peter Drucker, Forbes (1997).

In a world that has turn education into a globalized market, the idea of university needs to be addressed. The new information technologies, changing demographics, INTERNET and globalization must be acknowledge and applied in the design process of any new learning space and it should be used to rethink any already existing space. A study about the outcome of learning and space impact should go along the design process considering a vast range, from

macro to the micro-scale, from the position of the building to the very furniture. New fancy and impressive buildings are not suited to achieve this, but they are common in the educational market mentioned before, high quality spaces need to be prioritized.

Not only the design itself is key for the outcome but it needs to be blended with different spatial innovations as well as timetable and teaching skills, the space by itself can't do it all. Regarding this matter not only the quality of space and teaching skills are important factors but there is a need to foster the learner into participating in the process. They as customers must take responsibilities for their learning but also their ambitions need to be fulfilled by the system, human interactions would be the base foundation for the design patterns rather than specific needs mostly based on time-related needs.

As mentioned before, education blends with society so it would be needed to extend the educational landscape further from the boundaries of high education in the future, if it is assumed that informal learning is an ever life process its roots run deeper into society reaching business, cultural institutions and cultural spaces. Designing accordingly these spaces in the future would grant an all age-range ground for informal learning, from a very early age to elderly making learning an entwined and inalienable part of society itself.

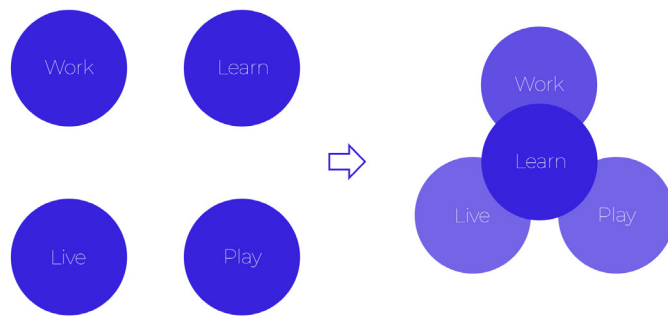


figure 1. Learning communities

1. Learning community. Adapted by the author from : "Harrison, Smith. Learning is the hub of the community, 2007."

2. Krathwohl, David R. A revision of Bloom's taxonomy: an overview, 2002.

3. Lorin W. Anderson, David Krathwohl, et al. A taxonomy for learning, teaching, and assessing : a revision of Bloom's taxonomy of educational objectives, 2001.

In this context, Bloom's Taxonomy concept needs to be recalled . The concept is born around the 50's in the University of Chicago, and was developed by Bloom and a group of specialists until the publication of the paper in 1956 called: "The Classification of Educational Fools. Handbook I: Cognitive Domain" (Bloom, Engelhart, Furst, Hill & Krathwohl, 1956).³

Bloom's Taxonomy aimed to lay a common ground in learning goals, easing contact between people and knowledge. It also tried to established broader educational aims in particular courses providing means for regulating educational objectives congruence. A deep landscape of learning choices is brought into play broadening possibilities of any distinct curricula.

Bloom's concept has evolved throughout the years, the original Taxonomy defined six categories in the learning process: knowledge, comprehension, application, analysis, synthesis and evaluation. They were later explained further on and subdivided into smaller categories.

Knowledge is the part of learning involving remembering and recalling information. Comprehension relates to the understanding of the learning acquired in the first stage. Application refers to the particular case in which such knowledge can be used, it requires some critic thinking out of the subject to handle it. Analysis moves further into the critic thinking to be able to compare and contrast ideas. Evaluation allows to find value in the information received and finally create applies all of the knowledge mentioned before for its own purposes. The process of creating involves all of the beforehand mentioned categories and since is the most complex of them all.

These categories were hierarchies, this meaning that they were getting more complex as one went further onto them. Learning and comprehending each category was essential to move on. As mentioned before Taxonomy evolved throughout the years slowly getting simpler. It was finally defined as a cluster of verbs which would define the activities on each of the categories called Revised Taxonomy (2001).³

It is clear that the complexity of the categories is higher since acquiring knowledge is significantly easier than creating out of that knowledge. It is some sort of simplistic way of looking at a way more complicated process such is learning.

In conclusion Bloom's Taxonomy is a strategy for classifying learning objectives and ambitions. It brings an outstanding look at the learning process that can be applied into the spaces themselves. If the aim of the educational process is to go through all of Bloom's categories then, a space that fulfills these needs shall be designed.

It also allows for space comparison and grading. Standard, unidirectional learning stays mainly in the first and second category, where students are fostered to gain knowledge and understand it although rarely to apply it. Therefore the quality of education is directly linked to the quality of the space where learning is happening. Is easy to assume then than the better the space the better the learning.

Ultimately the model of the education will decide the outcome of the learning even though the spaces created for plain knowledge cannot be the same as the ones created for apply it or creating new. Thus the outcome of the learning process will be a complex mixture of all these parameters. Innovative learning models in conjunction with innovative learning spaces will produce best results.

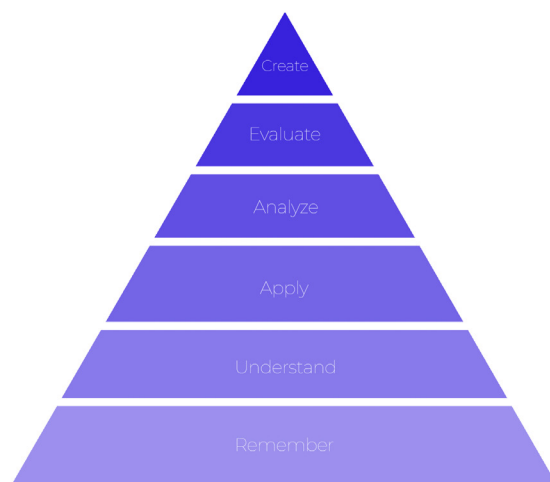


figure 2.. Bloom's Revised Taxonomy

2. Bloom's Taxonomy. Adapted by the author from: Inspired by Bloom's revised taxonomy



CHAPTER 1
INDIAN INSTITUTE OF MANAGEMENT
LOUIS KHAN
Vastrapur, Ahmedabad, Gujarat, India 1974

1. Jin-Ho Park & Ganzorig Baldanchojil (2014) The Superimposition of Circles Cut into Louis I. Kahn's Building Façades, Journal of Asian Architecture and Building Engineering, 13(2), 389-396, DOI: 10.3130/jaabe.13.38

Design in architecture circles around repetitive patterns that allow the architect to create a rhythm, a cadence. This fact is magnified in Kahn's buildings due to the complexity of the patterns that he was able to create which such simple shapes as circles and squares. Some studies have been developed to analyze the composition in the Indian Institute of Management facades¹, the aim of this part would be then to evaluate the floor plan structure and its impact in the educational spaces.

The Indian Institute of Management is composed by four masses of buildings, these being: the library, a classroom building, administration facilities and dormitories. The material solution for the whole aggregate consist mainly in brick masonry, opening big holes in the facades by overlapping circles and squares.



figure 3. IMM, L.Kahn, Middle Plaza.

The building is selected as a proto-project, this meaning that for being built over 40 years before the other study cases, still has some virtues which would add an interesting founding for the further development of the paper. Items such composition, grids, common spaces and usage of light will be key points in the analysis of this study case.

The agglomerate of buildings seems messy at first glance, but it rapidly becomes easy to differentiate the main masses composed by the library, the office buildings the residence and the classes.

figure 3. Louis Kahn's Indian Institute of Management in Ahmedabad" in ArchEyes, September 17, 2019.

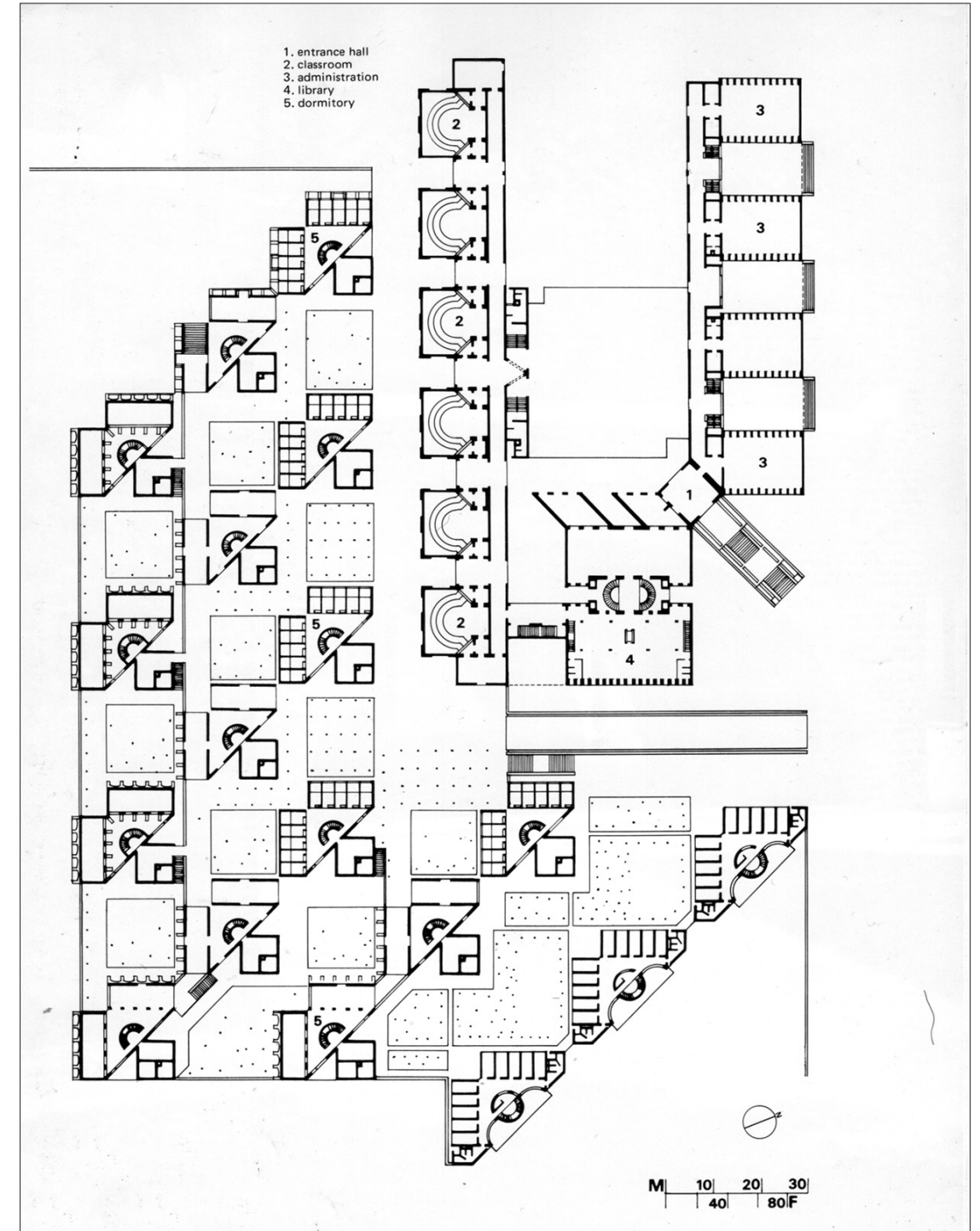
Furthermore in the floor plan the materiality is represented by these thick walls with small openings that clearly mark some overlay pattern for the whole ensemble.

The access is develop from an oversized stair on the northern part, breaking the corner joining both the office facilities and the library creating very clear pathing to the buildings themselves. This trail progresses on a East-West basis with very long corridors, giving access to both administration and classrooms while keeping contact with the main courtyard.

Several green spaces are created in between that connect the different buildings, primarily the educational complex with the dormitories, constituting what could be seen as informal exterior learning spaces. In the main learning building a big plaza is designed in the middle to provide circulations and light to the buildings.



figure 4. Louis Kahn's Indian Institute of Management in Ahmedabad" in ArchEyes, September 17, 2019.



An overlaying modular pattern just like that found in other grid-composed buildings is clearly present in the floor plan of the whole complex. Starting out from a 7x7 pattern, Kahn breaks it down in order to generate different scale spaces depending on the needs, nothing is left random. This allows to face an easy analysis of the structural composition of the floor plan.

The pattern is later on subdivided multiple times in order to achieve the smallest elements dimensions up to a 1.75 m grid. This way Kahn is able to offset the structure of the buildings at will, keeping a sense of whole and connecting visually all the buildings in the environment. It rationalizes the use of shapes, even allows to create diagonal forms that don't attack the integrity of the composition.

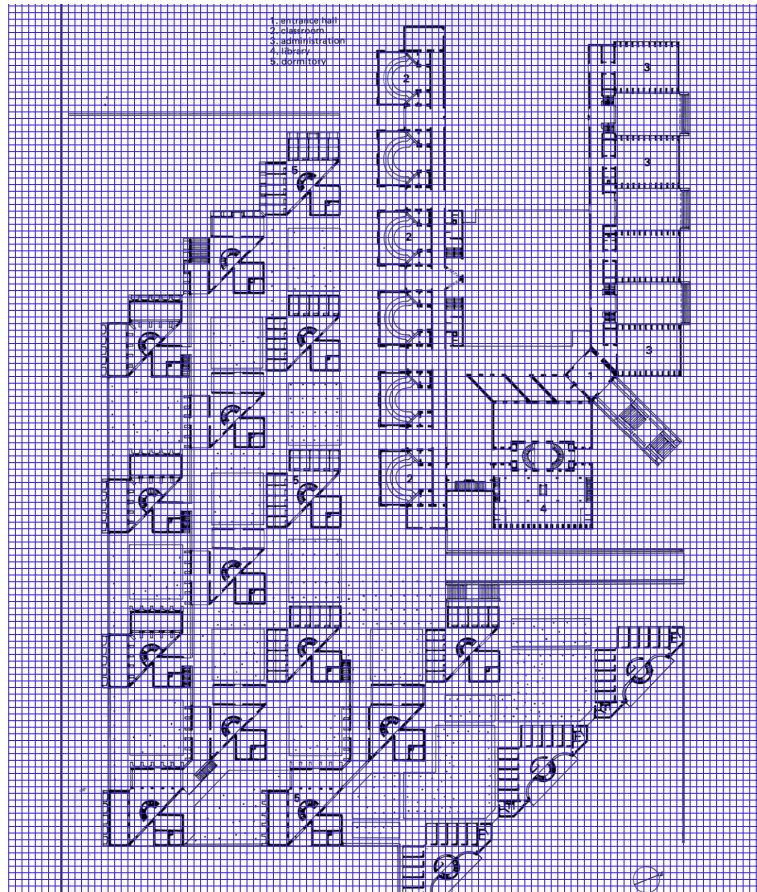


figure 5. IIM, L.Kahn, Floor plan. E 1:2000

figure 5. IIM. L. Kahn Pattern floor plan. By the author.

In order to focus on educational architecture analysis only the learning related spaces will be analyze deeper. Therefore the following plans are presented:

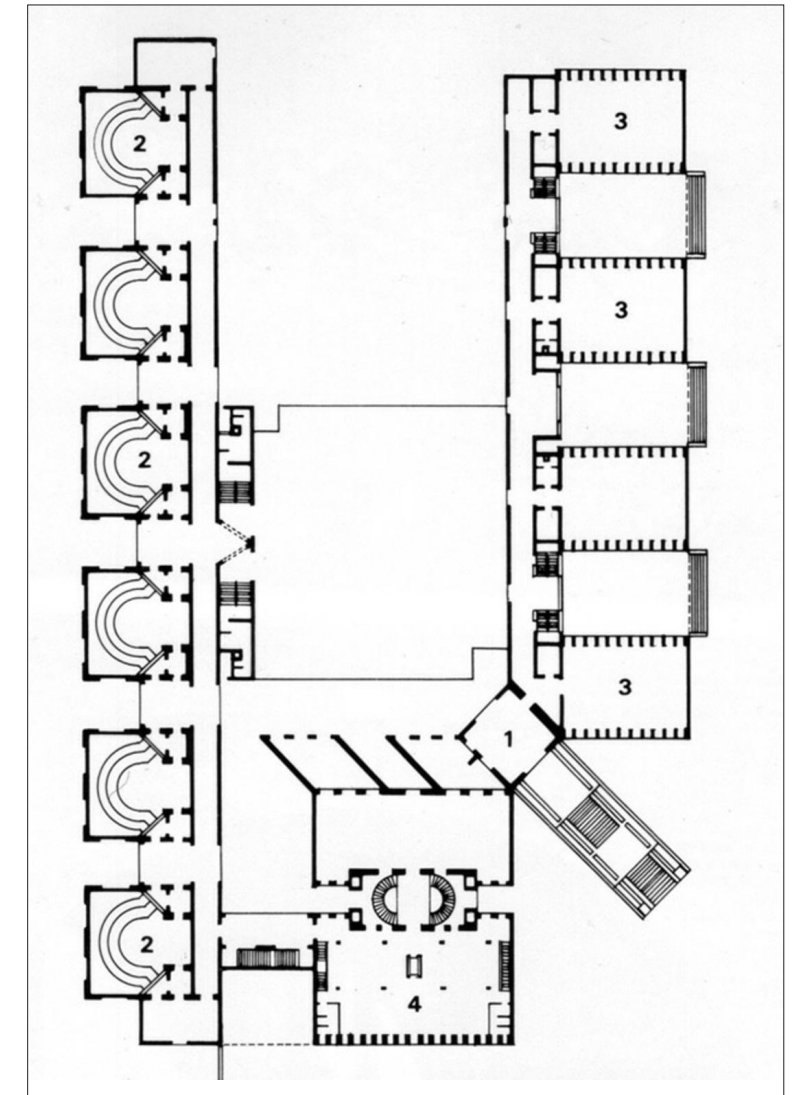
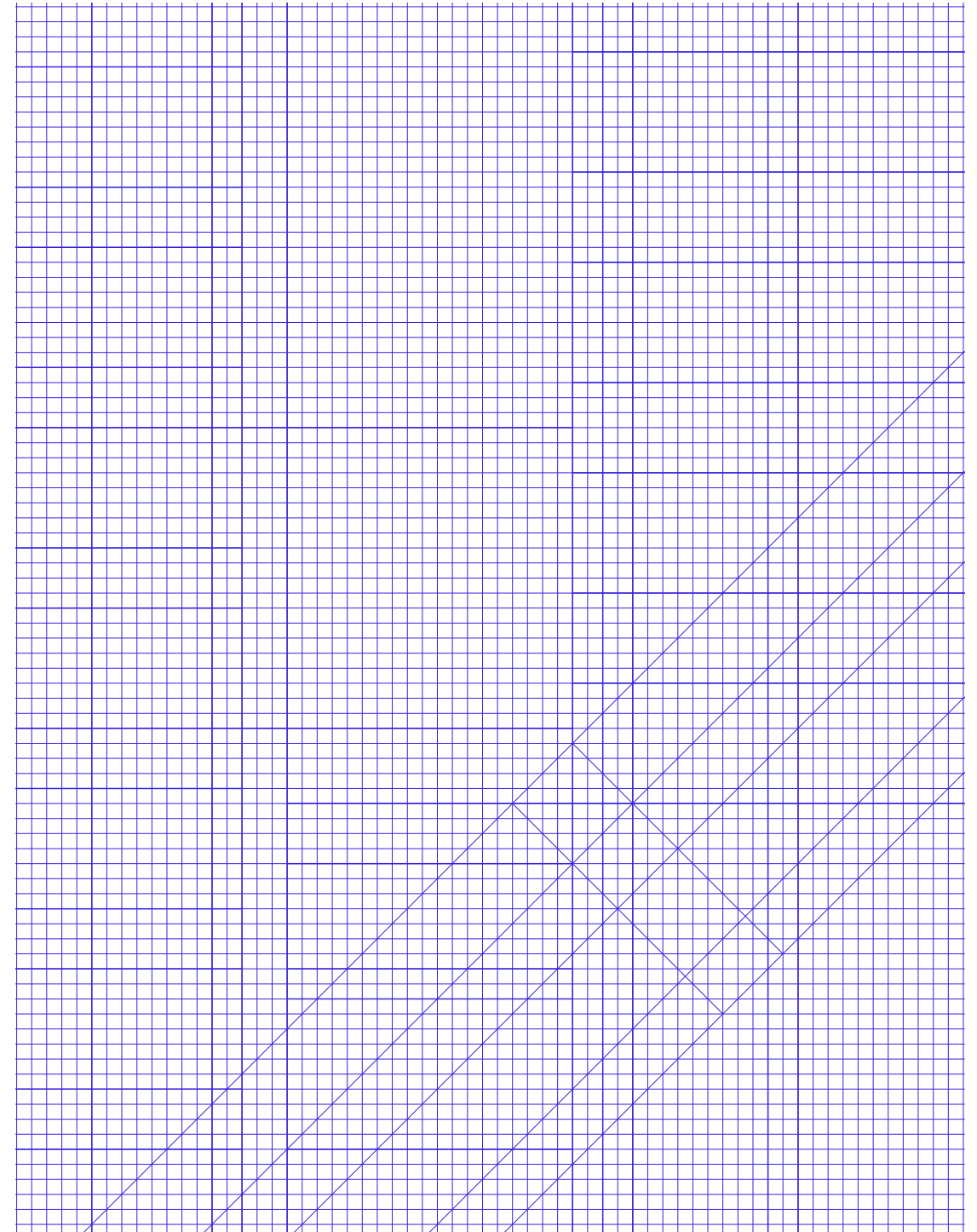
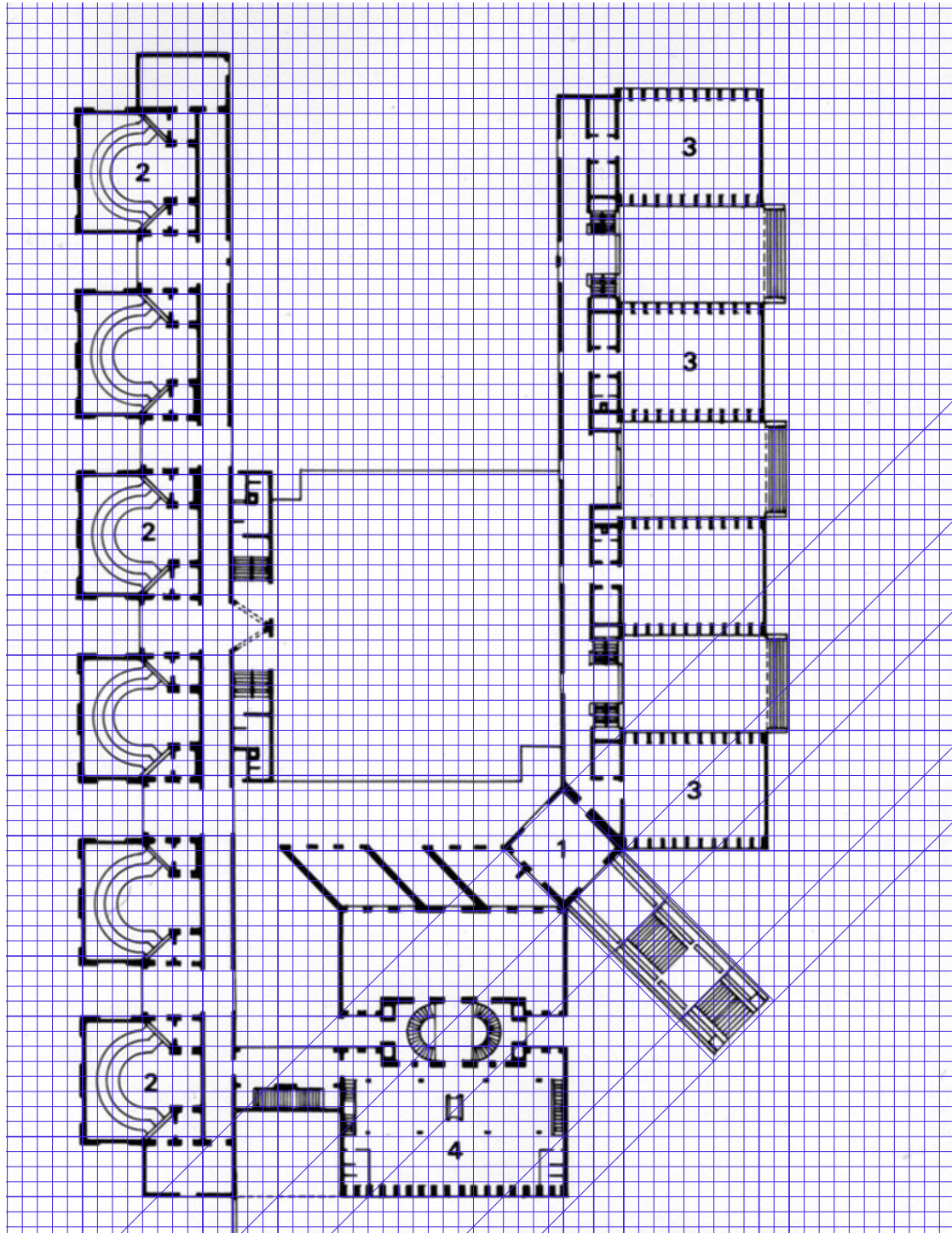


figure 6. IIM, L.Kahn, Floor plan educational block. E 1:1000

Once the main pattern is overlapped onto the plan, the guidelines for the main structure becomes clear, offsetting the tartan-like fabric more or less depending on the conditions of the space. The simplified grid of 1.75 m becomes more complex as it goes through served and servant spaces.

figure 6. IIM. L. Kahn. Educational Complex Floor Plan. Archeyes



The pattern reveals to have directionality to it, marking clear lines for the circulations inside of the building in a transversal direction. This allows to differentiate three different use strips almost mirrored in both the learning building and the office one. In the educational building the first strip is composed by the classrooms themselves, followed by a corridor and finally the vertical core. In the building facing, the first strip is the corridor followed by the vertical communication and finishing with the offices.

The formal learning spaces are static and solid, they fit in the fabric as 14x14 squares with a very American university look to them. The transition from the corridor to the classes is developed from an indent in the passageway that generates an intermediate space.

The grid allows for some flexibility, shown in the way the library is designed. Following the pattern the architect is able to generate these diagonal shapes that would be the imprint for the entrance on the building elevation. In a similar way the main access to the complex is rotated 45 degrees from the main pattern, generating a milestone, an anecdotal fact to strengthen the entrance.

The framework gains complexity as it transitions from one building to the next, the pattern gets offset and becomes a space with a different scale in the void and mass, mirroring the indents on the informal spaces in the learning building working as a negative space.

The focal point in the grid where all comes to meet is the main access stair, the guidelines for both separate patterns assemble bringing about a whole new pattern in a 45 degrees diagonal. This direction would also be used on the residence facility, changing the rhythm and the orientation of the facades in order to achieve a better angle.

The pattern serves as a tool for the architect to identify in it the elements of the program, shaping differently formal learning spaces from the informal ones. The overlay grid differentiate the space and the function can be read clearly endowing the spaces with a shape to fit the use, in general communication spaces become more directional while formal spaces do not have much directionality to them.

figure 7. IIM. L.Kahn. Educational complex floor plan pattern. By the author

figure 8. IIM. L.Kahn. Educational complex floor plan pattern exempt. By the author

In order to establish the comparison it is needed to generate a relation between the servant and served spaces in the study cases, in some cases this relation may not differ from the formal and informal spaces relation.

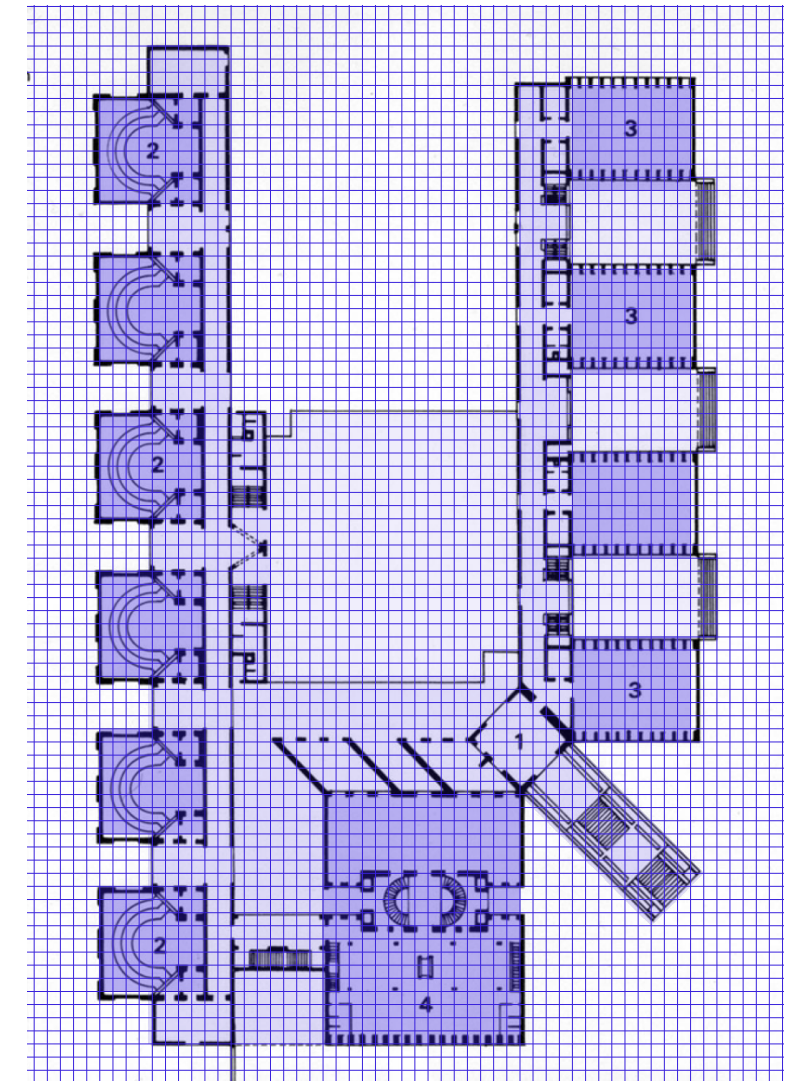


figure 9. IIM. L. Kahn. Floor plan spaces relation. E 1:1000

- Served spaces
- Servant Interior
- Servant Exterior

figure 9. IIM. L. Kahn. Educational complex floor plan space relation. By the author

Spaces are distributed almost evenly between servant and served, with a slight higher value in the servant due to the high amount of exterior servant spaces. The greater volume of these spaces allows for more versatility of informal spaces and allows for informal learning to be developed successfully.

Space	Dimension (m ²)	Relation (%)
Classes	1176	15
Library	872	11
Offices	880	12
Servant Interior	2916	38
Servant Exterior	1769	23
Total	7613	100

The high demand on servant spaces fosters relations between people, in this spatial framework the opportunity for informal learning to spontaneously appear increases enriching space itself.

When inter-spaces such as corridors whose function is essentially for people to move are tweaked in a way suited for informal learning to flourish, a quality space is reached. It is not assured that these activities will take place, but the environment design can foster their display. The small indents in the corridor of the learning building help students and professors to meet outside of the formal learning space, generating points of reunion outside classes or just by fortuitous encounters.



Establishing a comparison between interior and exterior spaces can lead to understand better the way these areas work. This relation helps to diffuse the boundaries firmly settled by the facades giving quality to spaces within. This link is mainly developed in ground floor plan by the existence or lack of voids in the enclosure of the building.

A clear relation is achieved in the main plaza, where the whole building tips over to it. Furthermore since both constructions are facing there is a definite visual connection composing a rhythm from interior to exterior to interior back again. This kind of strategy links spaces together and give depth to the architecture itself.

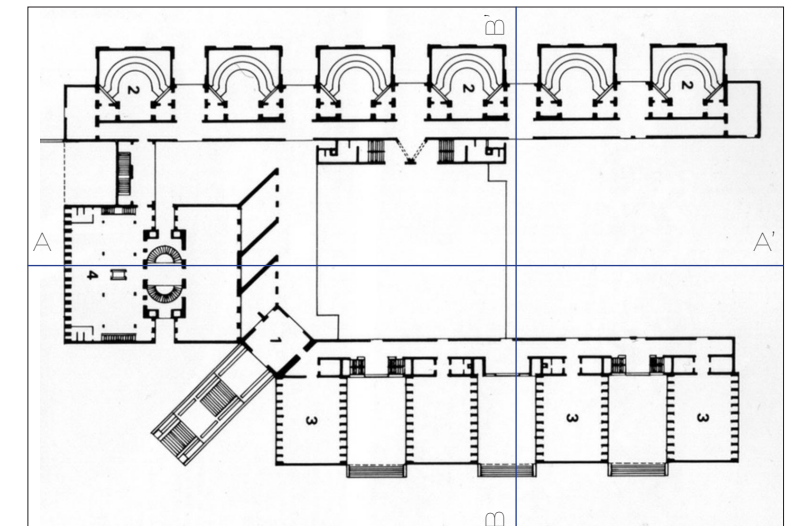


figure 10. IMM, L. Kahn. Section Lines on Floor Plan

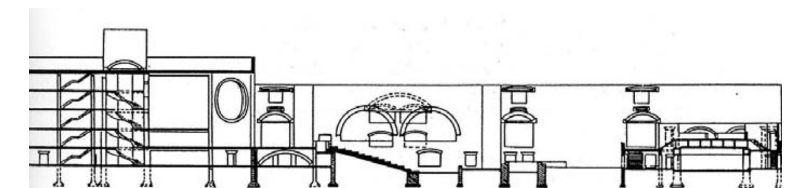


figure 11. IMM, L.Kahn. Section through the Plaza, AA'

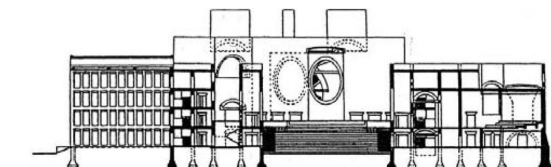


figure 12. IMM, L.Kahn Section perpendicular to the Plaza, BB'

figure 10. IMM, L. Kahn. Educational complex floor plan, sections. Modified by the author.

figure 11. IMM- L.Kahn. Jin-Ho Park & Ganzorig Baldanchoijil (2014) The Superimposition of Circles Cut into Louis I. Kahn's Building Façades, Journal of Asian Architecture and Building Engineering. Modified by the author

figure 12. Jin-Ho Park & Ganzorig Baldanchoijil (2014) The Superimposition of Circles Cut into Louis I. Kahn's Building Façades, Journal of Asian Architecture and Building Engineering. Modified by the author

The relation is present throughout the whole complex, several voids in the facade allow for the link between exterior and interior to appear. This tie is expressed in different ways, dimensions and heights, allowing for interior spaces to blend with the exterior (figure 11).



figure 13. IIM, L.Kahn. Interior and Exterior Relation

The filtering created allows for better transition into the interior spaces working as an overdimensioned door jamb, also having multiple relation spots for the inner-outer link allows for different interactions.

On the other hand there is the mirroring image of the small courtyards indented in both facing buildings. These courtyards are designed in a more private way, in a more private scale. They overturn to the classes and the offices providing greenery to them, and a pleasant visual connection between the interior and the exterior. Moreover the sequence of: interior-exterior-interior is repeated, at a smaller and stretched scale (figure 12).

The variety of forms and shapes to empty the facade enriches the connection giving it a new dimension and generates a game of visuals.

figure 13. IIM, L. Kahn. Exterior facade. Cernam Emden. Modified by the author.

Even though these relation developed mostly in ground floor, there is room for them to be developed in the elevation also, providing constant connection with the exterior throughout the corridors. Additionally the comb shape of the ground floor allows classes to be in constant relation with the exterior as a result of the patios created.

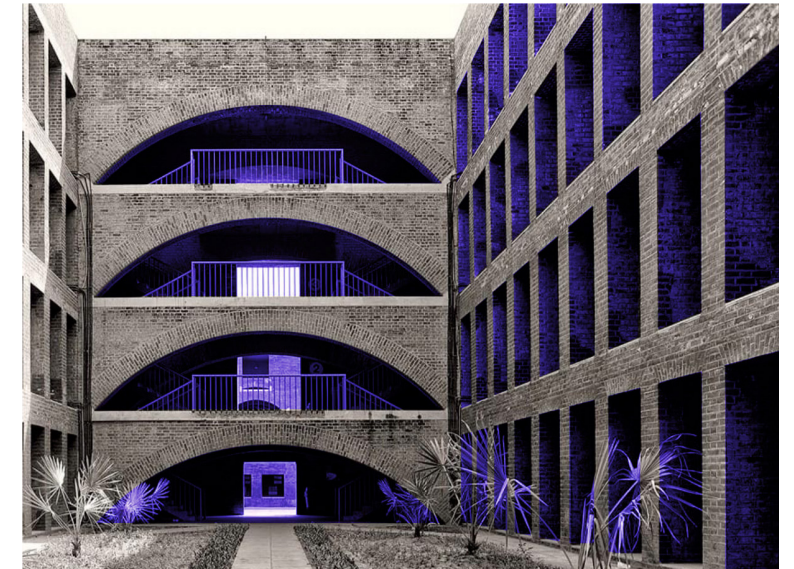


figure 14. IIM, L.Kahn. Courtyard between the Office Buildings

figure 14. IIM, L. Kahn. Exterior facade in between modules. Cernam Emden. Modified by the author.

Next item to be compared is the section itself, undergoing this process the relation between the spaces in height can be further developed and settled. Visual communication gains increased importance and cross views allow users to interact with each other.

Section analysis can extrude the understanding of the floor plan to evaluate the volume generated by the space. Furthermore it can consider the heights of spaces in relation to their use and how this affects inter-relations between users.

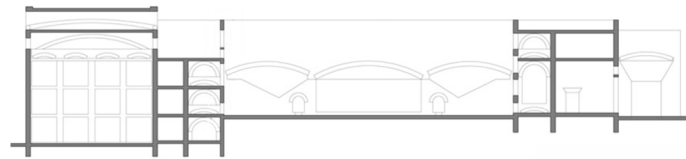


figure 15. IIM, L.Kahn. Transversal section through the plaza. E:1:2000



figure 16. IIM, L.Kahn. Volume masses. E:1:2000

The volumes are easily recognizable in the section from the vertical communication cores which have smaller dimension and they are more hermetic to the classrooms with bigger height. There is a gradient in imperviousness from left to right from the office building to the classroom.

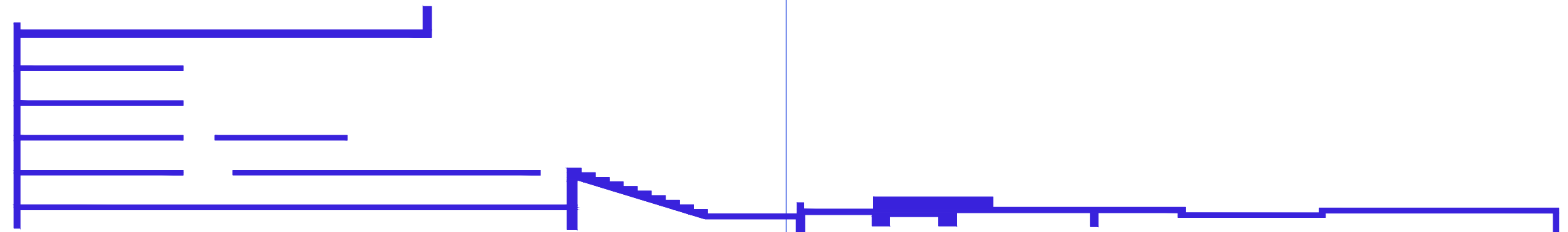


figure 17. Longitudinal section. E:1:500

figure 15. IIM, L. Kahn. Transversal section. Jin-Ho Park & Ganzorig Baldanchoijil (2014) The Superimposition of Circles Cut into Louis I. Kahn's Building Façades, Journal of Asian Architecture and Building Engineering. Modified by the author

figure 16. IIM, L. Kahn Volume masses. By the author

figure 17. IIM, L. Kahn Longitudinal section. By the author.

The vertical core in the administration building creates a dense barrier while the classroom building is more permeable. The walkways have a constant connection with the exterior plaza at multiple heights what is allowed by the double height in the ground floor. The second floor gets a more domestic scale.

The projected pattern (figure 14) is clearly visible also, and the modules and help to settle the visual proportions. The height of the filter space in the learning building helps to ease the transition, strengthening the bond but clearly separating spaces. In this particular section it can also be noted how the office building embeds into the ground to keep the visual proportion with the classroom building and balancing the volumes. Since the stories are not lined up cross-views appear from one building to the other.

In the transversal section just like in the old Greek architecture, the library works as a focal point framed by both buildings. The scene is not only framed but the section gains elevation as it gets closer to the focal point, emphasized by the big void in the facade of circular shape.

The structure of the library plays around with double heights with a strong vertical communication core in the center while the program centers around it. The increase on elevation is a resource used to gain that space for the project and allow installations and archives to be there. The interrelation in the floors of the library also adds a different scale to the building with a different use as the others in the complex.

In order to understand the role of light in architecture it is important to note that is one more element to design with. Space can be defined by light or by the absence of light. Architecture is shaped by shadow and light and how his light falls upon buildings and their voids and masses will change perception of it.

"Greek architecture taught me that the column is where the light is not, and the space between is where the light is. It is a matter of no-light, light, no-light, light. A column and a column brings light between them. To make a column which grows out of the wall and which makes its own rhythm of no-light, light, no-light, light: that is the marvel of the artist." (Louis Kahn).

The meaning of light gets an increased importance when talking about educative architecture since the kind of light needed for studying and classes might differ from others. Also light can help out to outline entrances or just to high-light places through light itself or even trough dark.



figure 18. IMM, L.Kahn. Exterior corridor.

In this case light is used to settle the rhythm of an otherwise very long corridor, by reducing ceiling height Kahn is able to give a more domestic scale to communication spaces. By positioning columns very tight together light can come through into the ground floor without compromising the structural layout made out of brick masonry.

figure 18. IMM, L.Kahn. Exterior corridor. Cemal Emden. Modified by the author.

Moreover by providing roofed exterior spaces suitable to be turned into informal learning space in a place with very high temperatures allows for outer interaction. A game-like strategy appears where shadow and light are used indistinctly as an architectural tool.

Absence of light can also be used as a flagship for entrances and passageways emphasizing the outer material of the construction.

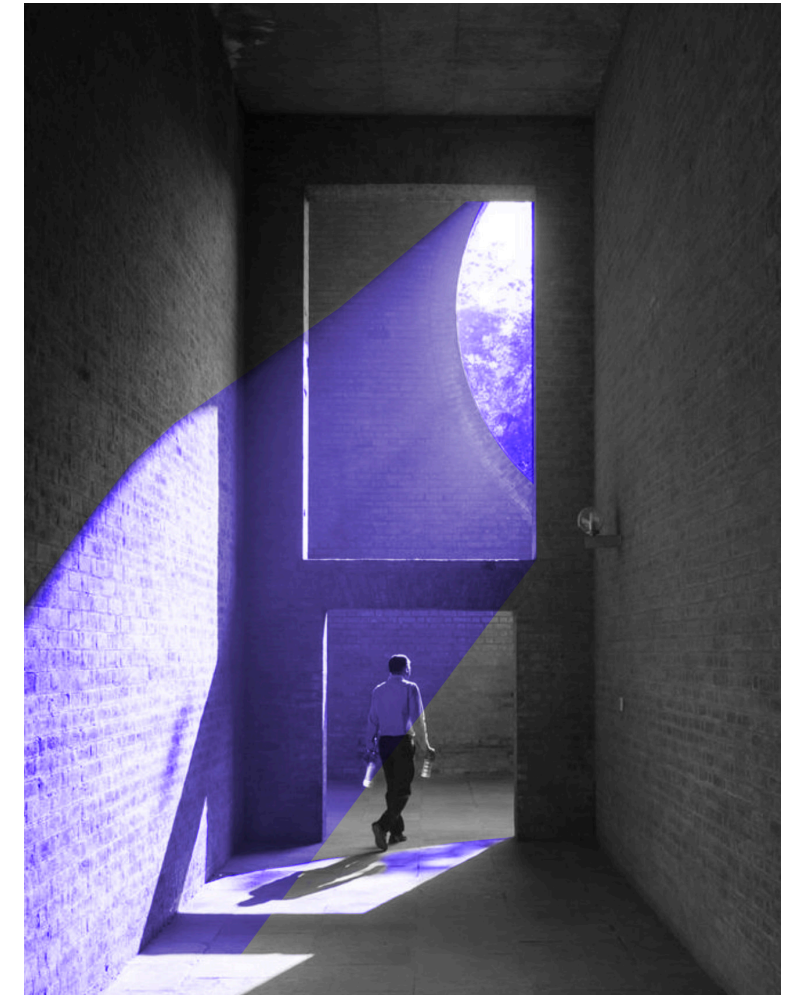


figure 19. IMM, L.Kahn. Light and Shadow

figure 19. IMM, L.Kahn. Light and shadow. Unknown author. Modified by the author.

Static and dynamic spaces are clearly differentiated in this particular study case. The architect designs evident bands of movement and stillness. The classes the core of the architectural complex would be then, the most static space where the user professor or student must stay. The plaza as the opposite side for comparison is the fastest moving and more messy place. Between these two some moderate movement architectural spaces can be identified.

One of the interesting architectural tools in order to get a smooth transition between fast moving space and one with a slower pace is generating intermediate spaces. These indents in the corridors before the classes allow to diminish the space and gather with people before entering the class. So a transition from high speed to stillness can be seen.

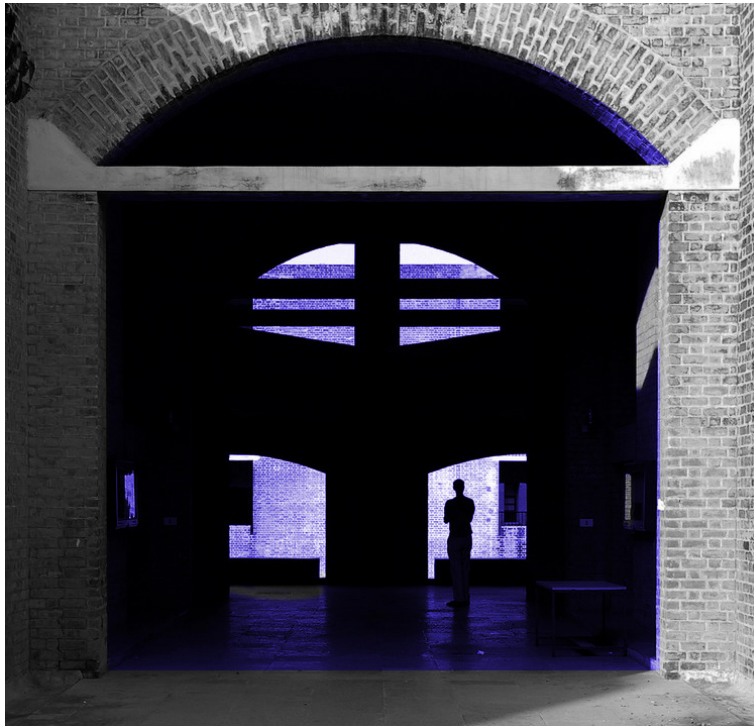


figure 20. IMM, L. Kahn. Exterior corridor passageway

Another more classical strategy can also be found, which is lowering the ceiling to separate spaces. The height reduction gives the user the feeling that the next lounge is bigger. Again, in a very warm country as India this allows for temperature control as well, providing spaces with sharper

shadows. The grading is established then, first the messy movement plaza, with no directionality, after that the lowered ceiling corridors which already moderate the user pathing. After that the small indents generating informal space between the class and the corridor which provides with the ability to stand. Finally the transition to the class, with a higher ceiling to open up the space and the end of the road.



figure 20. IMM, L.Kahn. Exterior corridor passageway, Cemal Emden. Modified by the author.

CHAPTER 2
UNIVERSITY OF OXFORD MATHEMATICAL INSTITUTE
RAFAEL VIÑOLY ARCHITECTS
Oxford, United Kingdom, 2013

1. Rafael Viñoly Architect. Text description provided by the architect in their building abstract.

The Oxford Mathematical Institute is inserted in the master plan for the University designed by Rafael Viñoly. The master plan goal was to keep the Oxford spirit with open spaces and relaxed character as well as height limitations. The building itself comes as a need to centralize an area that has scattered around through the campus. The facility provides a place for 500 researches focusing on the importance of privacy and interdisciplinary participation¹.

Oxford town centre and its master plan have strict limitations, the architectural design focuses on: keeping the proper scale, special care for historic buildings and fitting several research and bureaucratic facilities. The surroundings are filled with historical buildings so insertion in the environment was key in order not to break the visuals.



figure 21. OMI, Rafael Viñoly Architects. Oxford campus

The building is composed by two main masses connected by a glass volume. The program develops in both masses locating both auditoriums in the mezzanine and individual research offices stick to facades as they go up.

Research spaces are properly isolated to allow individual work. Between these spaces a big open area that serves as a social area and informal study place is created. Several pedestrian walkways and stairs connect the different departments in the building. All this space gets lightened by an atrium that covers nearly the whole range of the building.

The building is also designed in order to fulfill environmental goals, trying to reduce the amount of energy used. It merges solar concealers, rainwater recycling system and it uses natural ventilation overnight in the offices. Heat and cooling systems are also integrated in an energy center capable of further development.

figure 21. OMI, Rafael Viñoly Architects. Rafael Viñoly website. Modified by the author.

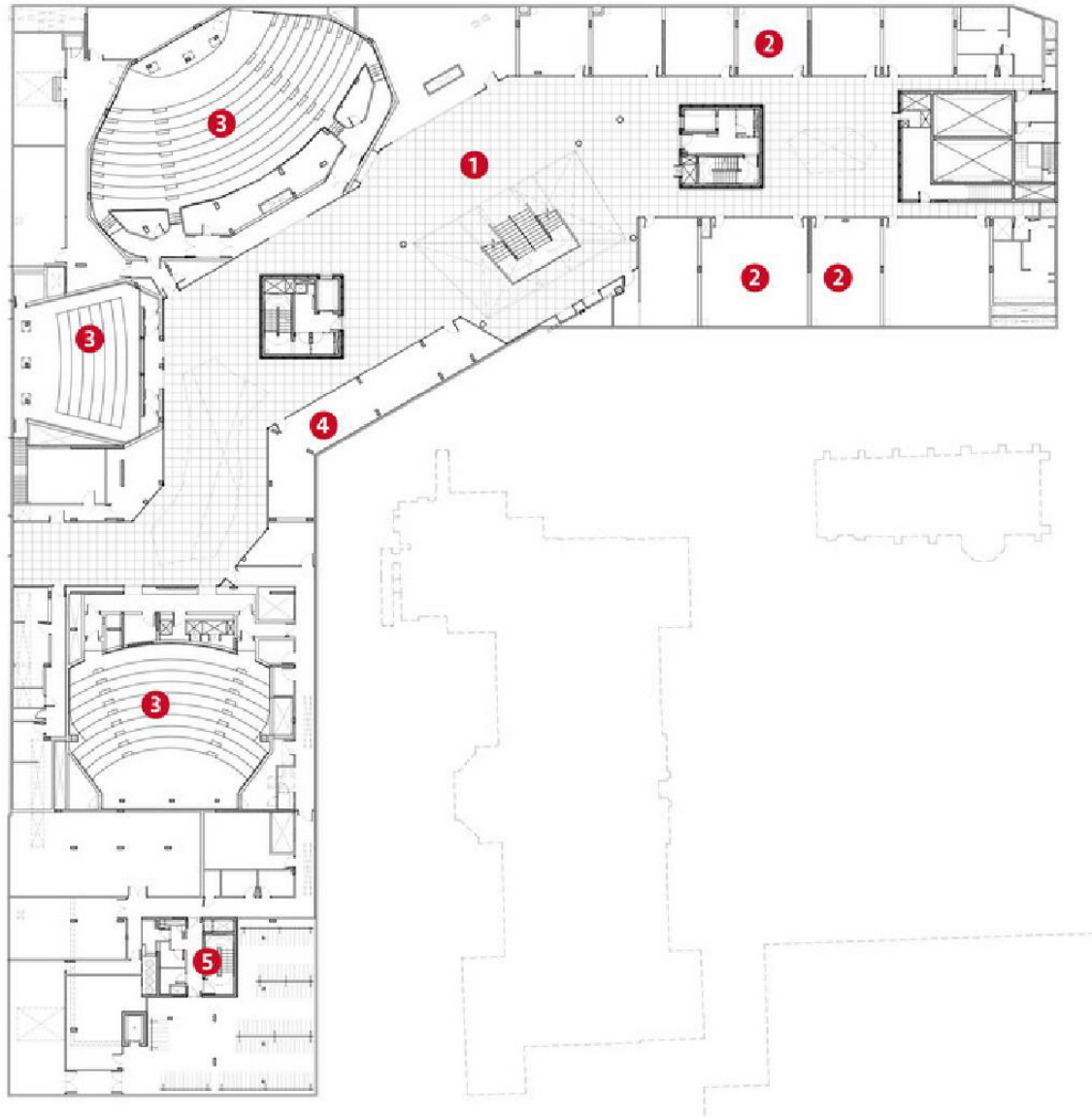


figure 22. OMI, Rafael Viñoly Architects. Mezzanine floor plan. E. 1:500



figure 23. OMI, Rafael Viñoly Architects. Ground floor plan. E. 1:500

In order to understand the building as a whole it is important to take into consideration the three floor plans. The vertical and visual connection between them make them indivisible for the space analysis.

The central glass structure works as a milestone, marking the entrance and giving a sense of direction to the user. Nevertheless several other accesses to building are present on the northern and southern parts. The pathing inside is extremely directional mainly due to the program since several individual cells needed to be designed and addressed.

Greenery is all around the building as well as in the rooftop, this characteristic extends from the rest of the campus where green elements are always present. These green areas shape the paths to the buildings in a very English picturesque way.

The main point of interest of this building lays in the way it integrates formal and informal spaces as well as the use of light in order to create different ambiances. Also the different type of user will be taken into consideration since the main user is a Math researcher, this meaning the use of private and public spaces will differ from traditional universities.



figure 22. OMI, Rafael Viñoly Architects. Mezzanine floor plan. Archdaily.

figure 23. OMI, Rafael Viñoly Architects. Ground floor plan. Archdaily.

figure 24. OMI, Rafael Viñoly Architects. Typical floor plan. Archdaily.

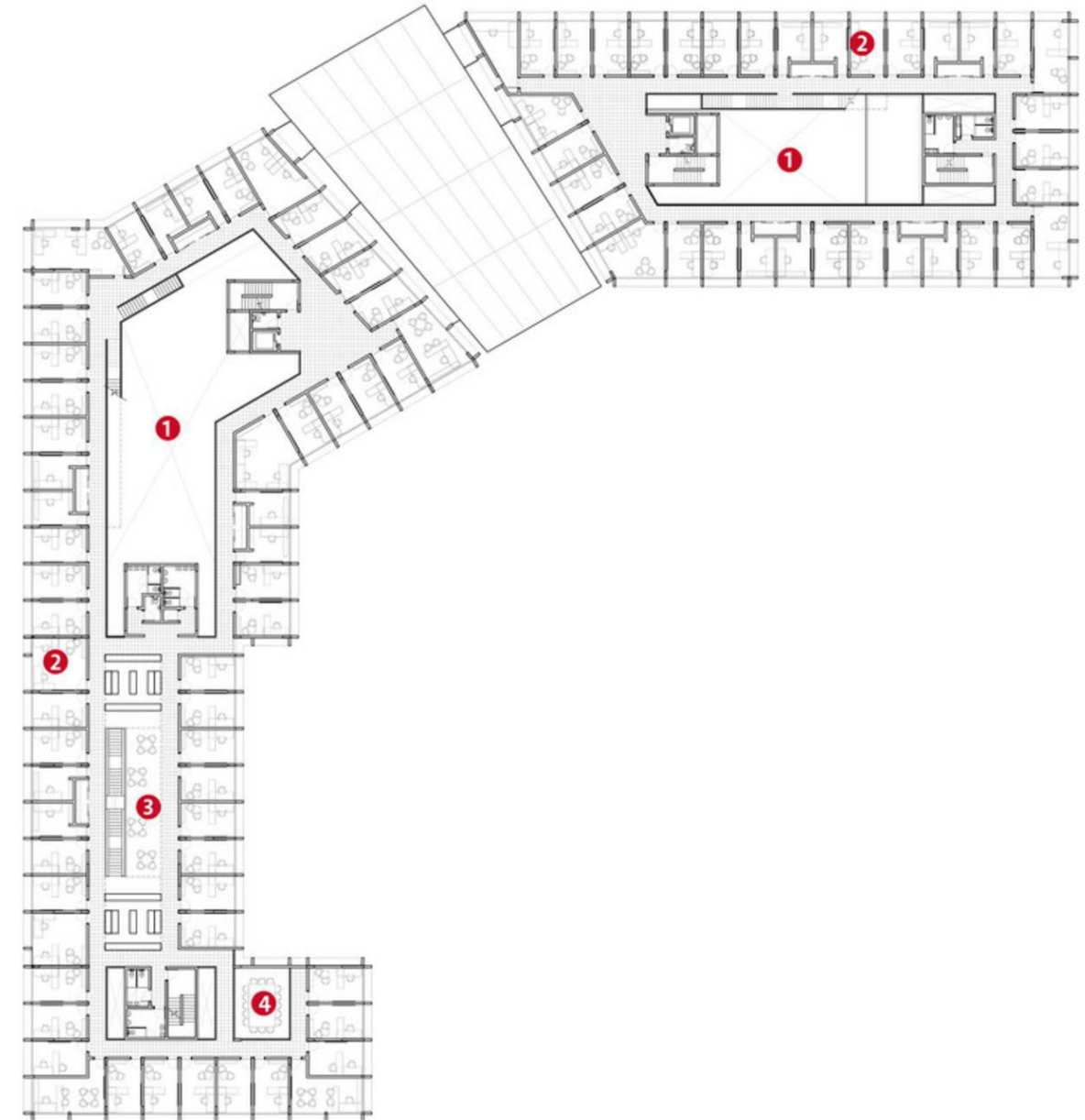


figure 24. OMI, Rafael Viñoly Architects. Typical floor plan. E. 1:500

A structural grid able to tie the whole building does not exist, nevertheless there is a repetition factor. It is impossible to talk about pattern but about a structural system with a high degree of freedom. Also there is a linearity in the way the module evolves, longitudinal lines define bands of spaces, from private individual researching to corridors and seminar rooms while perpendicular lines define the width of seminar rooms and research individual spaces. Split from the main repetitive system the vertical communication cores stand as major flagships in the floor plan being identifiable in all the floor plans.

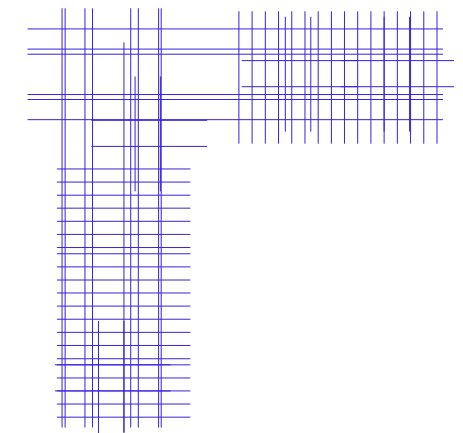
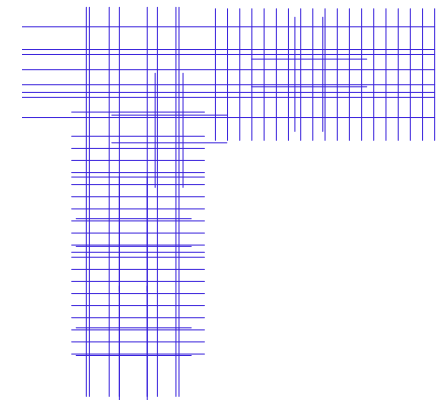
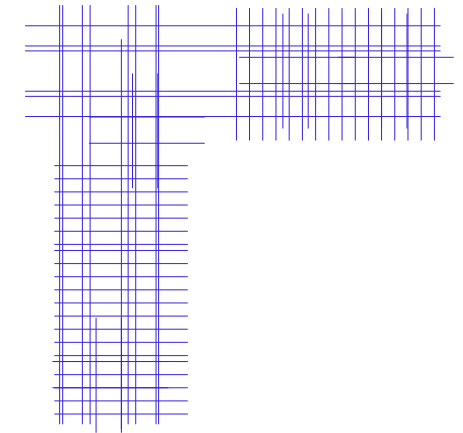
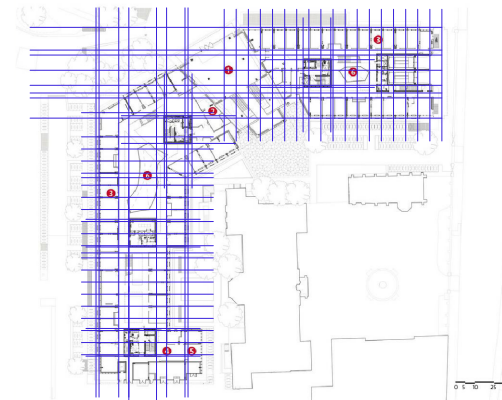
The project integrates this ordered no-grid with more organic like shapes from the atrium, these outsider shapes break the order giving dynamism to space. It is feasible to glimpse the order inside the structure identifying corridors, individual research spaces and informal space. The order is clearly influenced by the program, the private research spaces need good lightning provided by being on the facade. This would give the facade an image related and faithful with the program.

Also the grid highlights where the informal spaces are located since there, the rhythm loses its main structure. Further on, some shapes in the overall form of the floor plan are influenced by the classical shapes of the historical buildings around, keeping a sense of harmony and balance.



figure 25. OMI, Rafael Viñoly Architects. Underlying patterns over the floor plans. Modified by the author.

figure 26. OMI, Rafael Viñoly Architects. Underlying patterns. By the author.



In spite of understanding space distribution inside the building focusing on the typical floor plan would be needed. In it, the vast majority of formal learning spaces are located, and so the main part of the program. The formal spaces are mainly private research spaces as oppose to lecture halls or seminar rooms. They usually need a different spatial approach.

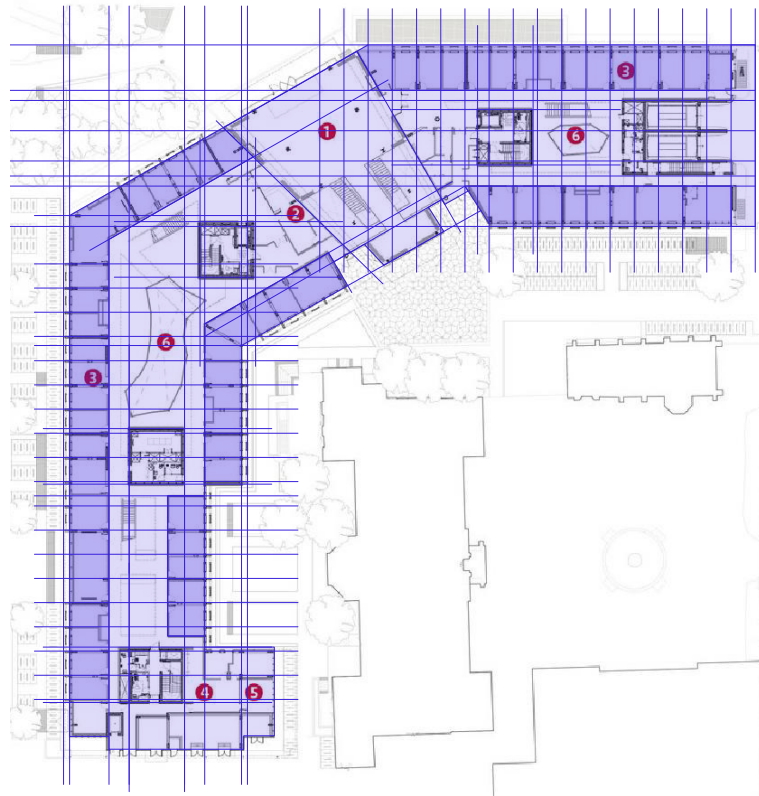


figure 27. OMI, Rafael Viñoly Architects. Spaces Relation. E. 1750

- Served Spaces
- Servant Spaces

Spaces are divided in three different bands from facade to facade. Both are populated with private formal researching spaces while the middle wider band is used for servant spaces. This allows for good lightning in the research labs while providing light from the ceiling in the servant spaces. The continuous servant spaces gives a visual connection throughout the whole building.

figure 27. OMI, Rafael Viñoly Architects. Space relation. By the author.

The dimensions fit the purpose of the building, the research private spaces are many, but come in a small dimension and the amount of servant spaces doubles the served. This allows for a very concentrated use of the building while allowing to develop informal life inside of the building with overdimensioned inter spaces.

Space	Dimension (m ²)	Relation (%)
Served	666	34
Servant	1255	66
Total	1921	100



Interior and interior relation gains a different dimension in this building. Oxford architectonic environment is very well taken care of and it allows for harmonic relations in the in-between amid buildings. There is mainly two kind of relations horizontal and vertical. There is a stream of connection from the research labs to the exterior, all of them are wide open to the exterior. Also in the middle of the building, the big glass volume allows for cross views inside the construction, achieving an interesting outside-inside-outside relation.

The vertical relation is constantly acting in the atrium of the building due to big skylights throughout the whole space. The horizontal relation is narrowed by the function, the fact that the main usage of the building is for private researching reduces the use of connection between the exterior and the interior. Even though this relation is invariably present in the research spaces, providing them with natural light and allowing for natural ventilation.

The program also separates research labs and student spaces in under and aboveground, preserving security and allowing visual connection between them through the atrium.

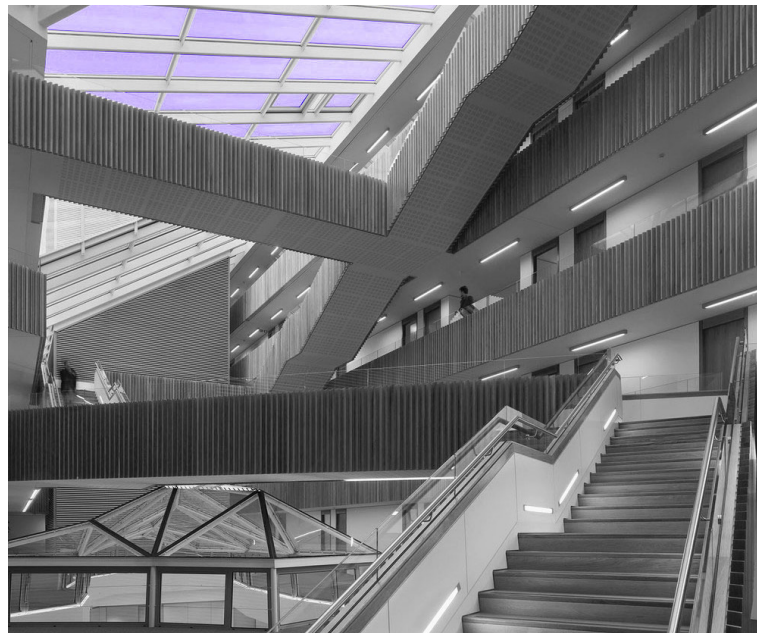


figure 28. OMI, Rafael Viñoly Architects. Interior exterior relation

figure 28. OMI, Rafael Viñoly Architects. Atrium. Will Pryce. Modified by the author.

The strong design idea of generating the atrium as informal and connection space conditions the interior and exterior relation uniquely to the research labs aboveground since the facade is populated by them.

The mezzanine relation with the exterior is even lower due to it being belowground and forces natural light to come through the atrium, something alike happens to the classes which need to be isolated from the open space in order to get quality teaching.

The program response generates complex relations between the exterior and the interior and relegates it to the research spaces mainly as well as the central glass volume.



figure 29. OMI, Rafael Viñoly Architects. Interior hall

figure 29. OMI, Rafael Viñoly Architects. Interior hall. Will Pryce. Modified by the author.

The section gains a lot of importance in the design since the architectural response is layered vertically and all the functions are easily recognizable in it. In the mezzanine the section reveals the slope of the lecture halls that also allocates the space for the parking. The atrium clearly distributes light to the whole volume with an intricate system of stairs that allows for people to relate and cross as well as generating visuals between the different floors. The space flows vertically as well as horizontally through the atrium supplying it with directionality that allows the space to be understood.

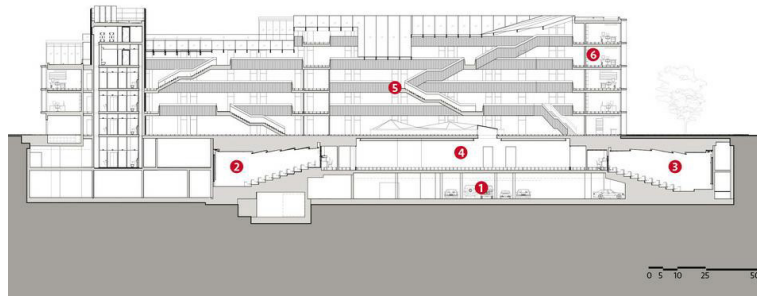


figure 30. OMI, Rafael Viñoly Architects. Section 1

There is a contrast between the vertical core and the educational spaces, vertical cores tend to be strong vertical volumes that set a milestone in the section. In this study case, the vertical connection is non-hierarchical while the private research spaces appear with the usual image of a staircase block.

The staircase space gets a new dimension becoming the inter-space in a vertical direction, where relations can be fortuitously found in a wide open space. The whole atrium becomes the staircase as well as the corridors. This oversizing tool is useful to foster meetings, turning the atrium in an informal learning space.

Nevertheless it is true that the one of the main vertical cores, unlinked from the no-grid also appears as a milestone in the section, as it should, but it is diluted in the visual strength the stairs in the atrium have.

figure 30. OMI, Rafael Viñoly Architects. Section. By the architect.

In the section through the glass volume some other aspects from the space are recognizable. The vertical lines setting the individual research spaces are still there, but ceiling openings to fill the atrium become visible as well as the strati showing the slabs to allow the light to come through down to the bottom. To allow this, the slabs where the research labs are located cannot cover the whole span of the building, in fact, they conform a small part of the section.

Thus it becomes more visible as a vertical core the classical staircase also, the atrium is not present here. Even though one can clearly see the glass volume, developing a lower height than the rest of the building and separating both wings.

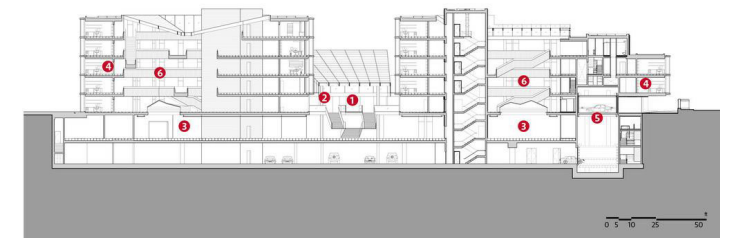


figure 31. OMI, Rafael Viñoly Architects. Section 2

figure 31. OMI, Rafael Viñoly Architects. Section. By the architect.

Light grades two kind of spaces, mainly differentiated by their use. The main use would be the atrium, where light comes filling the whole space, and the space is designed to allow the light to lavishly come in, the whole space focus is to enlighten the lower floors with natural light.

It makes all the sense then that the uses focused on the more private matters such as classes and lecture rooms are the lowest in the layered section. Light is used as a gradation of space. Light is filtered through the floors all the way down to the ground floor.

This wild light allowance on the more public spaces of the building, practically renders useless artificial lighting during day time, which comes in concordance with the green or ecological mindset of the building. Natural controlled light is always healthier and better than any artificial source.



figure 32. OMI, Rafael Viñoly Architects. Lecture Room

Materiality follows natural light usage, lecture rooms are treated with darker colors and warm materials such as wood in order to control light comfort and comfort which are particularly important in educational architecture due to exposure time. Many hours with lackluster lighting can turn into tired eyes, headaches and other problems which can give students and professors bad experiences.

figure 32. OMI, Rafael Viñoly Architects. Lecture room interior. Will Pryce. Modified by the author.

On the other hand we have the atrium material selection, directly related to the light. Transparent glass and white polished painted steel. Just in case opening the ceiling to the sky was not enough, material reflecting elements allow for the light to bounce inside of the building literally filling it with light.

The slabs generate shadowy spaces where one can get cover and transition into the research labs with a more controlled light source.

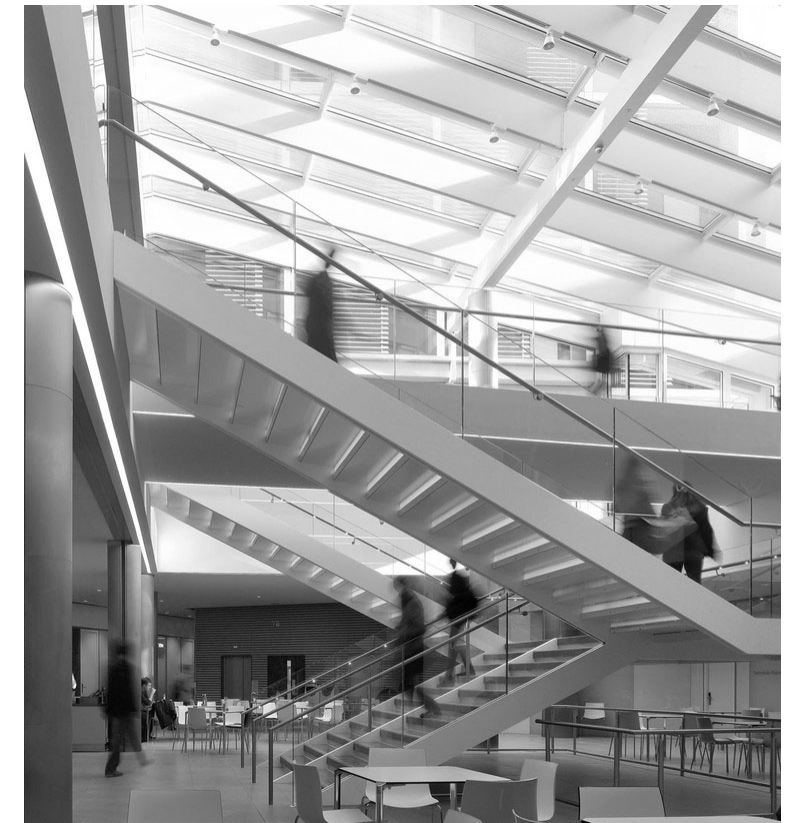


figure 33. OMI, Rafael Viñoly Architects. Light

figure 33. OMI, Rafael Viñoly Architects. Interior atrium. Will Pryce. Modified by the author.

It seems like the duality of building is simplified into two kind of spaces, that constantly stand against each other. Duality is clear in static and dynamic in a research lab building, research labs become the static part while the atrium is the dynamic.

The dynamic space becomes a stream in whose banks static spaces appear. The atrium is such an open wild space, that needs a strong counterpart, it needs a strong static space to find the balance.



figure 34. OMI, Rafael Viñoly Architects. Atrium

Space in the atrium flows thanks to the connection between the floors and the inter-locked corridors, that invite the user to move. It almost works like a highway and the speed lowers as one gets close to the facades of the building and descends to the lecture rooms.

The relation with formal and informal spaces is almost direct. Static spaces classically and practically have developed formal learning, in any of their displays while dynamic spaces are more suited for the informal. There is, though, an ambiguity, informal learning is usually fostered in oversized connection spaces which suddenly become static, but in an improvised way.

Formal learning, defined as the development with the goal to learn, is linked to a static space, classical or non-classical but it requires a static space. Privacy follows this gradient from the public and dynamic to the private and static.

figure 34. OMI, Rafael Viñoly Architects. Atrium. Will Pryce. Modified by the author.

This analysis comes in mind with the main user found in a research lab, their time table and their movement through the building. Static spaces are the most important for them, mainly because they spend the majority of the time in them, while dynamism is not the key point in it. Smaller spaces such as research labs allow for attention to the detail, and controlled ambiance to develop the desired activity.



CHAPTER 3
UNIVERSITY CAMPUS UTEC
GRAFTON ARCHITECTS
Lima, Peru, 2015

1. Grafton Architects. Text description provided by the architects. Grafton website.

The building is born as a man-made cliff, the shape and position of the country generates a constant relation between the sea and the mountains. The design is conceived as a continuation of the of the sea edges.¹ The feeling of a crafted cliff is reinforced by the materiality, a cliff made out of concrete.



figure 35. UTEC, Grafton architects. Campus exterior.

Located in the very edge of Barranco, one of the southern districts of Lima acts as the boundary itself, as welcome flagship to anybody coming from Lima. The shape comes as an overreacting relation between the city of Lima and the sea, evoking the boundary between it and the Pacific.

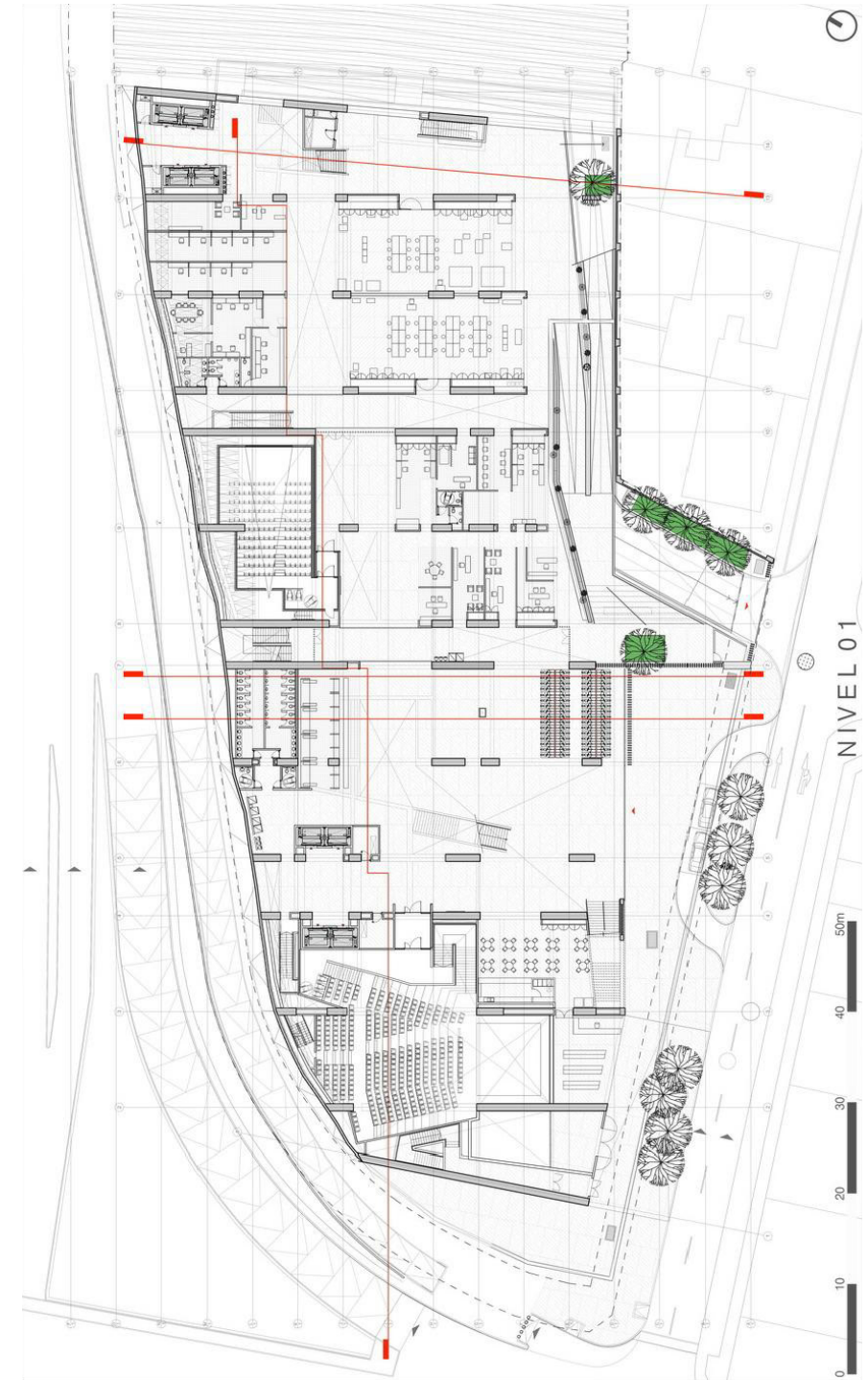
The building is composed by 10 floors, with the 6th being a complete garden and the roof at 09. The whole section escalates down on the city side towards Barranco, easing the transition with the lower urban scale with the descending gardens. The A shape allows for a different relation to the city life and the high traffic routes on the back, acting as a wall facing two different worlds.

figure 35. UTEC, Grafton architects. Exterior. Iwan Baan. Modified by the author.

The building, designed by the RIBA and Pritzker awarded architects Grafton, has a very interesting feature which is that is designed in section. University campuses are usually developed in floor plan and horizontally, but UTEC is developed in height having to provide multi-directional relations in order to make it work.

The way floors connect between them and the way students have them used would define success in such strategy. The whole design is framed in a very strict urban approach and that conditions the function design. Nevertheless the rest of items to be analyzed will have the same weight in order to flatten the comparison ground.

As already mentioned the building has many floor, and analyzing all of them would surpass this paper aim. The most relevant floor plans for the paper would be selected and further develop.



The floor plans are many and with different configurations, but all of them are composed by an open floor where spaces are being addressed. In the first floor several common study places can be found organized throughout the plan as well as a big lecture hall or theater which goes down to the ground floor. A smaller lecture room can also be found.

On the second level some more study spaces are scattered around, a cafeteria can also be found. Some of the private offices start to appear, with some of the greenery in the cafeteria area. All of this is always combined with double heights, which allow visuals between floors.

As one moves higher up, small courtyards start to appear surrounded by small classes or lecture rooms. These classes are interlocked in a constant rhythm with more private offices providing the floor plans with several functions. Connections with higher and lower floors keep showing up all along the floor plan.

Once in the 06 the vertical garden facing Barranco makes its appearance taking a huge chunk of the plan mass. Again the classes mix with the offices almost following the same pattern as in the floors below, offices facing northern and classes on the southern part. Even though the green elements are in the south facade, they can be seen through the whole floor plan, allowing for an exterior feeling even though it is located in a sixth floor.

Finally in floor 08 some remnants of the greenery are present still on the southern facade, while the floor is almost completely populated by eight lecture rooms. Some closed group work spaces can also be found as well as a student lounge for the students to rest or get off the academical ambiance. It is clear that in a building that is develop in height some uses must be repeatedly used in order that the users do not need to go up and down several floors.

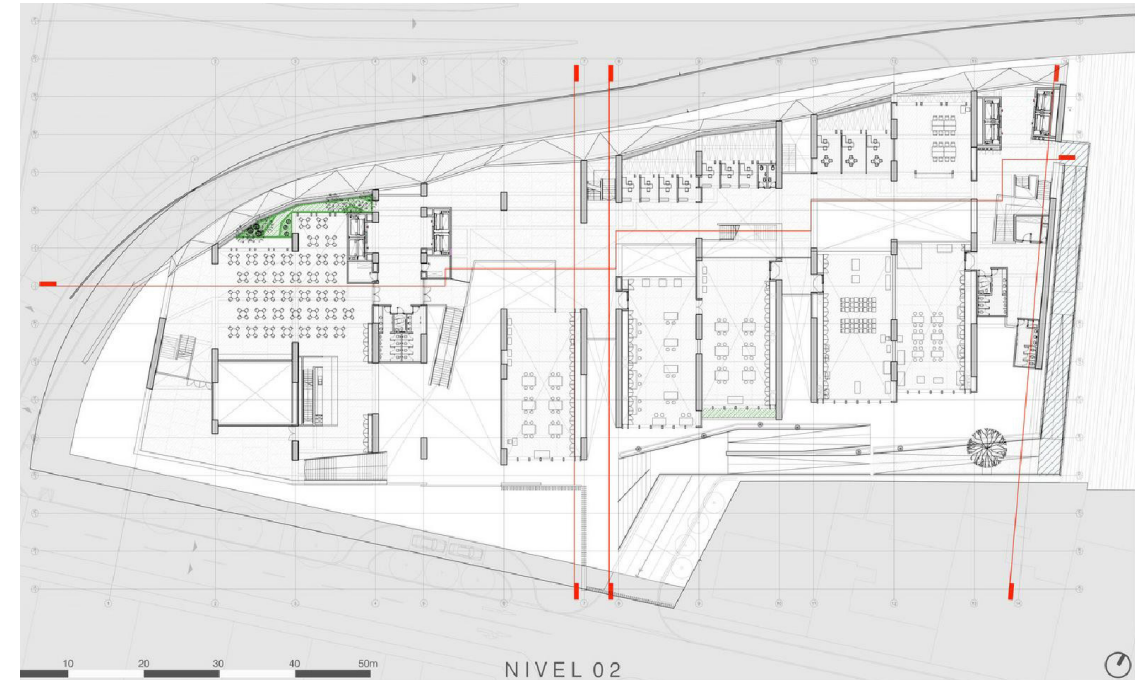


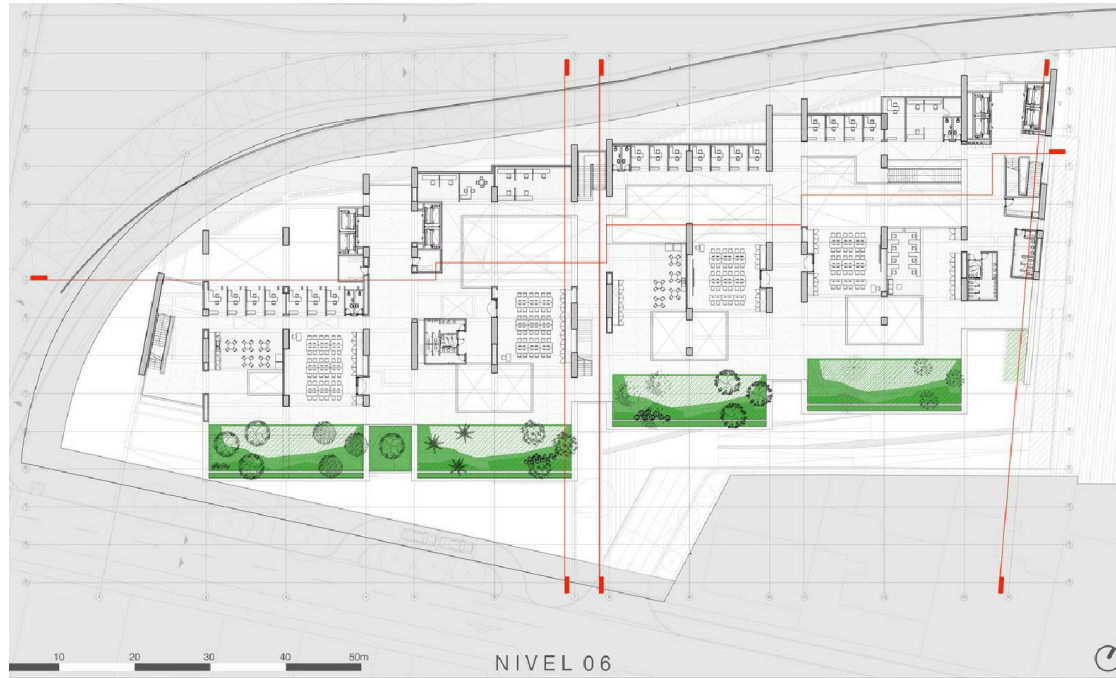
figure 36. UTEC, Grafton architects. 01 floor plan. E. 1:800

figure 37. UTEC, Grafton architects. 02 floor plan. E. 1:1000

figure 38. UTEC, Grafton architects. 05 floor plan. E. 1:1000

figure 39. UTEC, Grafton architects. 06 floor plan. E. 1:1000

figure 40. UTEC, Grafton architects. 08 floor plan. E. 1:1000



2. Grafton Architects. Definition for the northern facade. Grafton website.

The complex shapes carved in concrete show an underlying pattern that orders the uses inside of the building. Manifesting a game of holes in order to keep visuals between the different floors and setting up typical cores such as vertical connection or wet uses.

Just like a cliff the project scales in different directions, not only as it grows up with the “A” section but also on the floor plan from West to East. The modules are separated into four blocks which are also separated into smaller parts. These parts are not fully regular, but some similarities can be found between them where the main use blocks correspond to almost three times the served bands. This way the architects generate a cadence in the floor plan, a flow. An homogeneous pattern that can be treated at a smaller scale in an heterogeneous way. This small differences spice up the space, avoiding mirroring and repetitive patterns.

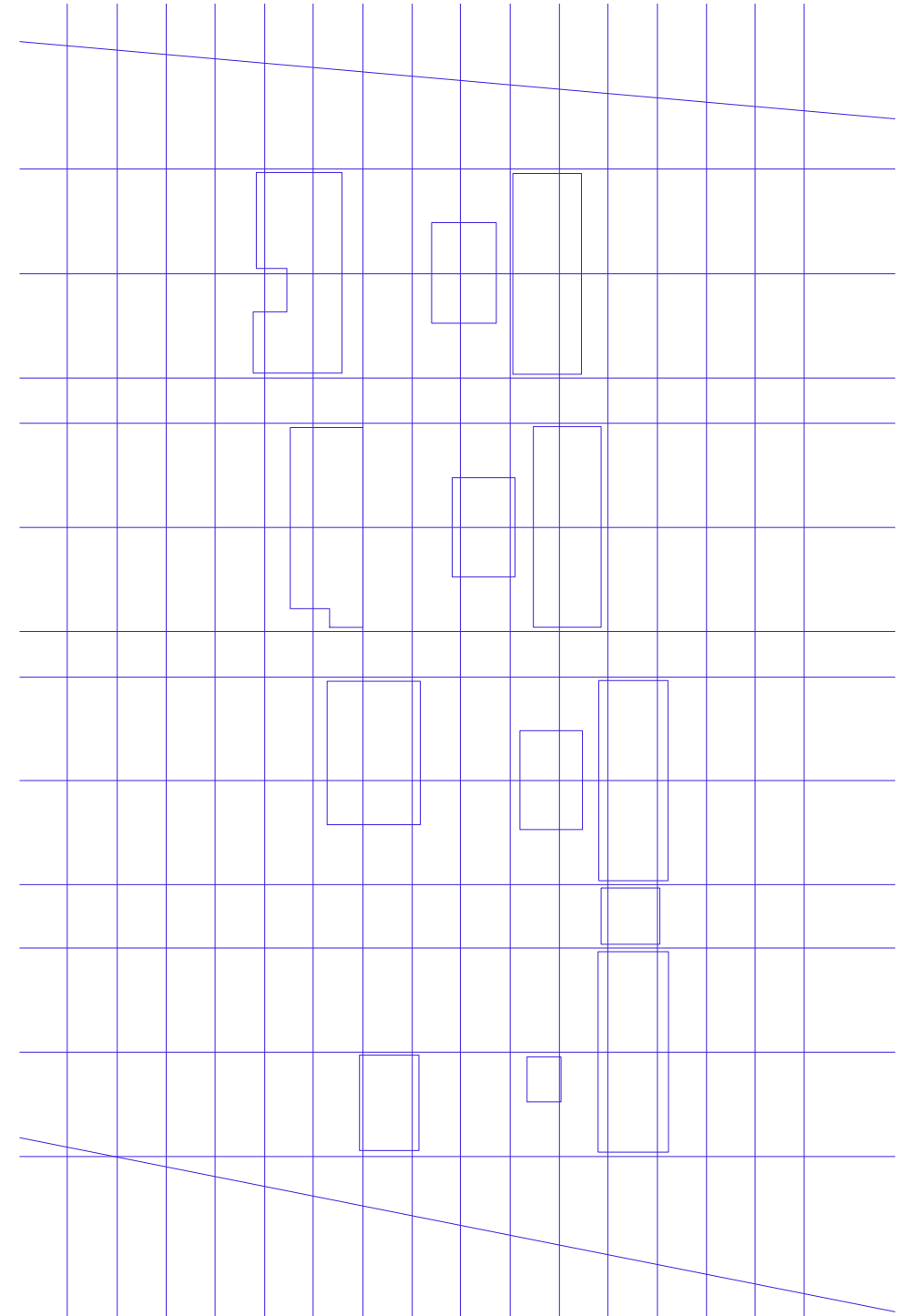
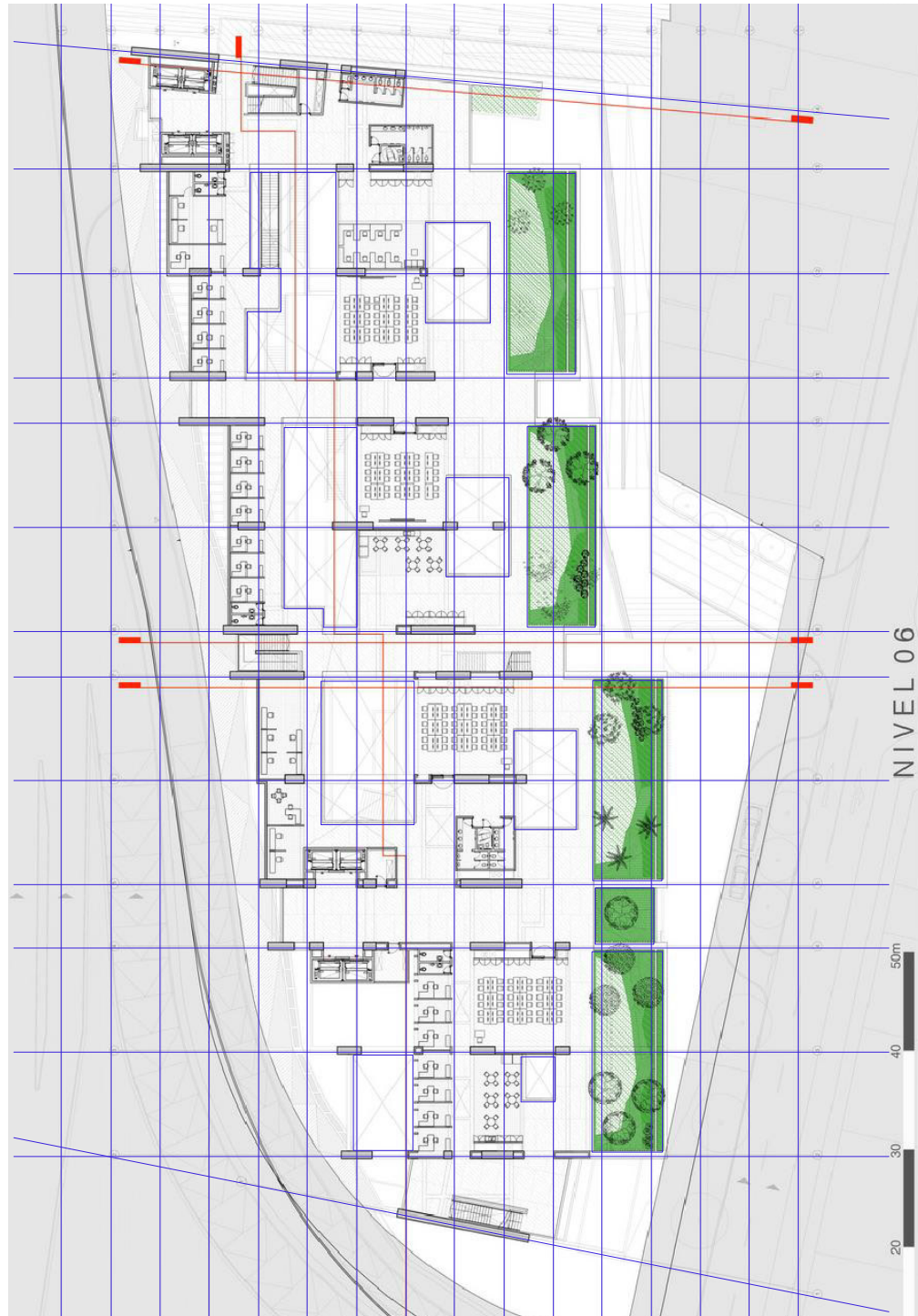
In fact, one of the most important features of the building, the holes carved throughout it fall on and out of the pattern. This gives to the observer a sense of order, avoiding to fall into reiteration since they are different in each of the blocks. The underlying pattern is present in all the floor, following mainly the structural pattern of the building, marked by thick walls of concrete.

The architects also take the freedom to bend the edges in order to end the pattern. The whole aggregate of tools actually make it resemble a human-made cliff. The hard edges on the concrete help bring that idea out, instead of having soft polished curved structures.

The pattern allow for an even distribution between the different floor plans, bigger spaces such as classes or common study ones are located in the southern part while smaller group study rooms or offices are located in the north facade. Always using the same kind of band size for the determined use content.

Also the pattern is being offset to fit with the “A” section, so each successive floor is smaller than the previous, from the fifth and on. “While the north face acts as a ‘cliff’ or ‘shoulder’ to the outer world - the fast-moving city - the south faces cascades as a series of gardens.”²





The pattern appears as an extremely simple set of lines, displaying that the simplest of the patterns can become a complex visual structure. In one direction the pattern orders as mention above, but in the longitudinal direction, the rhythm is constant and unchanged. Up until both building edges where they tip.

This longitudinal pattern system allows for the offset of the smaller spaces when taking up one module or bigger one when taking more than one module. On the South facade it can easily be seen how the offices spaces are being off-set slowly throughout the whole length of the building one module at a time.



figure 41. UTEC, Grafton architects. Pattern. Modified by the author.

figure 42. UTEC, Grafton architects. Pattern. By the author.

Served and servant spaces are intricate in this project since spaces are scattered through the open plan, so that served islands can be found inside of the servant spaces and the other way around. Complex plan shapes compound by different quads, their location and their form help to build th space.

Since there is no typical floor plan and all of the have slight differences number 08 will be selected as it is a floor with several lecture rooms, offices and some other uses.

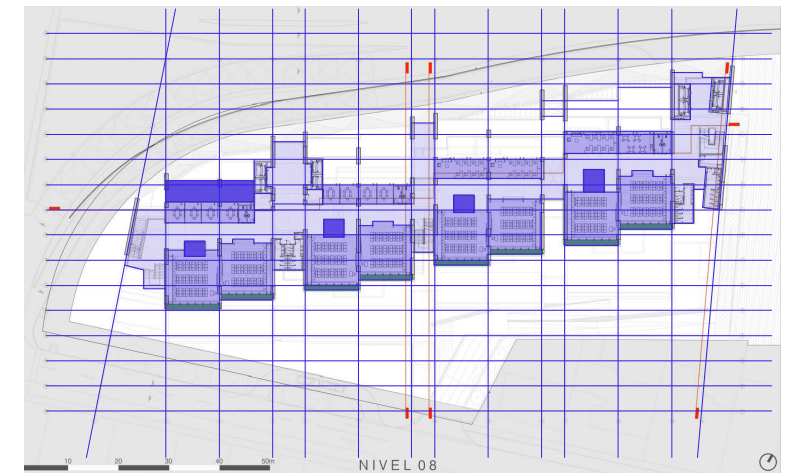


figure 43. UTEC Served and servant spaces.

- Served Spaces
- Servant Spaces
- Void

Space is ordered by a central serve space that articulates the whole length of the building. Spaces are separated in both sides by more classical learning into the south part and offices in the north part. The serve space is carved by some holes along the way, which provide light as well as visuals, an break the long corridor, even though the indents help to break the long visuals.

On the other hand the balance between serve and served space is very tight, both have almost the same amount of volume. The reason of this might be linked to the fact that the building is designed in section and not in floor plan.

figure 43. UTEC, Grafton architects. Served and servant spaces. By the author.

The main path branches out into smaller ones which provide small staying spaces as well as the vertical communication cores. The stair from in plan allows for these shapes to be heterogeneous, and achieve a more organic like shape, just like a cliff would, they become a faceted cliff.

Space	Dimension (m ²)	Relation (%)
Served	1247	49
Servant	1168	46
Void	133	5
Total	2548	100

The vertical cores have a very strong presence in the building due to users having to move vertically, and even with these circumstances spaces relation is balanced. Void is included in the comparison because they have a deep link with the building design.



The building designed by Grafton acts almost as a filter between Barranco district and the city of Lima. Its great permeability messes exterior and interior space, making it even hard to understand for the observer in the floor plan. Nevertheless differentiations are made, and the inside-outside relation can be established.



figure 44. UTEC, Grafton architects. Interior exterior relation

Interior-exterior relation might not be as plain as it seems, it is not strictly assigned to the boundaries of the building, the design of the building allows it to work as a filter, interlocking concrete elements to feel more or less opaque. This situation can lead the observer to misunderstand the relation.

The whole building itself is an inter-space, like an outside hall that is not entrance nor fully exterior. The whole design reinforces the feeling of space, avoiding to close fully to keep permanent connection with the outdoor. Passing by through the intricate of beams and walls gets the viewer the feeling to cross a filter where the fibers are made out of white concrete.

Nevertheless it is mandatory to have a differentiation between exterior and interior space in educational architecture: light control, comfort and temperature need to be addressed in order to provide proper service to the users. This spot where the relation is more closed, can be identified in the northern facade facing Barranco.

figure 44. UTEC, Grafton architects. Iwan Baan. Interior exterior relation. Modified by the author.

In South-North direction the filter gets denser, from the open inter space on the South to the glass facade on the North. The gradient also moves upwards since the ground floor and first floor are more permeable in some areas, and the main floors, where the uses are developed are more compact in Barranco's side. Still, the building communicates with the city through big flat glass surfaces mixed with the opaque white concrete.

As one moves up in the construction this feeling of filter and exterior space fades out, giving the user a more classical inner building sensation.



figure 45. UTEC Interior exterior relation

Green elements in a building are usually taken or give the user the feeling of exterior space. In a building the size of this one is important then to keep the relation with the exterior as one moves upwards. Here is where the vertical gardens come into play.

These huge terraces filled with green elements allow users to have the warm feeling of trees and plants through the window when in the upper floors. Also, it allows for a contrast with the concrete generating a game of warm and cold materiality. Green elements involve a cushion between the interior and the farther exterior as the city itself, providing a close range end of perspective.

figure 45. UTEC, Grafton architects. Unknown author. Interior exterior relation. Modified by the author.

In this case, relation with the surrounding and the exterior gains another level due to the building being in a privileged place. The relation also achieves a macro-structural scale, where the city meets the building and the building has to communicate with it.



In order to fully understand the building, the section analysis is necessary. Some of the features and design strategies come up highlighted in the section. First of all there is a pattern that orders the elevation coinciding with the structural framework, on the other hand there is very clear band lines that distribute space from the huge gap in the south facade to the strong enclosed blocks in the North.

The core of the building, the stairs are permanently linked to the south facade gap, helping the idea of filter, and giving ventilation and crossed views to it. As one moves in a South-North direction the gradient becomes clear. The section presented in *figure 46* show clearly the relation between the main essence of the building, its vertical nucleus. The section also defines a band of specific uses such as stairs and wet cores which articulate the rest of the space.

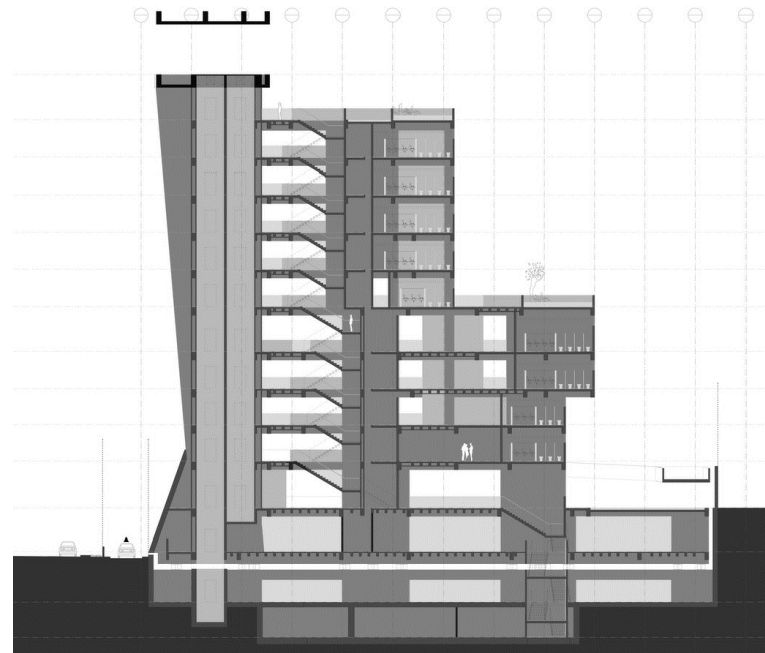


figure 46. UTEC Transversal section

If the section is then graded in elevation, three main blocks over ground floor can be identified: the first one composed by the first two levels, open and letting space flow, another block all the way up to the green terraces and the last one, with the biggest offset up to the rooftop. These offsets that indent the building help generate the “A” section that is so characteristic to this study case.

figure 46. UTEC, Grafton architects. Section 1.

Moving onward to the next section in *figure 47*, this one is cut all along the educational spaces, the main use of the building. There is a clear void following the pattern of intersecting beams in the southern facade while the masses composing the lecture rooms are clear. Only small remnants of structural elements are left there.

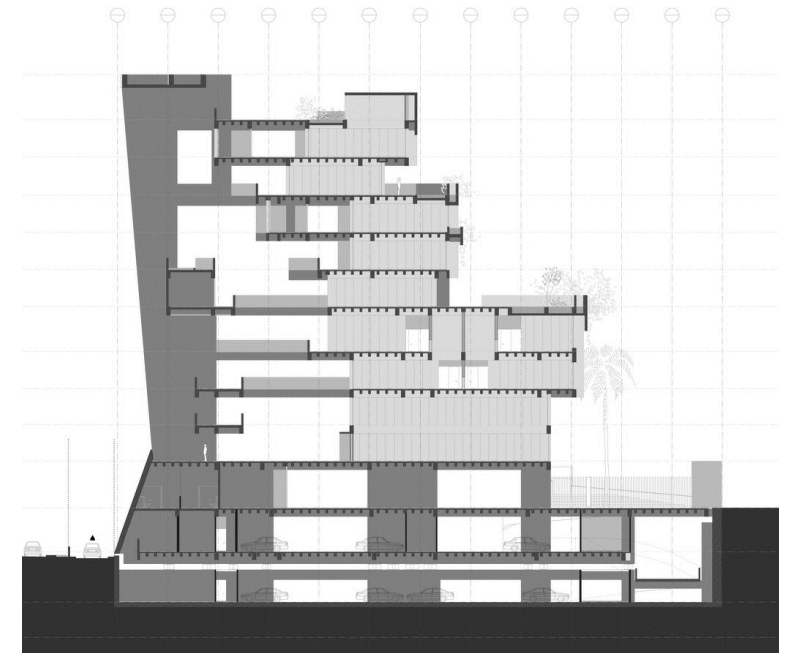


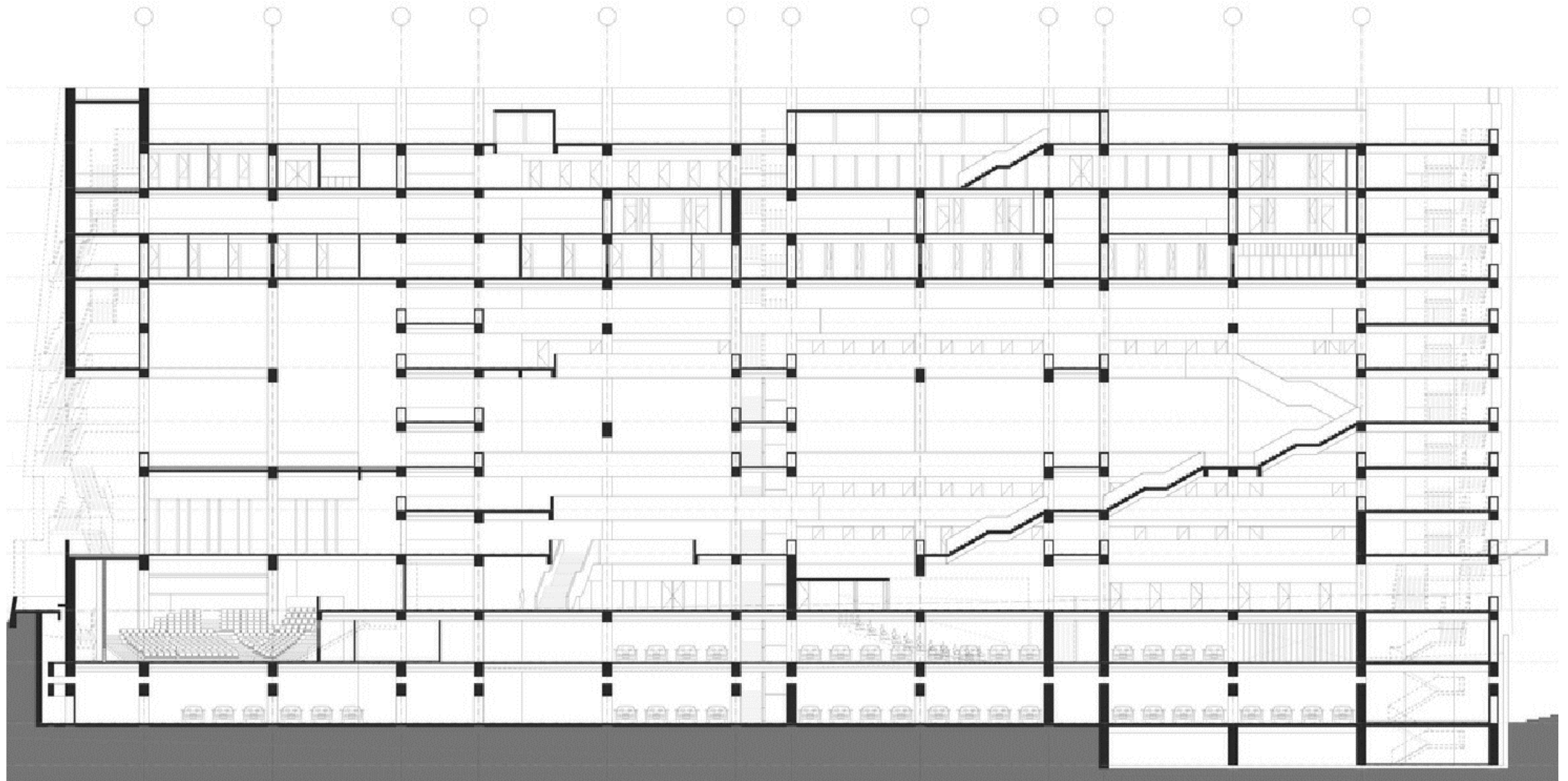
figure 47. UTEC Transversal section

A very likely configuration to the other section is present in this one, by separating in three different blocks in height. Nevertheless the volume of the learning is easily understandable and recognizable, which also helps to understand the filtering from left to right.

The height on each individual floor also varies from one section to the other, allowing user spaces to become higher where they need to while keeping ceilings in connecting spaces lower.

Finally, the main staircase is not present at all in this section, due to the thick concrete walls that enclose it on the sides, this gives the filtering a clear direction, aiming views to go through the building instead of along. Once again following the structure direction.

figure 47. UTEC, Grafton architects. Section 2.



After stating the directionality of the building, it might seem weird to give importance to the longitudinal section, nonetheless a lot can be understood from it. In a way, the building is more void than space. The structural system can be identified through the lines that go from ground to ceiling, but still space can be identified. There is almost no furniture information, but the way the section is presented allows to position vertical cores, formal and informal spaces.

The idea of visual connections and cross views also gains a new level of importance, in which almost every spot that is cut has a relation with another one, generating diagonal views on successive floors or way down to the bottom of the building.



figure 48. UTEC, Grafton architects. Section 3.

As light goes through the building it starts to fade out. The three dimensional pattern of beams, columns and structural elements, filter the light on each stage, providing the lower floor with less light. The different concrete structural elements generate a game of shadows and light which adds depth and interest to the space.



figure 49. UTEC, Grafton architects. Light

There is a slight problem, due to being very close to the equator. Sun movement varies from Summer to Winter, while in the first movement occurs through North, in the second movement is slightly to the South. This affects the way the building acts on each season, receiving sunlight from a different direction.

Main facades are oriented North and South and slightly to East. Thus light is coming to the classes from the South in Winter, providing the main use with natural scattered light while the southern structural elements allow for light management.

figure 49. UTEC, Grafton architects. Iwan Baan. Light.

Light is seen as a filler of the carved spaces inside the man-made cliff, it pours inside the chiseled holes of the building. It also reinforces this idea of the cliff, making the user feel like they are inside of ravine, a geographic accident in which the user is at the bottom.



figure 50. UTEC, Grafton architects. Light

The structure is designed in order to let light come through, an strategy that actually designs more void than matter. Light helps to understand space, and natural light in this context help the user discern its position in relation to the building. Thus spaces requiring less natural light such as big lecture halls are located in the lower floors, fulfilling the function design, while resting rooms for higher up in order to provide a natural relaxed ambiance as well as proper lightning to the classes.

All in all light can be seen as another architectural element which defines space and matter. It can assort space, and grade it to help the user on its way through the building. Its use can be reinforced with material reflectivity as well as with shadow and light games.



figure 50. University campus UTEC.
Iwan Baan. Light.

The project develops its function in height, swapping the connection spaces to a vertical direction where the main corridors become then staircases. Given this scenario, the staircase needs to evolve into an open space which flows through the building. The offset and counterbalance of the stairs endow these spaces with dynamism, not only people flow through it but the shapes of the structural elements add to it.

Stairs landings become then reunion spaces, where the speed of movement is decreased in the flow, and those become one part of the decelerating process. Open spaces help people gather and even further when they are interconnected with several paths.



figure 51. UTEC, Grafton architects. Static and dynamic space.

The cores of vertical connection and thus the dynamic space articulate the whole building, which more than usual needs good connection between its floors. An oversized elevator landing also adds to this matter, where people gather and meet. Elevators themselves are a complex space though, being linked to vertical connection but fostering gathering.

Even though vertical movement has special interest in this study case, dynamic and static space can also be identified in the floor plan. Acting like a spine, the main corridor that goes through the whole building branches out to generate small indents and slow spaces. These spaces would then give access to classes and offices.



figure 51. University campus UTEC. Iwan Baan. Static and dynamic space.

CHAPTER 4
UDEP Lecture Building
BARCLAY&CROUSSE
Piura, Peru. 2016

1. Barclay & Crousse. Text description provided by the architects in their project abstract.

The UDEP campus is located within the pattern of Piura's city. Its surrounding are defined mainly by an Equatorial Dry Forest which gives an strict relation with nature to the building. Nonetheless this huge piece of land is located inside of the city.

The building is designed as a 70x70 m square which allocates then, the study rooms and lecture halls. The system interlocks covered outside spaces with open ones, and their transition to the inside of the building. Eleven buildings are arranged around the square circulation, fostering resting, gathering like a promenade.

The buildings has then several accesses stimulating to go through the building as a normal path to move around the campus. The interstitial space is almost labyrinthine and its tilted walls help create interesting lightened spaces. The use of materials and lattices also help to generate comfort and appeal.



figure 52. UDEP Lecture building, Barclay & Crousse. Main entrance

From the outside the concrete texture as well as the wood marks in it help the building to stand up from its surrounding. The lattices also help to contrast with the big flat surfaces that cover most of the envelopment. Finally, the same green elements are used in the interior and the exterior helping the user to correlate both spaces and understand it.

figure 52. UDEP Lecture building. Barclay & Crousse. Cristobal Palma/Estudio Palma.

The interest on this project is defined by the architects intentions on their buildings design: *“Our project had as a main goal to create a learning atmosphere more than an architectonic type or shape. We considered the building should be capable of nestling informal learning: casual encounters for exchanging ideas between students and between students and teachers, in a friendly environment.”* ²

The way informal spaces are designed in order to foster participation and interaction between students themselves or with professors is relevant to this work.



2. Barclay & Crousse. Text description provided by the architects.





An underlying pattern can be found in the regular building shape, the grid marks several of the main elevated paths in the building as well as some of the guidelines for the lecture halls. Still, it is important to note that the building does not follow the pattern blindly, it is closer to a guideline or an order that an actual grid.

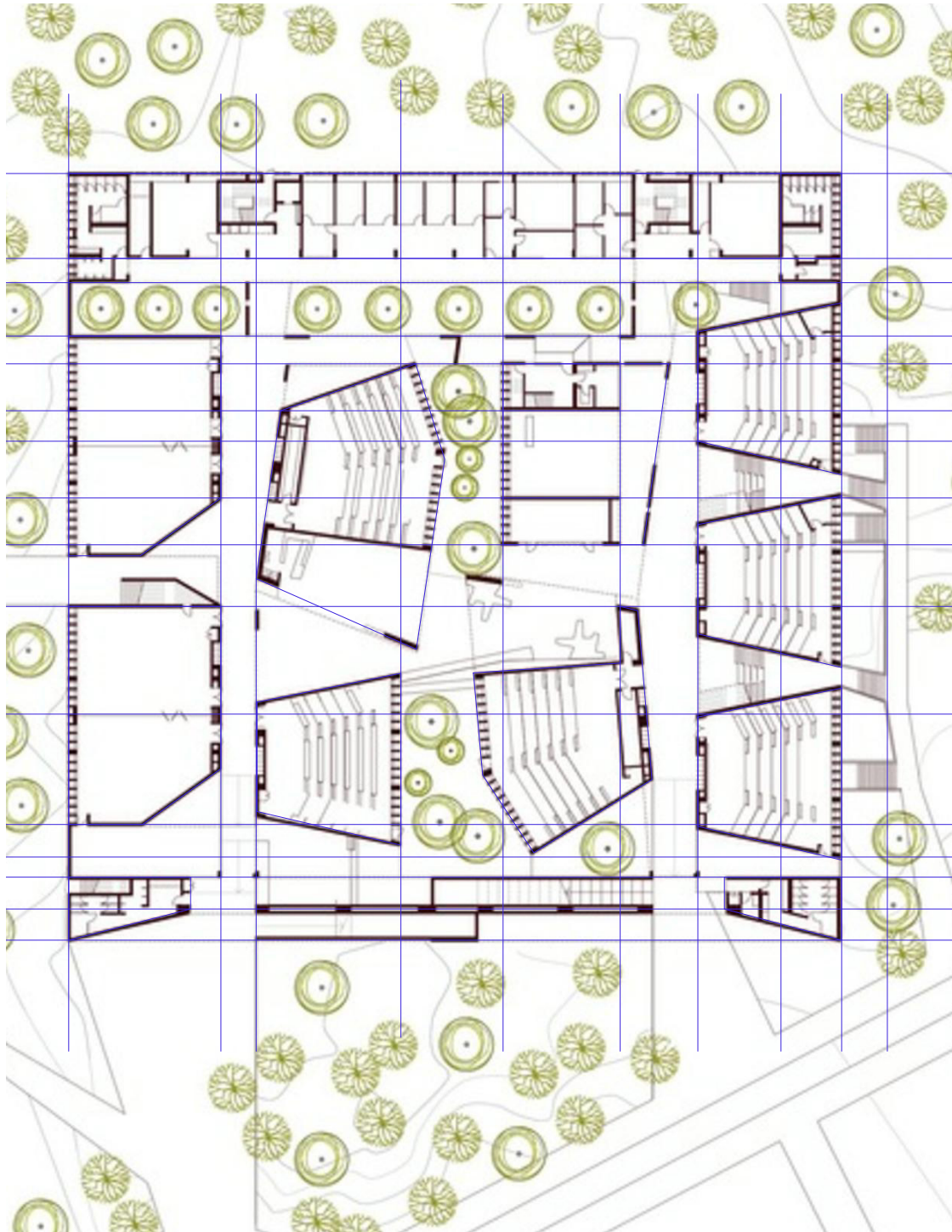
The guidelines are mainly ordering the connection spaces and setting the ground rules for the elements inside the square. There are four main paths parallel to the facades that circle around the lecture halls. These paths open to the exterior of the square in several occasions. On the North facade the architects open wider the facade whole, generating a triangular shape.

The grid help differentiate bigger connection spaces from the less important ones where the grid reduces its size. In the same way, the it helps to put order to both the South-East and South-West facades in the offices and the multi-purpose rooms.

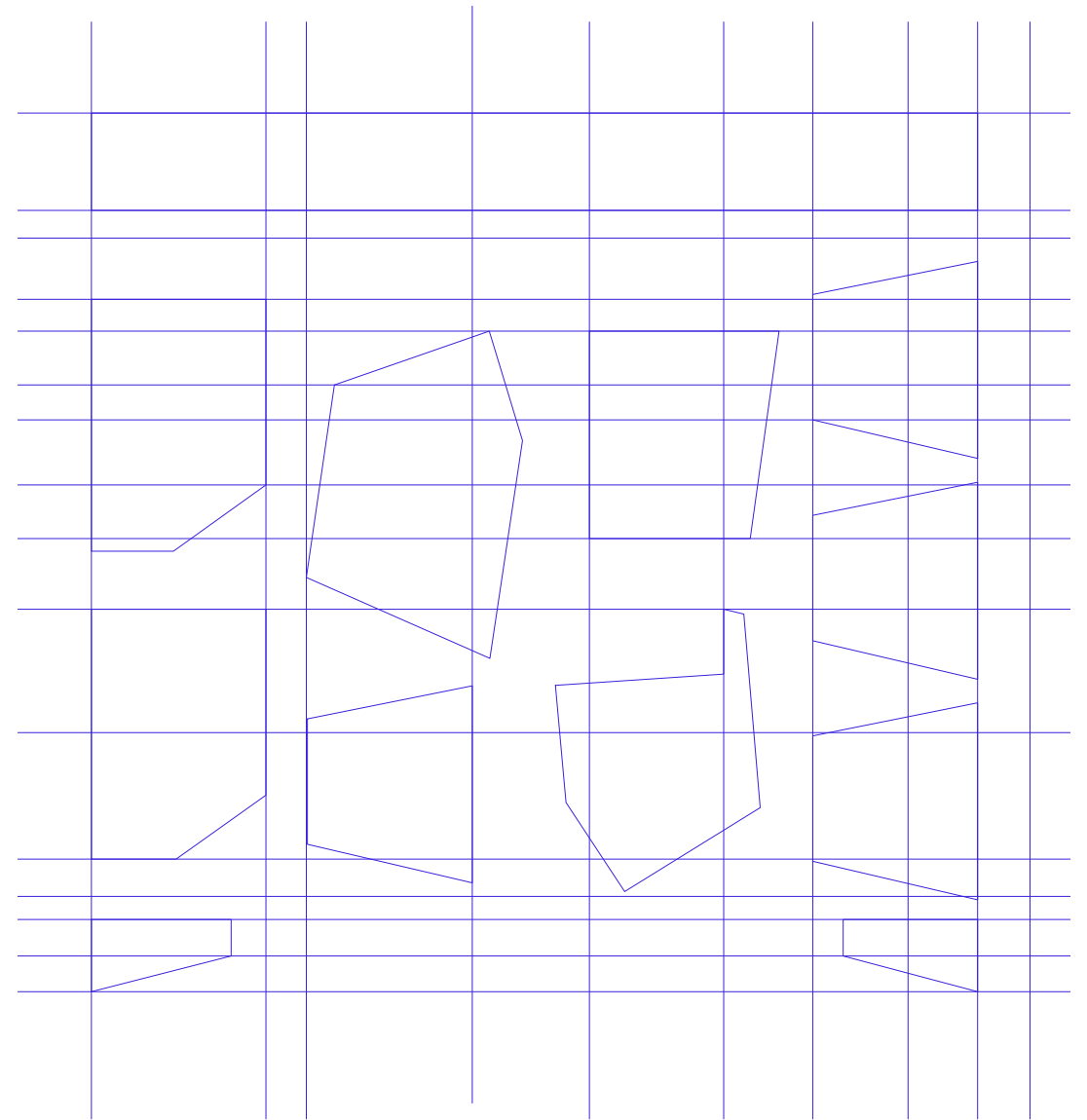


figure 53. UDEP Lecture building. Barclay & Crousse. 00 floor plan. E. 1:1000

figure 54. UDEP Lecture building. Barclay & Crousse. 01 floor plan. E. 1:1000



UDEP lecture building, barclay & crousse, pattern and floor plan



UDEP lecture building, barclay & crousse, pattern and floor plan

Specifically in this study case, separating served and servant spaces becomes an easy task due to it being a one story building. The overlap of spaces becomes also very clear in the isometric develop by the architects, where it is very easy recognizable the interstitial space, even one can see the elevated connection runways.

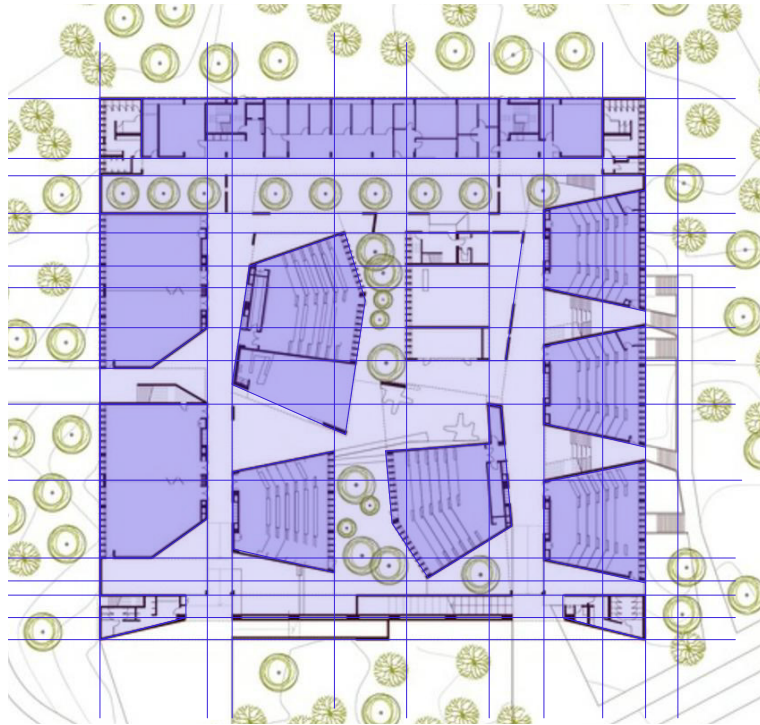


figure 57. UDEP Lecture building, Barclay & Crousse. Served and servant spaces.

- Served Spaces
- Servant Spaces

Notably interstitial spaces are more prominent than the served spaces, also these spaces are mostly exterior, helped by the fact that the building is warm weather throughout the whole year. Serve spaces are overdimensioned on purpose by the architects allowing for unforeseen encounters that would generate knowledge among students and professors.

Also, the regular shape of the building is broken by the irregular shape of these spaces, giving space a different character and controlling views from each space.

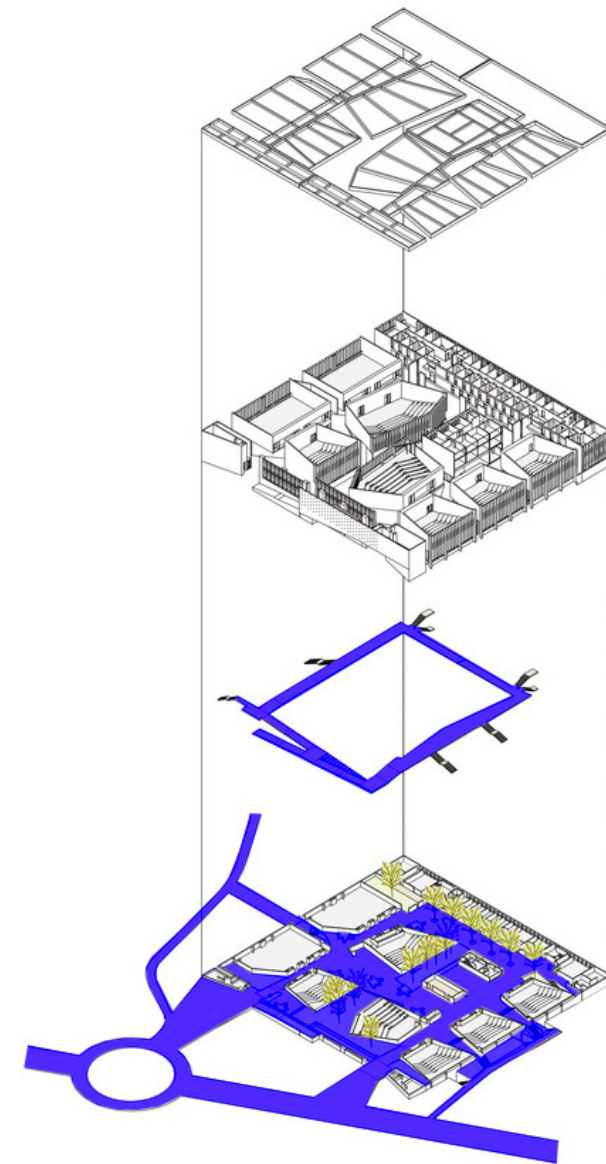


figure 55. UDEP Lecture building. Barclay & Crousse. Pattern. E. 1.600. Modified by the author.

figure 56. UDEP Lecture building. Barclay & Crousse. Pattern. E. 1.600. By the author.

figure 57. UDEP Lecture building. Barclay & Crousse. Served and Servant Spaces. E. 1.1000. Modified by the author.

figure 58. UDEP. Lecture building, Barclay & Crousse. Exploded Isometric.

Nevertheless served spaces are still covering a great chunk of the floor plan, the lecture halls generated are huge and almost work like buildings themselves inside a cocoon of 70x70.

Served spaces adopt a more organic kind of shape, integrated in a very strict, strong, geometrical shape, allowing to create interesting corners inside of the building that can foster reunion and gathering.

Space	Dimension (m ²)	Relation (%)
Served	2200	45
Serve	2700	55
Total	4900	100



Interior and exterior relation in this particular study case has a different degree of complexity. Two distinctive levels of relation can be found inside of the building, the one of the boundaries of the construction, given by the squared shape and the relation between the interior elements and the interstitial spaces.

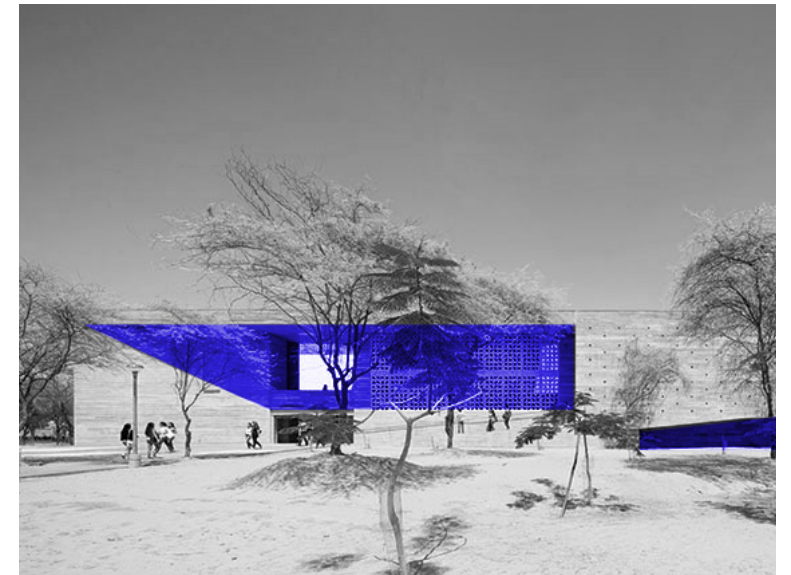


figure 59. UDEP Lecture building, Barclay & Crousse. Interior and exterior relation.

The exterior intermediate spaces of the building extend outside of the seventy meter side square, just like the nature around goes through the building inviting users to go across.

The enveloping creates a covered exterior environment that helps to reduce sun incidence, reducing temperature in the patios as well as providing ventilation spaces. This enclosure materiality helps to copy the pantone of the surrounding environment mimicking its colors and relating to it.

On the inner part of the square, the patios order the circulations between the different elements, relating this intermediate exterior with them. This strategy helps to blur the boundaries between exterior and interior space, creating a comfortable place for people to gather. The building becomes a passing component of the buildings in the area, inviting people to walk through its courtyards

figure 59. UDEP. Lecture building, Barclay & Crousse. Interior and exterior relation. Cristobal Palma/Estudio Palma. Modified by the author.

Several levels of concrete furniture are placed in these exterior spaces fostering even further the reunion aspect of these areas. A transition between the interior and exterior is also visible, from the complete interior to the roofed exterior to finally the opened exterior. This transition aids to ease the progress from one to another.



figure 60. UDEP Lecture building, Barclay & Crousse. Interior and exterior relation.



figure 60. UDEP. Lecture building. Barclay & Crousse. Interior and exterior relation. Cristobal Palma/Estudio Palma. Modified by the author.

Visually the section scheme shows the intention of the architects to generate a void bellow the cover of the building, providing light control as well as a ventilated space. Since the building only develops one story building the section allows the viewer to identify relation between ground and first floor as well as void spaces that appear on the ground floor.

Even though graphically the section is not detailed it still allows for understanding exterior roofed areas among the building elements. It also shows different levels on the ground floor. Some of these exterior roofed areas are created as cantilevers that generate terraces in the first floor. Mainly masses and volumes are to be identified in these kind of graphic content.

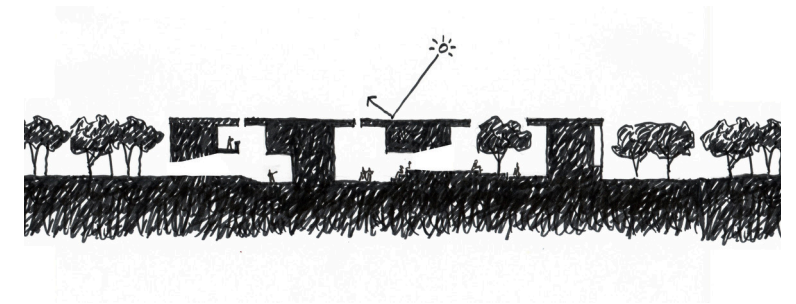


figure 61. UDEP Lecture building, Barclay & Crousse. Section scheme.

The section also shows a very even layout with few gradation on importance of the space, all the space has the same importance in the section. The interest out of the section analysis in this study case is mainly based on the fact that the building itself act as several different units interconnected by exterior patios inside the envelop.

On the other section a more detailed graphic expression allows for the understanding of the cut space. The ramps going up from the ground floor that were glimpsed already can be formed in this section also. The section acts like a whole volume of void inside of the envelope, that almost cross the whole mass of the building.

Once again the homogeneity of space is present in this section, creating a very even space, despite the different floors being sectioned. The facade texture is also glimpsed in the sections, generating interesting patterns of light.

figure 61. UDEP. Lecture building. Barclay & Crousse. Section scheme.

Framed views can be seen towards the campus area creating an alternating feeling of interior and exterior. The openings to the sky as well as the openings in the facade can also be seen. The building tries to integrate itself in its surrounding allowing nature to get inside.



figure 62. UDEP Lecture building, Barclay & Crousse. Section



figure 62. UDEP. Lecture building, Barclay & Crousse. Section.

In order to analyze light is important to take into account the different uses of it the architects did. Firstly, the concrete lattices in the stairs help filter the light in an ambience with strong sun light, in the same way the material helps reflect light and creates interesting and comfortable spaces.

Some times (*figure 62*) light works as the end of perspective, creating a darker atmosphere in the corridors, while the openings between constructed elements are lighted up. Light accompanies the user constantly when walking through, generating a game of shadows and lights inside of it.

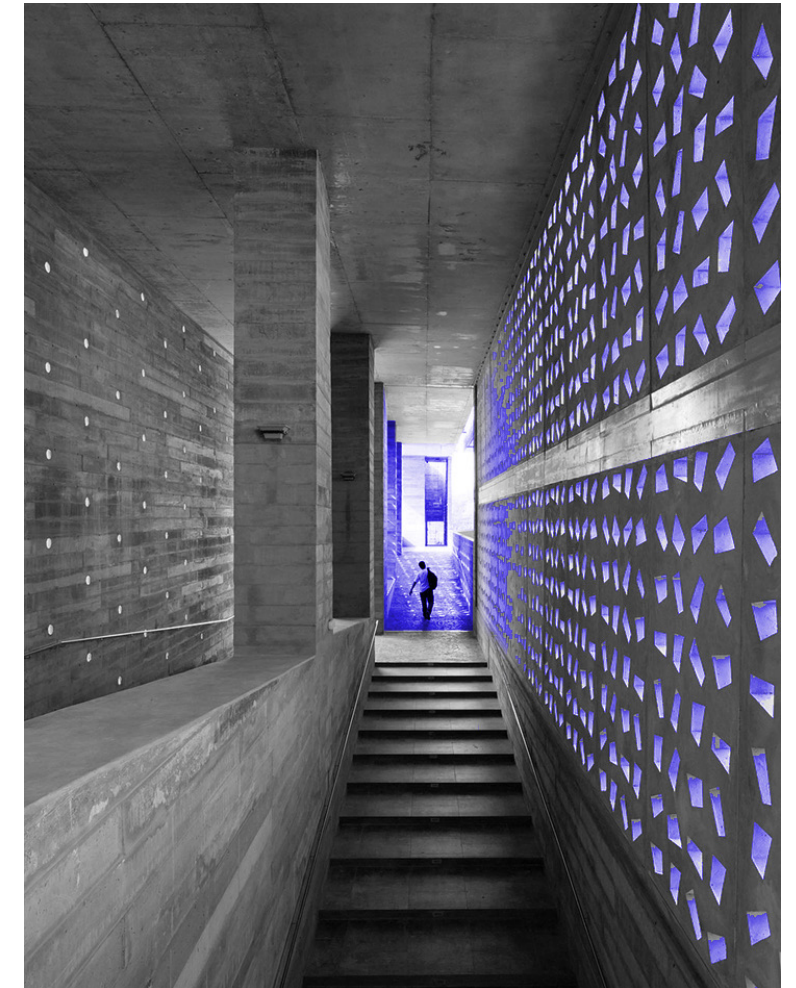


figure 63. UDEP Lecture building, Barclay & Crousse. Light

figure 63. UDEP. Lecture building, Barclay & Crousse. Light. Cristobal Palma/Estudio Palma. Modified by the author.

Once the user arrives to these interstitial spaces, the roofs leave gaps in between them, providing the patios with fair natural light as well as generating interesting contrast between the shadowed covered spaces and the strong light. This helps the viewer to see cantilevers and roofs as lighter elements, visually reducing the weight of the concrete slab.



figure 64. UDEP Lecture building, Barclay & Crousse. Light

The tropical climate, dry and warm, obliges to create this shadowy areas in order to provide exterior comfort zones to gather. Light helps to make them stand up by contrasting big saturated light with low saturation light zones. Transitioning between these zones is also interesting as one moves from dark to light to dark again. Also helps to differentiate warm and cold ambiances in a glance, nevertheless the shape helps the breeze to ventilate and get space colder.

The different facades are treated differently depending on the orientation, working with the lattices or vertical louvers to protect from the more horizontal light. The patios light and opening lines on the roofs and cantilevers work as a sunclock as light moves along the day. Space changes depending on light, depending on the time of the day, in a way space is defined by light.



figure 64. UDEP. Lecture building. Barclay & Crousse. Light. Cristobal Palma/Estudio Palma. Modified by the author.

Static and dynamic spaces have two layers, on the macro area and in a smaller scale. The building as a whole works as a dynamic space itself, where people gather and cross it through instead of going around, because the interstitial spaces foster this kind of action.



figure 65. UDEP Lecture building, Barclay & Crousse. Static and dynamic spaces

Meanwhile, for the users there is different levels of movement and speed. Static spaces are clear, the lecture halls scattered in the surface of the square would be the slowest spaces, as well as the offices in the South-West facade. The gradient of movement descends when moving into the roof exterior areas, the shadow provided by the cantilevers help the users slow down, gather and meet. The saturated areas though, with light and very warm, speed up the movement of the users when the sun is high.

Inside the corridors of the building, dynamic spaces are accompanied by the whole materiality of the building, concrete guides the user through the dynamic spaces inside, being broken by small glances of light.

Materiality helps identify slower spaces to, concrete on floor and ceiling is cut by a different darker materiality aiding the user to rapidly identify changes in dynamism. In the same way in the exterior, concrete helps the user to identify slow and fast spaces, mainly graded by the handling of the user.



figure 65. UDEP. Lecture building, Barclay & Crousse. Static and dynamic spaces. Cristobal Palma/Estudio Palma. Modified by the author.

CHAPTER 5

Skolkovo Institute of Science and Technology

Herzog & de Meuron

Moscow, Russia. 2018

1. Herzog & de Meuron. Text description provided by the architects in their project abstract.

Skolkovo is an initiative promoted by the Russian government in order to create a new community in the 3rd ring of Moscow. The aim in Skolkovo is to create a center for innovation in 21st century, research and production, mixing urban uses and headquarters for schools, institutes and new universities. The Skoltech University is a newly founded institution and its goal is to establish a distinguishable research center for Moscow, its country and the world.¹



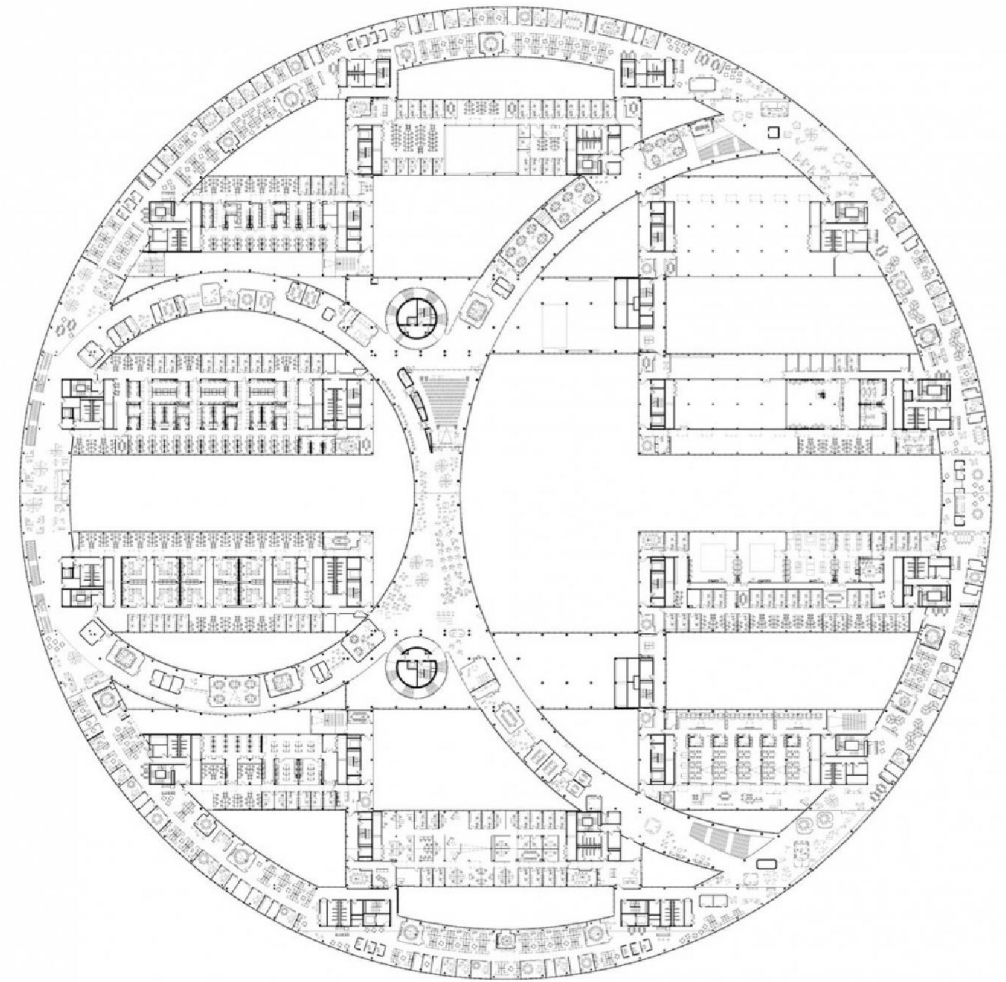
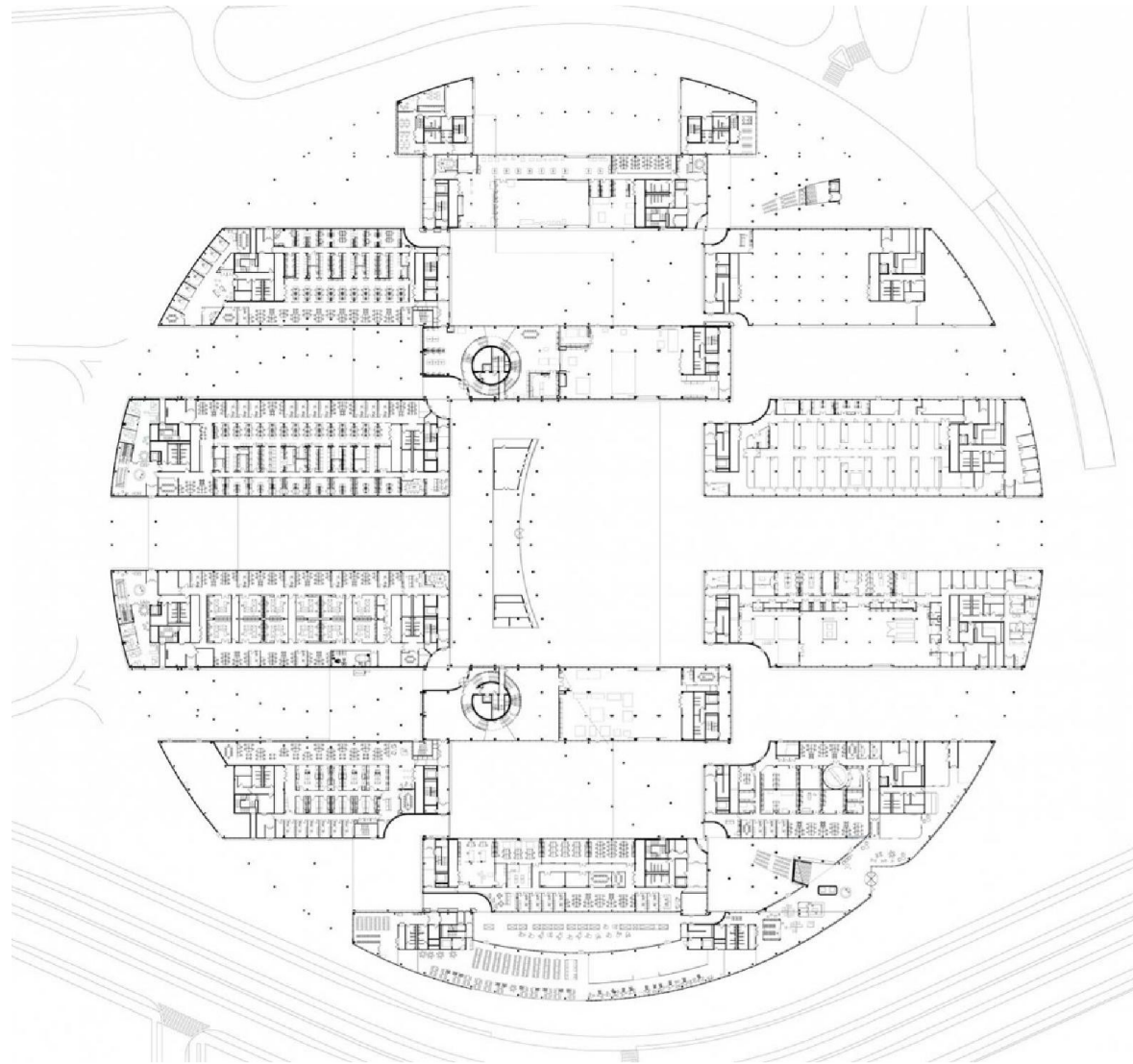
figure 66. Skolkovo institute of science and technology, Herzog & de Meuron.

Skolkovo's master plan goal is to provide an urban environment that mixes activities in an interesting ambiance of: studying, working, shopping, journeying and relaxing. Skolkovo tries to move away from the old USSR-era satellite cities that surrounded Moscow, trying to get integrated in its cultural identity, transport and facilities.

The structure is massive, it tries to represent an urban scheme in which every district is an urban island. Each of the districts has its own shape as well as its own program and use. The architects designed the master plan of district 3 with the university as flagship building. Skoltech is seen as the core of the facility and founding stone of Skolkovo.

The specific building develops a perfect circular shape with different square-like shape integrated within the form. Other circle shapes clip the different buildings and patios in the inner part, generating interesting overlaps and courtyards that shape the interstitial spaces within the building.

figure 66. Skolkovo institute of science and technology, Herzog & de Meuron. Iwan Baan.



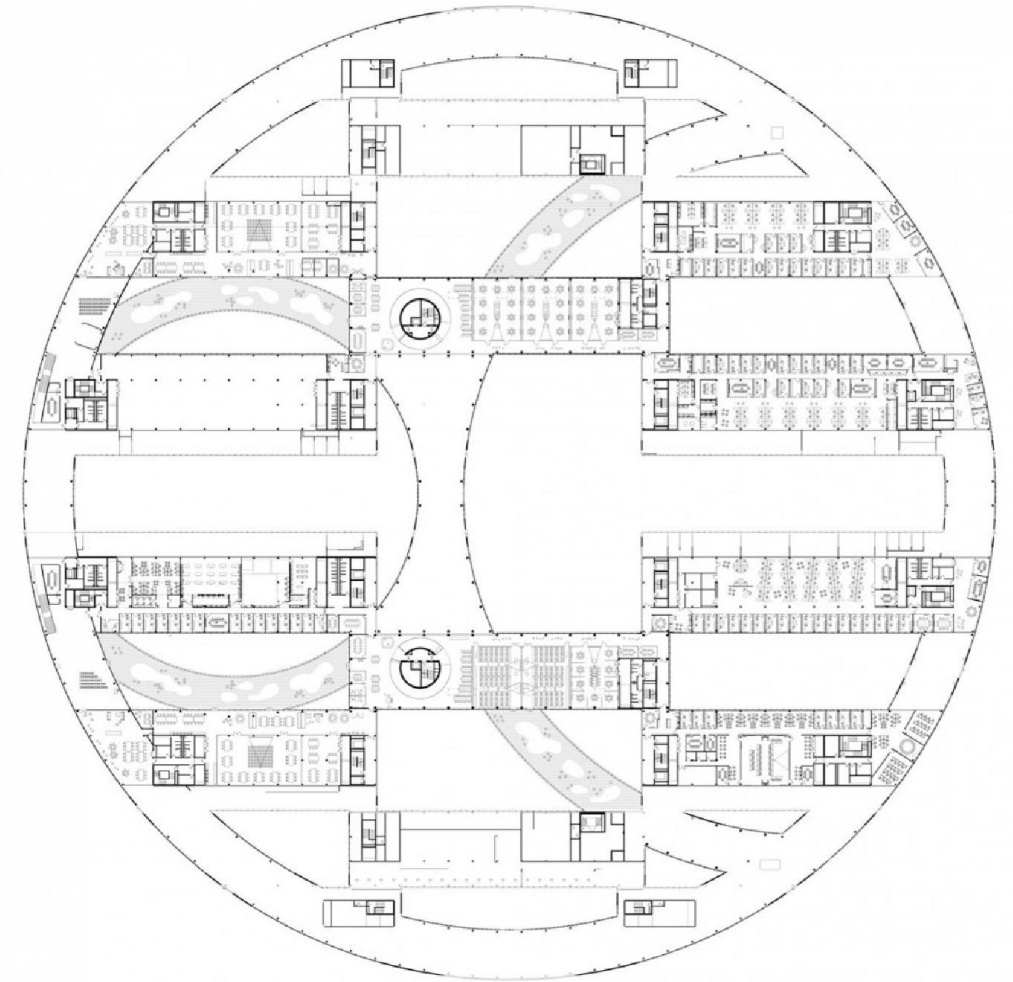
Each squared shape is a different facility of the university and has a different use and size, the main circle shape is divided into bands that alternate patios and built volume. A pattern of interconnected circles on the first floor is used as a network to move between blocks.

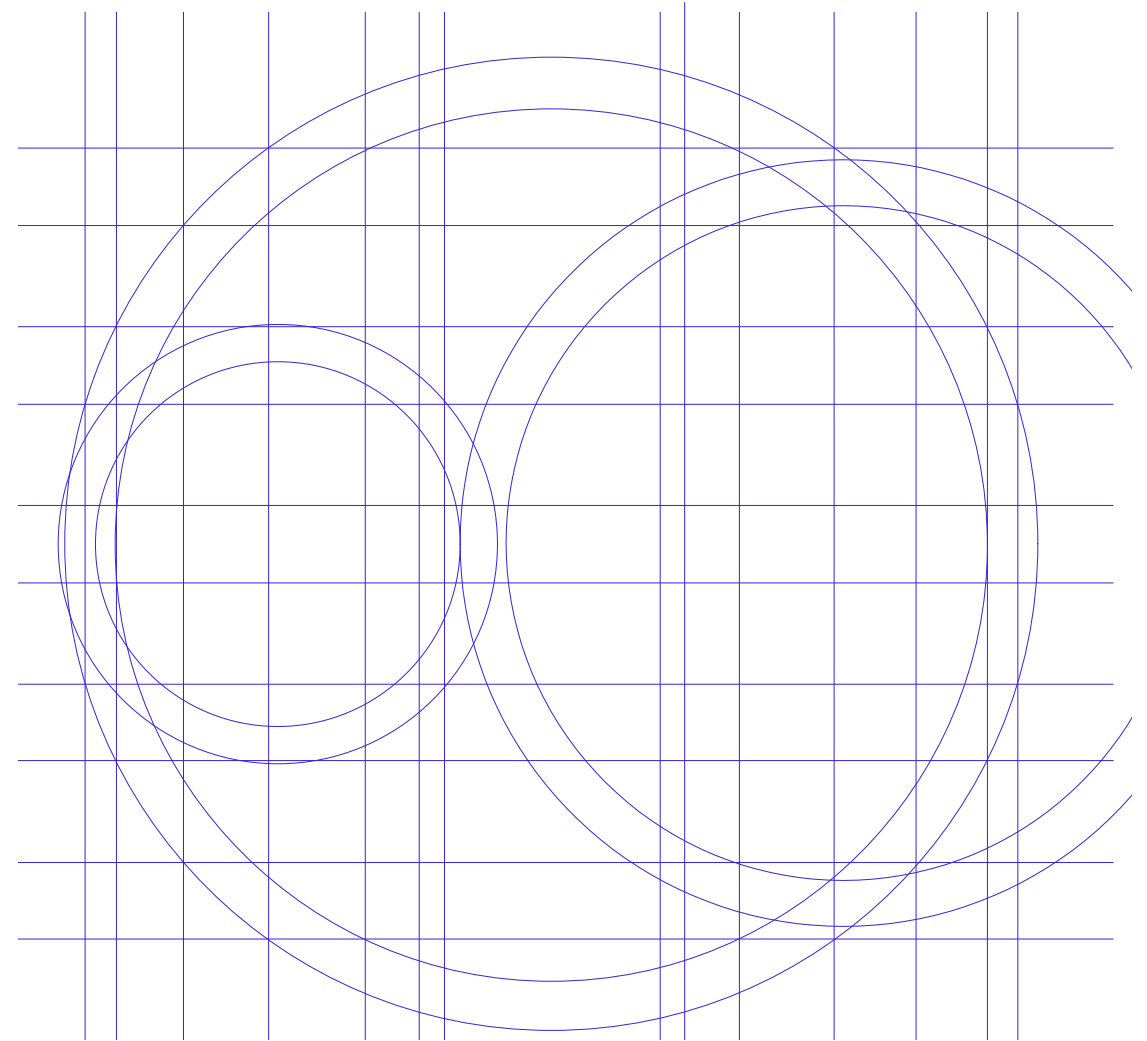
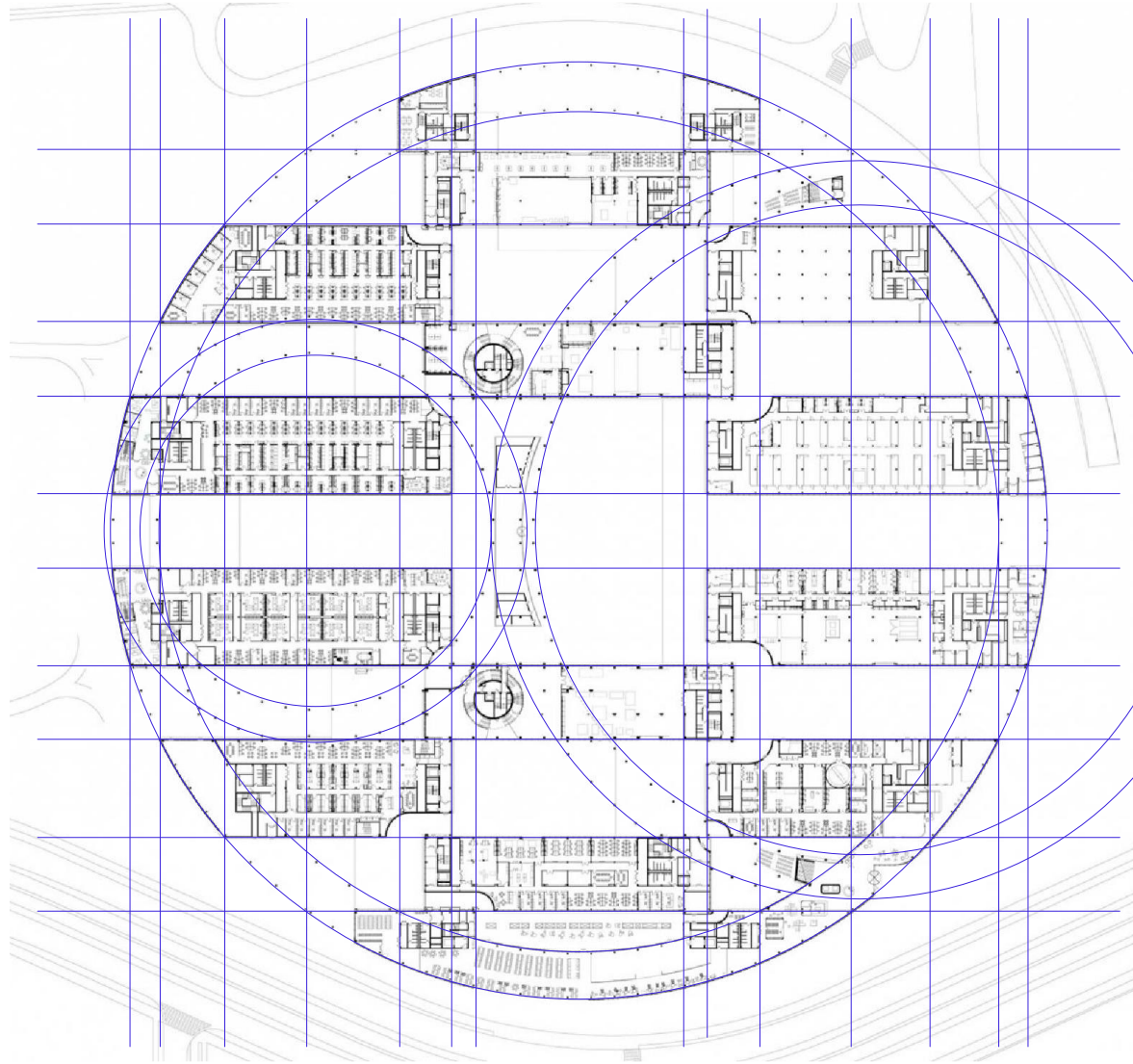


figure 67. Skolkovo institute of science and technology, Herzog & de Meuron
Floor plan 00. E. 1:2000

figure 68. Skolkovo institute of science and technology, Herzog & de Meuron
Floor plan 01. E. 1:2000

figure 69. Skolkovo institute of science and technology, Herzog & de Meuron
Floor plan 02. E. 1:2000





Skolkovo institute is developed in a very particular and simple geometrical way. A main circle shape defines the boundaries of the whole, an approximately fifteen meters wide corridors rounds the building, connecting all the departments. In this line, two more circles overlapping with the boundary generate two secondary circulations that interlock the rest of the departments. They also allow for crossing the building through instead of around due to the huge scale of it.

The functional program is developed in squared-like buildings that fit inside the main shape. Horizontal bands are created with them that alternate void and mass in order to generate patios and courtyards. Two main perpendicular directions are used for the regular squared pattern: North-South and West-East direction.

The bigger shapes are located closer to the center of the circle while the farther ones are narrower. The spaces provided in each of them vary depending on the needs of the department itself but the size of each one of the departments allow for easy compartmentalization of space. This provides space with easy customization and freedom.

A smaller scale grid can also be seen inside of the departments, that orders both connection and functional spaces. Separating corridors with smaller width with classes and lecture halls as well as offices. The same width pattern is applied in the circular corridor, in which both facades are used for learning spaces.

On the ground floor the space is projected as a continuum in which all the patios and courtyards are interconnected and users can go through the whole building. The voids in the ground floor are carved as a complex system of interlocked patios. Even though the patios are at a scale that they can be considered as exterior space itself contained inside of the building. It is also important to note that the ground floor lacks most of the interconnection spaces due to the main moving happening on the first floor.

The structural grid is tightly linked to the pattern grid, both overlap in the coincident spots inside of the building, mixing both the structure of the circular elements and the squared ones.

figure 70. Skolkovo institute of science and technology, Herzog & de Meuron
Pattern with floorplan. E. 1:2000

figure 71. Skolkovo institute of science and technology, Herzog & de Meuron.
Pattern. E. 1:2000

The use of two different patterns of forms for two different uses is very interesting since it allows the architect to separate these uses by shape. Overlapping the figures also generate appealing spaces when the forms trim each other as well as creating limitless flowing space like in the outer ring.

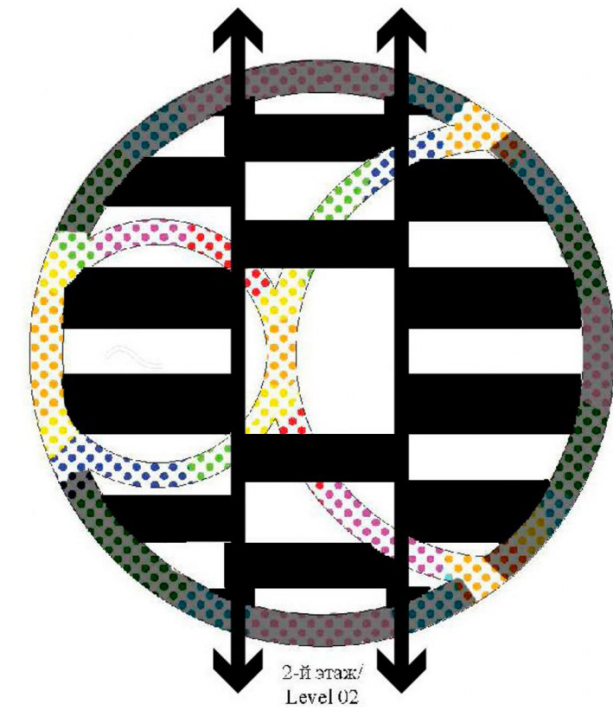


figure 72. Skolkovo institute of science and technology, Herzog & de Meuron.

figure 72. Skolkovo institute of science and technology, Herzog & de Meuron
Connection drawing.

The analysis of served and servant spaces becomes intricate, spaces tie and untie together as they please, making it difficult to set the boundaries that differentiate both of them. Easily served spaces are found inside the servant ones, scattered around the outer ring as well as throughout the inner parts of the complex.

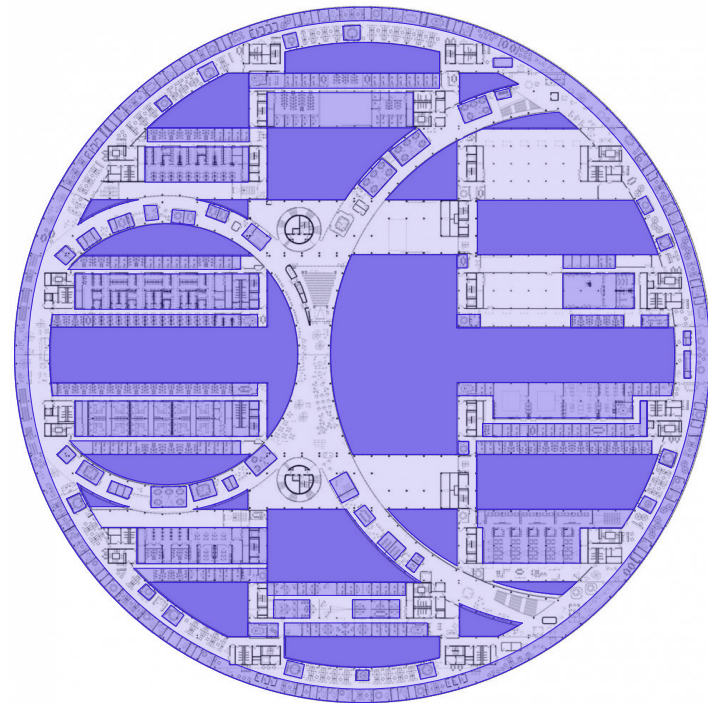


figure 73. Skolkovo institute of science and technology, Herzog & de Meuron. Served and servant

- Served Spaces
- Servant Spaces
- Void

As it can be seen graphically spaces are distributed evenly, void masses take a great chunk of the volume of the floor plan, providing middle spaces with much needed illumination as well as allowing space to breathe. Also voids are allocated one after another, giving the impression to the user of multiple spaces aligned.

figure 73. Skolkovo institute of science and technology, Herzog & de Meuron Served and servant spaces. E. 1:3000

The building provides with several multipurpose intermediate spaces that are set as servant space, but they could be used in several ways. The same happens with the outer ring, it is analyzed as served space, because its major purpose is this one but the boundary between both spaces is blurred.

Nevertheless some of the square-like buildings use is clear and major. Mainly on the west part of the complex classes, offices and study rooms gather together while connection spaces are minor and in between.

Finally, serve space is carved and chiseled several times by many vertical communication cores that can easily be identified in the floor plan by its repetitive pattern. Each individual block has its own while there are some that are common to the served and servant spaces.

Space	Dimension (m ²)	Relation (%)
Served	20668	40
Servant	15007	29
Void	16246	31
Total	51921	100



Skolkovo institute relation with the exterior could be separated into two aspects. The first aspect is how the building as a whole relates to the surrounding, in other words, how the outer skin of the building connects with its location environment. On the other hand and due to the scale of the building, its relation to the inner patios generated which have considerable size.

Two different facade strategies are used in both different inside-outside relations. The outside conditions are given, while the inside conditions are projected and design in order to provide comfort and appeal.

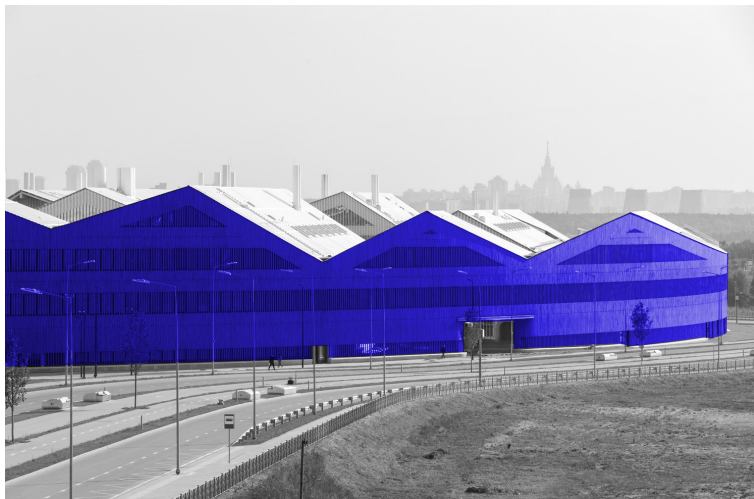


figure 74. Skolkovo institute of science and technology, Herzog & de Meuron.

Firstly, its relation to the exterior environment is visually closing the facade with a vertical wood lattice. The building is located in an area between a built surrounding, on the other side, it is delimited by a road as well as some unbuilt lands. The strategy to enclose the facade visually seems natural to this environment and also allows for a very well marked entrances to the building, carved in the wood of the envelope.

Its visual relation with the surroundings is also present through shape, the square-like buildings emulate factory roofs which help the building insert in its nearby. From the exterior this shapes with wood covering seem closed to give privacy to the building all around, while from the inside the vertical elements allow for views on the outside as well as light coming in.

figure 74. Skolkovo institute of science and technology, Herzog & de Meuron
Interior and exterior relation spaces.
Iwan Baan.

On the inside of the courtyards the strategy changes but follows a likely line. Vertical lattices are still present but materiality and size change into a more human scale, allowing the building to be close to the user. This vision is more private and provides the inside of the building with several green elements throughout the whole complex.

The building does not have any balconies or cantilevers, nevertheless, there are some covered areas among the circle shapes on the first floor, which become covered passageways on the ground all surrounded by green element. These would be the only intermediate elements among inside-outside relation. Mostly due to weather in Moscow, the architects strategy is to keep a strong and clear difference between inside and outside spaces.



figure 75. Skolkovo institute of science and technology, Herzog & de Meuron.

figure 75. Skolkovo institute of science and technology, Herzog & de Meuron
Interior and exterior relation spaces.
Iwan Baan.

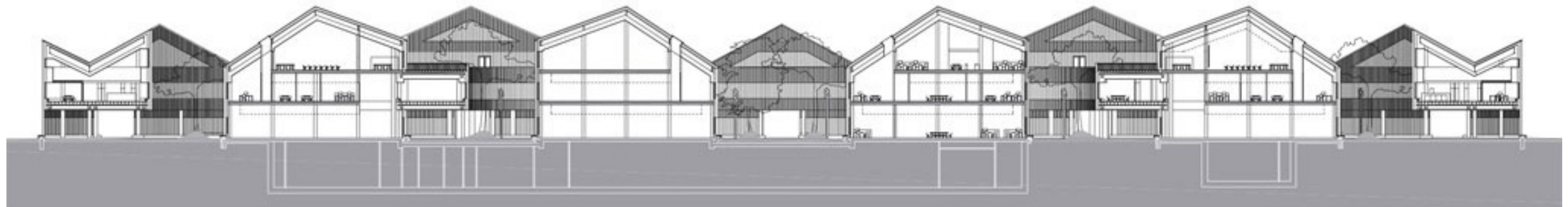
Section wise the building behaves in a very simplistic way. Voids and masses alternate through the whole circle, allowing for green patios to interlock with the actual volumes. This gives the impression of a very homogeneous space in section, mostly graded by the inclination provided by the gable roof.

Floors height also vary from the ground to the two upper ones, while the volume of each space remains constant. Over the average ceiling heights provide the space with unceasing flow and comfort. These floors are connected considerable times using double heights and crossed views between the floors themselves. The specific heights for the different floors are directly linked to the use, as technology institute several engines or big technological elements need to be contained in the halls.

The ground floor appears as a continuous empty line that crosses the whole facility. The flat open ground floor helps people move freely and gather below the passageways. As well as provide breathing spaces in the mass of buildings.

On a smaller closer scale facilities can be inserted in the ceilings of both floors increasing its depth by a substantial amount. Also the structure of a barn gains great complexity due to the standards needed due to the weather. The steel that covers the ceiling needs to gain width again to sustain extreme temperatures.

figure 76. Skolkovo institute of science and technology, Herzog & de Meuron Section.



Light usage in Skolkovo is tightly linked to the facade strategy, where the vertical wooden slats cover like a sheet the whole building. These slats are oriented in a way to let light come through and provide privacy as well as provide visuals from the inside of the building. The actual strategy in order to fill the building with as much light as possible is coming from the ceiling. The factory-like shape of the inner blocks allow for the light to come through the gable roof, increasing solar collection.



figure 77. Skolkovo institute of science and technology, Herzog & de Meuron.

Scale of spaces allow for light to scatter around. Small spaces tend to look darker while big spaces tend to feel more filled with light. The fact that floors are interconnected with double heights every now and then plus the fact that the materiality and amounts of glass used in the interior increase the light of space.

Clearly natural light is a very valuable resource when undertaking any educative architecture, but some places cannot afford this resource. It is valuable then to squeeze the resources at ones hand in order to achieve what is needed.

Courtyards noticeably help light income. Perforating the whole circle surface allows to increase drastically facade surface and thus light. The main program use blocks of the building are oriented North-South increasing both scattered light in the North facade and direct light in the southern one.

figure 77. Skolkovo institute of science and technology, Herzog & de Meuron
Exterior light. Iwan Baan.

Light is a scarce resource throughout the year in Moscow, inside of buildings not only have to fight extreme cold but also lack of light in the winter. Thus, buildings have an important amount of artificial lightning to be supplied. Not only that, but in Skolkovo interior materiality works with light wood, white textures and reflective white. With this materiality selection light is multiplied and amplified generating a warm and bright ambiance.

The high ceilings in all the floors help fill the space with light as well as reflections to be made, giving the user the impression of bigger spaces that breathe.

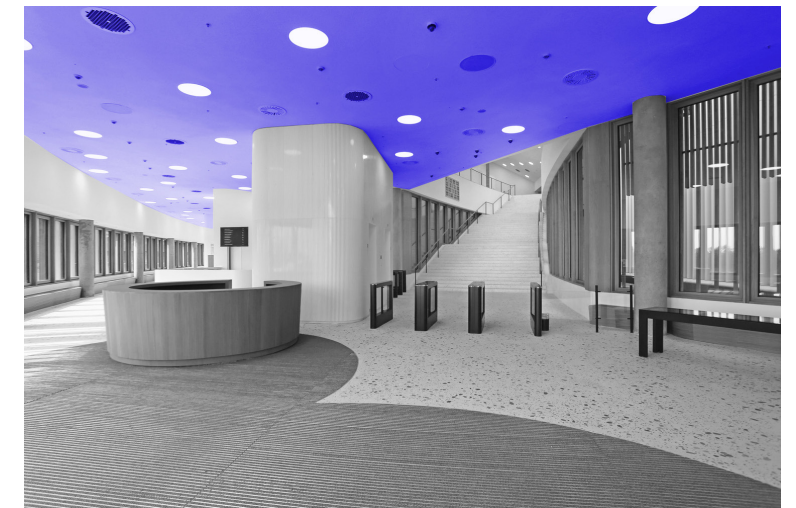


figure 78. Skolkovo institute of science and technology, Herzog & de Meuron.

figure 78. Skolkovo institute of science and technology, Herzog & de Meuron
Interior light. Iwan Baan.

Dynamic spaces are clearly differentiate and designed inside of Skolkovo Institute. Actually both different shapes conforming the whole complex can be differentiate in overall aspects as dynamic and static. While the circle and rounder shapes evoke movement and dynamism, more square-like shapes stand for stillness and calm. This can be clearly analyze in the pictures where the facade or the inner walls bend, the seer overviews this movement. Space invites to move, it invites the user to travel.

Not only the shape of the simple shape, but the shapes generated by the overlapping are also suggestive, generating almost organic shapes on the ceilings of dynamic spaces and following them with light patterns to strengthen the dynamism feeling.

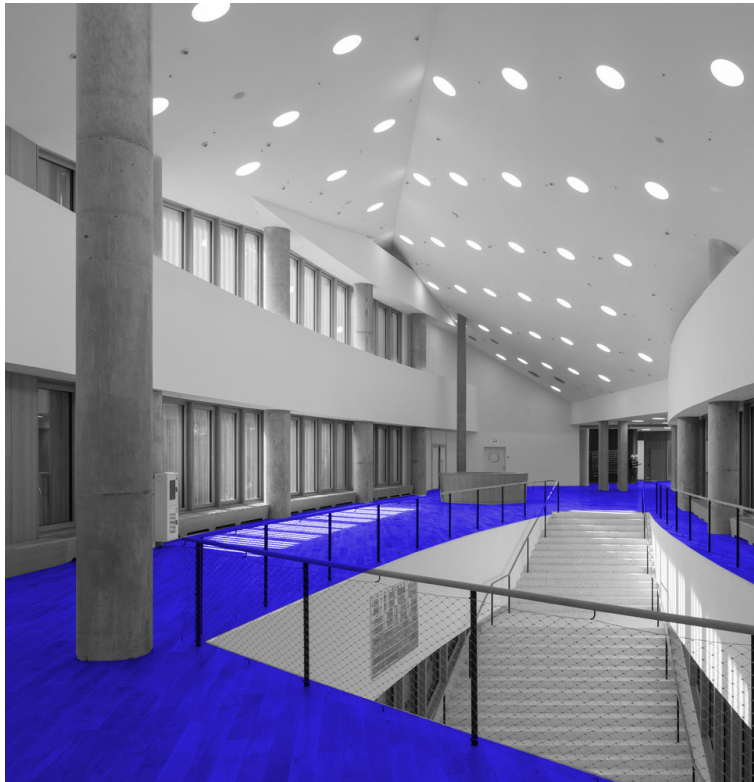


Figure 79. Skolkovo institute of science and technology, Herzog & de Meuron.

Nevertheless the architects design still provide dynamic spaces with stillness possibilities. Creating a bench all along the circular shape, allowing for the pace to be reduced, in a kind of highway designed space.

The outside of the building does not behave very different-ly from the inside, suggestive round shapes and covered ground floors allow users to identify pathings. Nonetheless patios and courtyards allow for senseless and chaotic movements in between blocks, the grass dictates this directions, following no form or pattern.

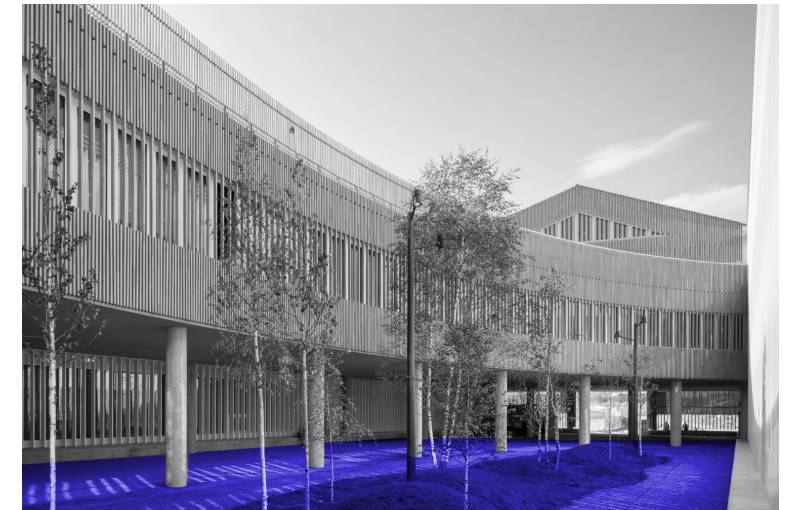


Figure 80. Skolkovo institute of science and technology, Herzog & de Meuron.

figure 80. Skolkovo institute of science and technology, Herzog & de Meuron Static and dynamic spaces. Iwan Baan.



CONCLUSION

In order to flatten the volume of text contained in the present paper and in order to be able to cross information between them it is remarkable to synthesize each of the study cases and how they can interlock with each other.

Louis Kahn Institute of Management is developed fifty years before the rest of the study cases. This would lead to a different and more conservative use of servant spaces while already showing some virtues in space, light and mainly pattern usage. Patterns and structuralism are even projected into the facades and sections which would not be the case on the following study cases. There is though an interest and worry about the movement of spaces and reducing pace of the users between high and low density areas.

Moving onto Oxford Institute, the mindset of the viewer needs to be changed completely. The focus is aiming then at a high end university building, where resources are not precisely scarce. The use of light, space, relations and movement is flashy and luxurious in an educational way. Nevertheless, there is a clear interest of the architect of taking care of giving space quality and comfort, providing interstitial spaces with wide open views of the British campus. Served spaces are not far behind, researchers have proper comfortable size offices that also open to the campus.

Grafton designed with extreme care an elaborate intricate of structural elements, which also gives this perception of flashy, but in a different way. Patterns, elevations and the complexity of developing a campus in height is noticeable. Care for keeping the user away of the limitations of high university is also present, in general responsibility for the user. Nonetheless the building is still designed as a bulwark, closing its interior and elevating it to separate it from the surroundings.

UDEP can be analyzed in likely terms, a closed perimeter in which space is develop, once again designers take care of interstitial spaces giving them quality for their users to gather and meet there. Same result different approach, a low height building which encloses the uses. It glances the idea of permeability, even though it is creating inner private space.

Skolkovo is not far from the rest of the study cases, size-wise it is, but once again a closed perimeter with controlled access is found. An extreme care for inner interstitial spaces, while the outside is locked to the viewer. Huge amounts of servant spaces that help users gather in between the islands of served spaces. Flashiness is again the topic here, against the inhospitable public space.

After a short critical briefing on each of the study case, a more discursive access would be taken further on, crossing now different elements of the buildings as well as introducing critical high education approaches.

University institutions have become fortresses in which access has been narrowed and diminished throughout the years. University has become somehow elitist while trying to convince that it is permeable and inclusive, when its physical space is proposing idyllic informal approaches, it is really creating private gardens. Taking UDEP as an example, the envelope strongly limits the boundaries of the building, in a country in which public space could be insecure or not even designed. Several patios, that are designed with a lot of care contrast with the real outside space, in which the users feel extreme comfort and quality of space. The same strategy is used in Skolkovo and UTEC, surroundings mark hard the contrast in between inside and outside of the spaces. Funnily enough the contrast is lacking in Oxford, the ambiance created by the surrounding is already elitist, making the building design the perfect fit. Skolkovo follows the same pattern as UDEP with its closed perimeter but in a completely different climate and culture while Amehabad's IMM is modest in materiality, space and contrast. This contrast between interior designed spaces and exterior develop an intermediate scale so users and visitors understand the space they are in.

Scales become extremely important then in these typology of buildings, they tend to be massive and out-scaled from the users, a mid-way scale is needed to be introduced to ease the user response. These scales can be defined as macro-scale and micro-scale, the first one reflects how the building reacts to its environment as a whole, how the building is defined by big scale patterns. The rear one defines the human scale, the inter-relation between the user and the building itself. These two aspects of the building relate directly with the private space mentioned above, in which the private designed inner spaces become the mid-way scale to shorten the distance between the user and the huge building scale. These intermediate spaces are present throughout all the study cases, trying to fill the gap between the user and the use of the building. They become extremely important because is in them where the informal learning can become stronger. They develop into islands of knowledge which might have been forgotten in educational architecture for years, it is important to remember that these study cases are designed no more than ten years ago, with the exception of Kahn's exquisite architecture already in the '70's.

This means the majority of university buildings that are used nowadays might not be designed in such ways. The point of study stands up now, formal and mainly informal spaces, this unused and vastly unknown resource. It is clear though that it is a complex resource and measure its impact and usefulness has been hard for researchers through the years¹.

These informal spaces come in many shapes, but they are mainly represented as interstitial or servant spaces. These spaces are normally residual or secondary inside of any building design, these leads to a conclusion, the quality and more importantly, the scale of these spaces is directly linked to the resources one possesses. If the relation space in Oxford is taken as an example, one can see the amount of resources used in the atrium, not monetary resources, but spatial. Not only constructed mass and volume generate architectural space, but also void. The role of nothingness in architecture is unprecedented, space is composed of hole and cavity. Void provides architecture with its own identity. Void in the way Grafton designs its South facade facing Lima, with interlocking structural elements, but essentially it is empty, and the quality of the space is there, in its emptiness. It is then in this void where relations happen: in the patios of UDEP, in a modest way in the Louis Kahn plaza or in the out-scaled corridors in Moscow. ¿Does this mean that these spaces are properly or more accurately addressed when there is spare resources?. It would seem so, it is clear that the population of the study has a very European almost elitist point of view, but when comparing this point of view to Kahn's project, it would seem that there is a modest way to do it.

On the opposite hand, formal spaces are linear and unchanged from Peru to Russia, there might be still some incipient strategies to diversify space in order to vary formal historic learning, but essentially it is still all the same. Offices are still offices while classes tend to still be unidirectional and focused, from the '70's straight to 2018. ¿Would this mean that, educational strategies and theories are evolving while learning spaces are not going along with? It might, there's been development on new strategies and conducts in order to foster education and student-teacher interaction², as well as plenty literature, and some advance might have been done in informal learning, but still.

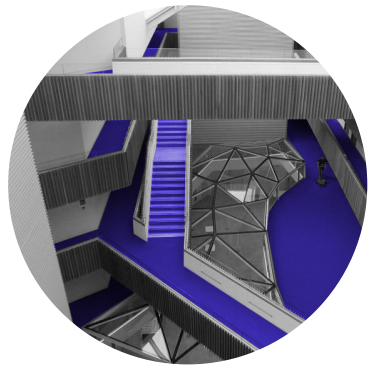
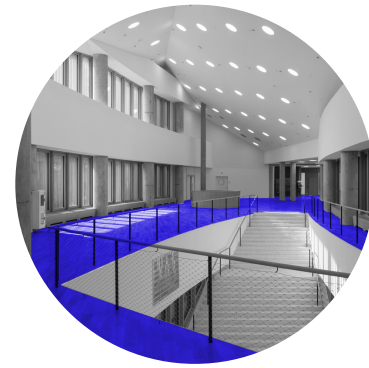
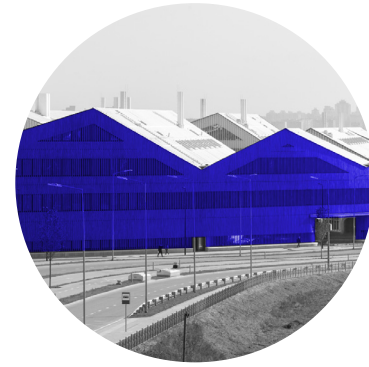
1. Harrison, Huton. Design for the educational landscape space, place and the future of learning. 2014

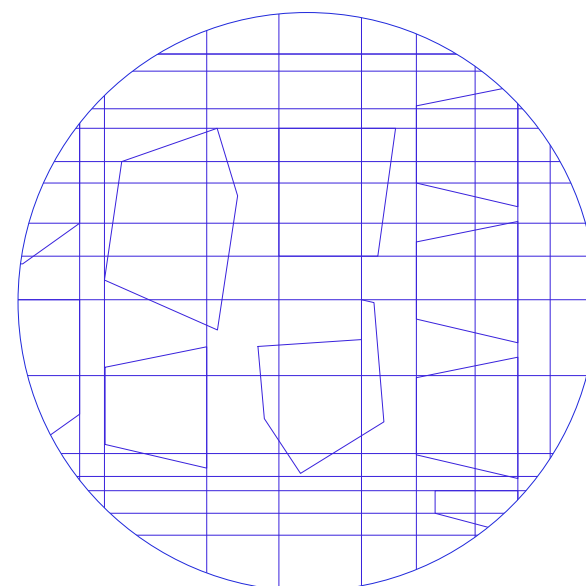
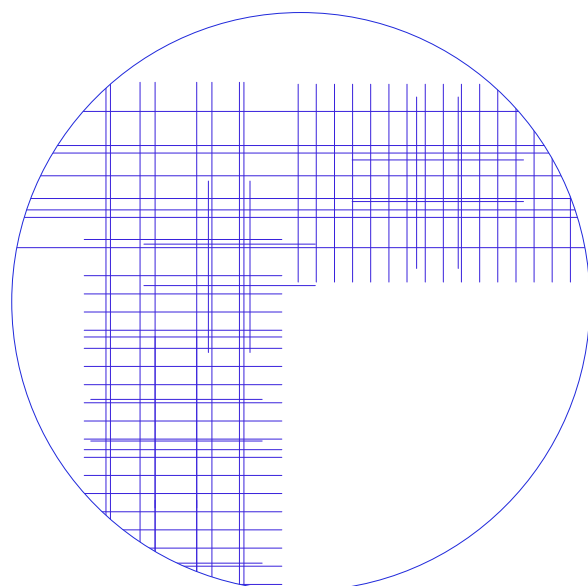
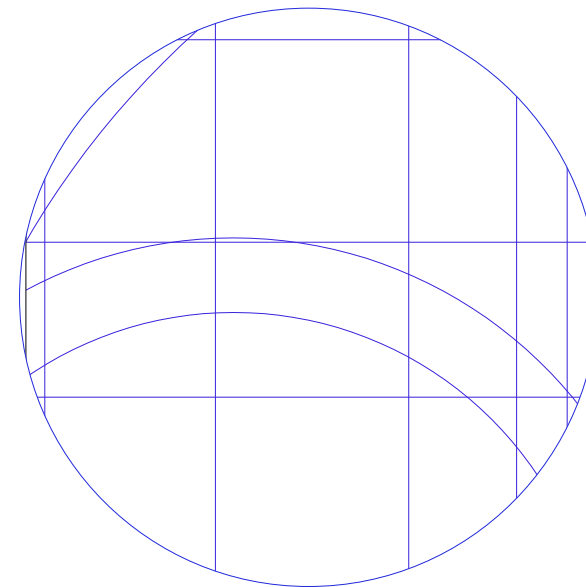
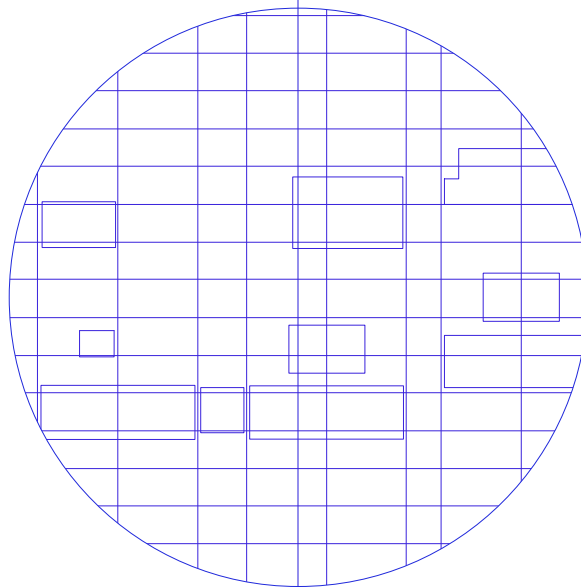
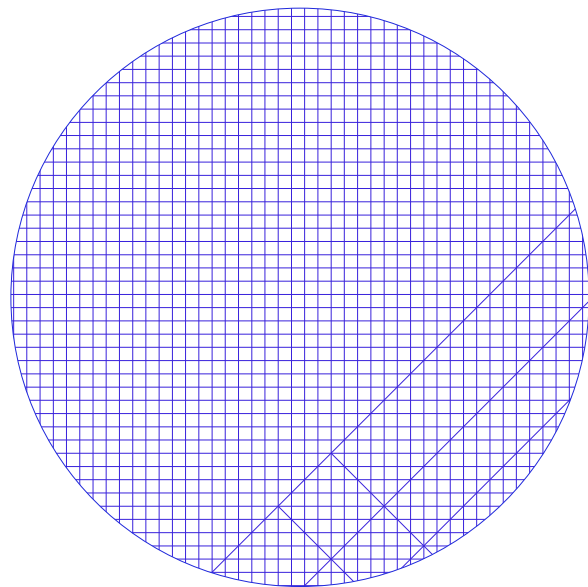
2. Harrison, Huton. Design for the educational landscape space, place and the future of learning. 2014

Grounded approaches in architecture such as interior-exterior relation and light have not differed excessively. Accompanying formal as well as informal space, light has been one of the most important assets. Light as a space filler gains even more meaning in architectural education. Tightly linked, to educational space, more so to informal ones is relation with the exterior or the other way around. Informal spaces tend to be as exterior as interior metamorphosing from one to the other, and blurring boundaries between spaces. These are almost invariable concepts that help to even the study cases. Almost like a leveler, these points of view do not change much and their strategies are well known and worked out.

It is the role of architects as designers and professors and students as users to not only provide but to demand higher quality learning space in higher education. Being one of the pillars of society it is something that cannot be left behind. The aim is to have a critic and grounded point of view to try and change the institutions that help learning and knowledge grow. To analyze which are the needed changes as well as the strategies to be followed. There is not though, a universal answer a methodology to be followed, there is though plenty space for improvement to be done in formal and informal learning spaces in higher education.









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figure 2. Bloom's Taxonomy. Adapted by the author from: Inspired by Bloom's revised taxonomy

figure 3. Louis Kahn's Indian Institute of Management in Ahmedabad in ArchEyes, September 17, 2019.

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figure 11. Louis Kahn's Indian Institute of Management in Ahmedabad, Jin-Ho Park & Ganzorig Baldanchojil (2014) The Superimposition of Circles Cut into Louis I. Kahn's Building Façades, Journal of Asian Architecture and Building Engineering. Modified by the author

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figure 15. Louis Kahn's Indian Institute of Management in Ahmedabad, Transversal section. Jin-Ho Park & Ganzorig Baldanchojil (2014) The Superimposition of Circles Cut into Louis I. Kahn's Building Façades, Journal of Asian Architecture and Building Engineering. Modified by the author

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