Academic Libraries: Analysis of Organization, Flexibility and Adaptability of Their Spaces

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ABSTARCT

The increasing changes of teaching and learning methodologies in the academic context and the impact of new information and communication technologies (ICT) are confronting academic libraries with the modernization need at the level of spatial organization and functionality.

According to these issues, the present investigation strives to identify to which extent academic libraries' functional programming and spatial configuration find their concretion in order to satisfy the needs and expectations of their main audience. The study is focused on the reality of academic library (AL) in Portugal and for that purpose were selected as case studies 9 AL recently built or being the subject of an ongoing modernization process. The approach explored the academic libraries' programming requirements as well as its main audience features; there were also evaluated the conditions of use and identified architectural conflicts.

The adopted analysis methodologies made both use of Post-Occupancy Evaluation procedures in order to study the use of space and of Space Syntax procedures to explore the spatial morphology and configuration and their influence in the performance and use of space.

It was concluded that the researched academic libraries represent centers of learning par excellence and stand out—image wise—in their respective locations. However it is necessary to invest in the improvement of their conditions of use in order to allow a greater capacity of use, reconcile different activities at the same time, render the conditions of access and consulting information and query them to spatial configurational features.

KEYWORDS: Academic libraries, main audience, spatial configuration, functional programming, Post-Occupancy Evaluation, Space Syntax.

1. INTRODUCTION

Academic libraries (AL) are the main object of study of this dissertation as learning spaces that support the dissemination and preservation of scientific knowledge over time. The thematic option intended to continue Valada's (2011) research work, realized within the framework of her architecture master's thesis entitled "*Academic Libraries – Conquering the New Users*" (Valada, 2011).

The academic library is seen both as a space of study and knowledge sharing, storage of specialized material or as a social meeting place for its users. This entity that supports the academic course of university students has experienced recreating processes of its functional concept that were not always sustained by the physical component

of its space. Considering these issues, the research aims to analyze the academic library's' spatial and functional performance facing the new requirements of its users in the Portuguese academic context.

The organization, flexibility and adaptability strategies of academic library's spatial configuration to current uses have been the subject of many investigations around the world. The confrontation between different realities in the academic context often emerges strategies of spatial organization and functionality facing multiple factors such as technological development, transformation of the teaching methodology, trends handling information and appropriation of space. The impact of the implementation of these strategies is an important fact in the development of space use and diagnostic principles to be adopted by the contemporary academic library.

In the choice of the study cases there were considered the architectural strategies and the conditions of use provided by the academic libraries while storage places of a rich scientific bibliographic collection. The purpose of the selection was to get a representative sample of different architectural approaches in the Portuguese territory being chosen nine libraries: *i*) Academic Library of Faculdade de Letras of Universidade de Lisboa (FLUL), *ii*) Academic Library of Faculdade de Ciências e Tecnologias of Universidade Nova de Lisboa (FCT), *iii*) Academic Library of Faculdade de Engenharia of Universidade do Porto (FEUP), *iv*) Academic Library of Instituto Superior de Economia e Gestão of Universidade Técnica de Lisboa (ISEG), v) Academic Library of Universidade do Minho (UMINHO), vi) Academic Library of Instituto Superior de Ciências do Trabalho e da Empresa de Lisboa (ISCTE), *vii*) Academic Libraries of Instituto Superior Técnico (IST); *viii*) Academic Library of Instituto Superior de Ciências Sociais e Politicas da Universidade Técnica de Lisboa (ISCSP), *ix*) Academic Library of Faculdade de Arquitectura of Universidade do Porto (FAUP). To see a short descripton of the case studies consult Figure 18.

2. OBJECTIVES AND JUSTIFICATION OF THE THEME

The investigation was structured in order to identify how the Portuguese academic library responds to their user's requirements focusing 4 key issues:

1) What is the academic library for the academic community?

2) What are the influences of shape-space in the academic library functional program and living experience?

3) What are principles of organization, flexibility and adaptability of the academic library's spaces in order to respond to future requirements?

4) Who are the academic library's users in Portugal?

A comprehensive analytical perspective, aimed to understand the academic library's functional and spatial context, identify strategies of organization, flexibility and adaptability of its current and future spatial requirements, study its users characteristics and formulate a general overview of space use able to be implemented in subsequent investigations and in the planning projects for (re)creation and (re)shaping of a library (Figure 1).

3. METHODOLOGICAL PROCEDURE

The analysis is based on a function space approach, making two complementary overviews: the Post Occupancy Evaluation and Space Syntax (the Theory of the Social Logic of Space). The analysis deals with the space from the point of view of its size and distribution (occupation, dimensions), configuration (relationships between your spaces) and perception of users (students, librarians) in the present generational context.

By adopting the corresponding procedures, the investigation pretends to identify and study the spatial attributes with direct measurement in the use of space, according to functional, bioclimatic and aesthetical aspects (Holanda, 2005). Among the evaluation of the conditions

of use (spatial performance), the investigation aims to evaluate the user's perceptions of academic libraries.

Therefore, in this thesis, here were contemplated analysis parameters related to *i*) observation *in-loco*, use of space and dimensional measurement; *ii*) configuracional space analysis of the building according to the Social Logic of Space Theory; *iii*) user's perception of academic libraries space. These analytical procedures were implemented together because they focus on complementary aspects in the understanding of space and contribute to a wide range of reality approaches and a diverse spectrum of diagnostics due to the variety of "symptoms"[1] that allow to identify.
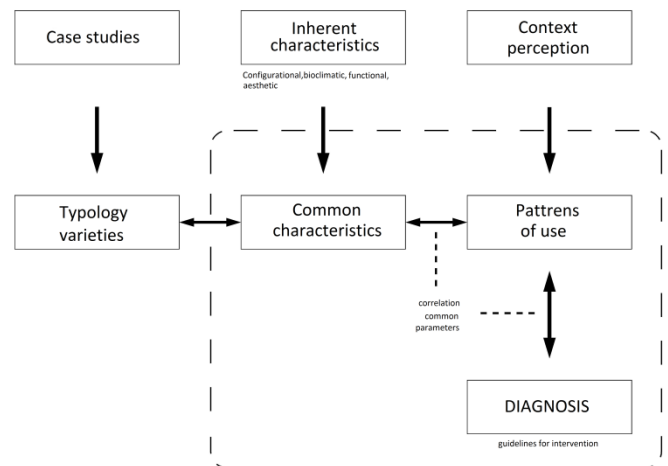

Figure 1: Methodological analysis organization.

3.1. Functional, bioclimatic, aesthetic aspects

The Post Occupancy Evaluation (POE) is an analytical methodology of environmental, use of space and physical performance of a building that aims to assess the satisfaction degree of users and with this information, fix the identified problems and conflicts (Castro, Lacerda, & Penna, 2004). The definition of evaluation variables has to be related to space function specificity (Ornstein & Roméro, 1992) of each building type and focuse on information related to functional, bioclimatic and aesthetic aspects of the space (Holanda, 2005).

Functional aspects - space requirements concerning everyday life practices according to the type, quantity and interrelationship of spaces dedicated to these activities. Evaluation criteria: accessibility, signage, inclusivity, adaptability, organization, dimensioning, diversity, technology and furniture*.

Bioclimatic aspects – related to light conditions, acoustics, temperature, humidity, air-quality. Evaluation criteria: state of conservation of the materials, lighting, acoustics, air-quality, temperature and performance efficiency.

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[1] The term "*symptom*" was used as an analogy with the diagnosis procedure in medicine. Medicine, considers the "*symptom*" as a manifestation of the disease (space, here) and the "*signal*" a result of direct observation of the patient by a doctor (*in-loco* observation, here). By crossing their results doctors obtain clues for the cause and identification of diagnosis (diagnosis of use here).

Aesthetic aspects – scenic beauty of the place derived from the organization characteristics of the architectural object that contributes for the identification of space as a "work of art" promoting a philosophical overview of its shape-space. Evaluation criteria: oomph, topoceptive, color, symbol and conductive.

The functional, bioclimatic and aesthetic aspects were assessed on a scale of 0 to 4, depending on the specific evaluation criteria defined for each one. The average evaluation of academic libraries according to these aspects is the arithmetic mean of the quote of each aspect.

3.2. Configurational aspects

Space Syntax describes the space based on the fact that its configuration affects the social dynamics, considering architecture as being simultaneously a dependent and independent variable (Medeiros, 2006). This analytical model allows the built space description - representing, characterizing and quantifying - according to barriers and permeabilities of the system. Considering this facts, this analytical model assumes building organization as a continuous system of spaces, ordered by adjacency relationships translated into physical and visual permeability gradients. (Hillier & Hanson, 1984).

In this research, the academic libraries' configurational patterns were analyzed using the convex space map focusing variables like connectivity, integration HH, control and step depth from the 3 most important spaces (lobby, reading room and technical services). The definitions for these concepts are listed below (Heitor, 2012; Medeiros, 2010, 2006):

Connectivity – local measure that indicates the amount of direct connections of a space with adjacent spaces.

Integration HH – global measure that refers the potential accessibility degree of an area in relation with the whole spatial system.

Control – local measure that represents the dominance of a space by requiring its obligatory crossing in order to get to other spaces of its immediate vicinity.

Step depth – from a specific location – distance from a given space in relation with the entire system.

The convex space analysis reflects the experience of one who remains static, (Hanson, 1998; Heitor, 2012), supporting the reading of academic libraries' enclosures.

Spatial configuration has also been studied considering the dynamic experience of space - *Visibility Graph Analysis* – VGA (Benedikt, 1978; Turner et. al., 2001). Therefore, in this investigation there were analyzed isovist area, visual integration and visual control of the spaces according to the definitions below (Medeiros, 2012; Turner et al., 2001):

Isovist area – size of visual field or visible space area from a given point.

Visual integration – number of visual steps it takes to get from a specific point to any other point within the system, that is, the potential of a point to be seen by the users of space.

Visual control – ability of a space to visually dominate the spaces around; the visual control is higher when the visual range of the adjacent spaces has poor visibility.

The VGA results allows the study spatial performance considering the issues of orientation, choice of route and overall visualization of the system. Due to the conceptual articulation, there were also discussed the concepts regarding *topoception* – related to the configurational space performance promoting orientation and identification stimuli in a spatial system (Kohlsdorf & Kohlsdorf, 2004) and *co-presence* – understood as the simultaneous presence and visual contact of people in architectural spaces (Doxa, 2001; Holanda, Kohlsdorf, & Kohlsdorf, 2004).

3.3. Users' characteristics and perception of academic libraries

For the user's perception analysis, the study employed the application of 565 surveys concerning the academic libraries. The questionnaires focused on three main themes, namely:

Users' characteristics - age and profession

Use of space - weekly frequency, permanence staying and the main activities usually performed by the users.

Academic library perception - assessment on a scale of 0 to 4 and identification of conflicts, qualities and performance improvement suggestions for the academic library.

The identification of these characteristics is fundamental to the understanding of patterns of space use and users' actual requirements of library spaces.

4. RESULTS

The investigation of the case studies achieved a set of inferences about the configurational issues and space use of academic libraries.

The map of use of space, allowed the observation of relative occupancy of the functional areas in relation with the total area. The average occupancy of the academic libraries' functional areas is represented in Figure 2. Note that the libraries have, naturally, higher percentage of study spaces, followed by technical services.
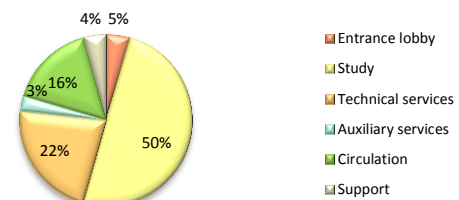

Figure 2: Average occupancy percentage of the functional areas of the studied academic libraries.

The vertical distribution of the functional sectors of academic libraries follows a principle of decreasing versatility of uses from the bottom to the top of the building. The multifunctional lower floors tend to assume a more private character, as they rise from the ground.

Physical proximity between multifunctional areas and silent study places is a noise interference factor.

4.1. Functional, bioclimatic, aesthetic aspects

The overall analysis of the academic libraries revealed their better performance according to the bioclimatic and aesthetic aspects comparing to functional aspects (comparative reading of Figures 3, 4 and 5).

The physical dimension of the libraries' spaces generally fits the requirements, however, some librarians have stated the need for space expansion due to the rapid growth of the bibliographic collection over the past last years (Academic Libraries of FLUL, IST e FAUP). The adaptability and diversity of academic libraries' spaces (Figure **3**) are conditioned by the rigid physical structure of the space that in some cases wasn't planned to be able to respond the requirements of the diverse nature of learning methodologies (study-based and group work learning) that lead the users to spend more time in space.

The academic libraries' technological performance is substantially prejudiced by the failures of the electric system in the reading rooms, outdated work equipment and catalogue consulting software and inadequate functioning of the wireless internet network. Given the intense computer use, for both study and research purposes, updating the academic library's technology resources is a priority key factor for a good functional performance.
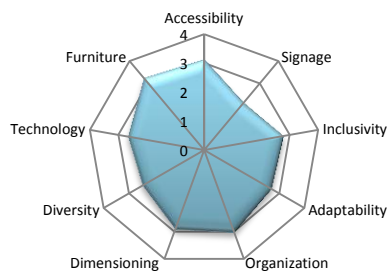

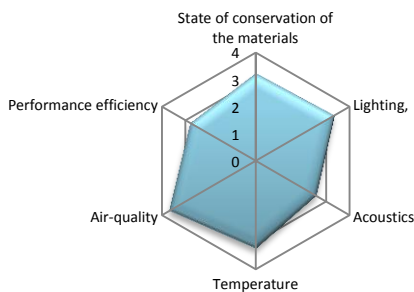**Figure 3:** Academic libraries' assessment according to functional aspects.

Figure 4: Academic libraries' assessment according to bioclimatic aspects.
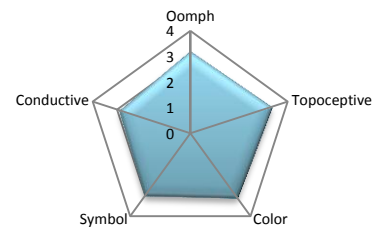

Figure 5: Academic libraries' assessment according to aesthetic aspects.

The academic libraries' appropriate response according to the bioclimatic and aesthetic aspects denotes the efficiency of its architectural design by optimizing both environmental conditions and enhancing the beauty and symbolic meaning of these learning spaces.

4.2. Configurational aspects

As expected, the analysis of convex maps indicated that the academic libraries with larger area have a higher number of convex spaces, which corresponds to higher spatial complexity of the built systems.

An overall reading of the spatial configuration of academic libraries indicated that *i*) the spaces with higher connectivity are the halls and circulation corridors and *ii*) libraries that are organized around a central void have higher values of connectivity homogeneously distributed, as in the case of Academic Library of ISCTE, FEUP and FCT, shown in the Figure 6.
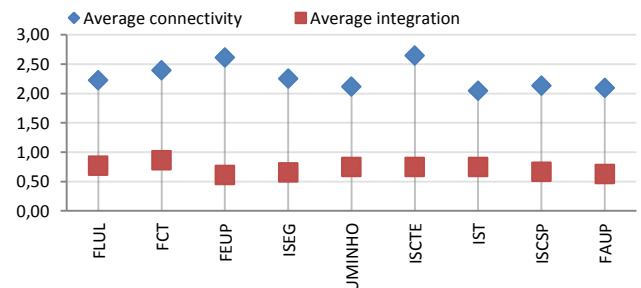

Figure 6: Connectivity and integration mean average of the academic libraries' system

It was also observed that, the smaller the average connectivity of a library, the greater the tendency of heterogeneous distribution of connectivity values around a single core of spaces. Figure 7 shows different distributions of connectivity among the convex spaces.

The study of the space integration allowed to conclude that: *i*) the most integrated spaces are the corridors and circulation atriums; *ii*) the coincidence of the integration core with the reading rooms is associated with frequently incidence of noise due to the intense circulation in the space that disturbs the silence of those who are studying; *iii*) the proximity between the integration core, the main entrance of the library and the circulation spaces allows an easy access to all areas and deviates the larger flow of movement of the working areas and silence study places.
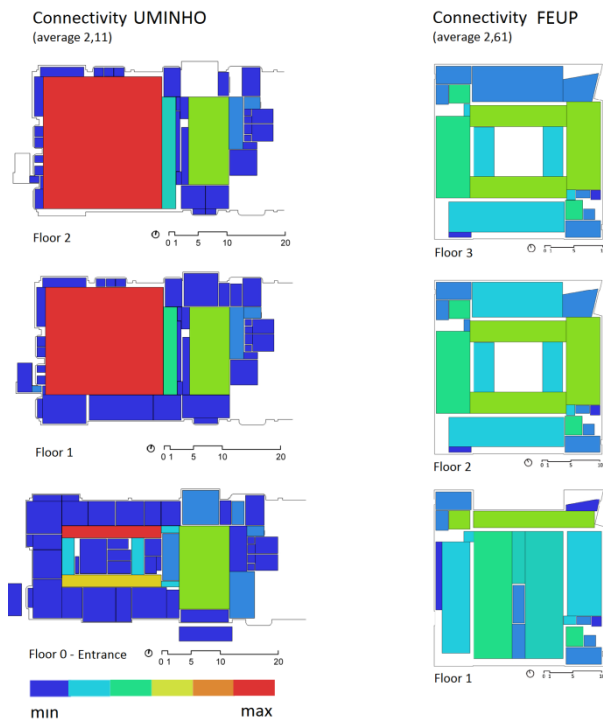
Figure 7: Space connectivity analysis of UMINHO Library (left) and FEUP Library (right) (there are not represented all the floors). It is observed that in the UMINHO Library the maximum connectivity is associated to unique space on each floor while in the FEUP Library, the spaces organized around the central atrium present homogeneous distribution of connectivity both along the floor and vertically.

Figure 8: Space integration analysis of the UMINHO Library (left) and ISEG Library (right) (there are not represented all the floors). The high integration of the lobby and circulation atriums in the UMINHO's library facilitate the flow movement and access to all spaces. The location of the integration core in reading rooms as in ISEG's library is associated with intense circulation flows due to the high accessibility of these spaces that have a natural tendency to be used.

An example of a coincidence between an integration core and reading room was verified on the 1st and 2nd floors of ISEG's library (Figure 8). In addition to the intensive movement in this space, the direct connection of the stairs and elevators to the reading room is constantly committing the silence. A case where the core of the integration coincides with the circulation lobby is the UMINHO's library. In this situation, the flow of movement takes place within an area destined for circulation that is also physically separated from the reading room.
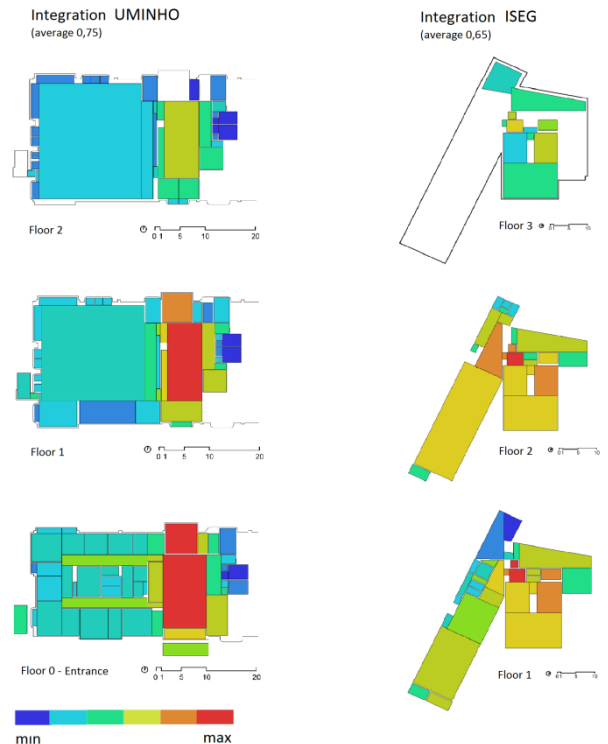
The variation of the integration mean value of the academic libraries depending on the number of floors and on the number of convex spaces led the investigation to a correlation between these variables. It was noted that the average integration of academic libraries simultaneously depends on the number of levels and on the number of convex spaces space having an appreciable correlation coefficient R2 = 0.62 (Figure 9). An attempt was made to make the association of these variables using a multiple correlation lading to the function:

$$\text{Average Integration HH} = 0{,}771 - 0{,}061 \times \text{nº of floors} + 0{,}002 \times \text{nº convex spaces} \tag{1}$$

In this case, the high values for the (Bhattacharyya & Johnson, 1977) coefficient r = 0.832 indicate a great affinity between the integration value and the number of floors of the library.

These results are interesting considering that they express the average level of accessibility (integration) of the spatial system of academic libraries depending simultaneously on their vertical, (for floors) and horizontal (number of convex spaces) distribution.
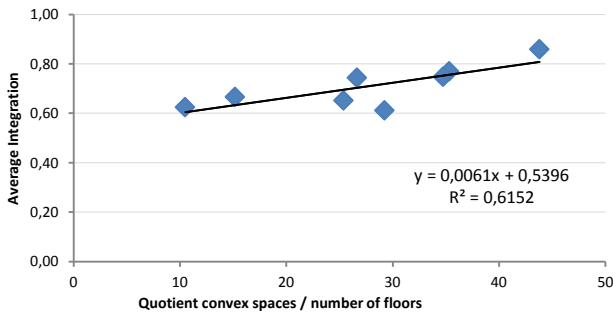
Figure 9: Correlation between average integration and the quotient convex spaces / number of floors.

However, it is necessary to point out that the analyses were limited to 9 case studies, which may compromise the significance of regression analysis in some contexts and the function calibration. Further studies, with a wider number of case studies, could lead to more reliable and accurate results.

The average control of the studied academic libraries has a constant average value equal to 1.00, however, its maximum value is allocated to the circulation corridors and halls. High control of circulation spaces is benefic for the academic library, due to the structural nature of these spaces that distribute the movement and articulate the spaces.

The step depth average analysis of the main entrance lobby, biggest reading room and technical services in relation to the libraries' system, showed which of these space typologies is the most accessible (the smaller the average step depth, the greater accessibility of the space in relation the system) (Figure 10). It was observed that the smaller libraries' (smaller total area) functional sectors are closely while in bigger libraries these sectors tend to assume an independent position. The lower step depth value of the technical services in relation to the library is related to an easier displacement of librarians and technical staff among the system and consequently, to a better performance and efficiency of their labor activities.
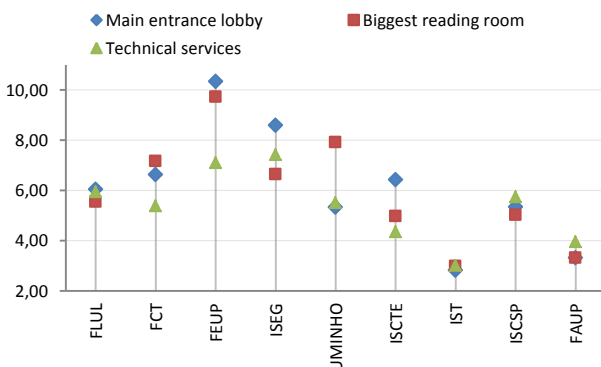

Figure 10: Average step depth of the academic libraries' system.

The visibility graph analysis allowed the association between the influence of configurational properties of space and the orientation, visual field amplitude, co-presence and topoception in academic libraries.

Therefore, by analyzing isovista area, it was observed that *i*) the reading rooms with rectangular geometry well outlined had a greater isovist area enabling a wider visual field amplitude of space (Figure 11) and *ii*) the higher isovist area average of the library, the greater the tendency to appreciation of space and environment of the library by their users.
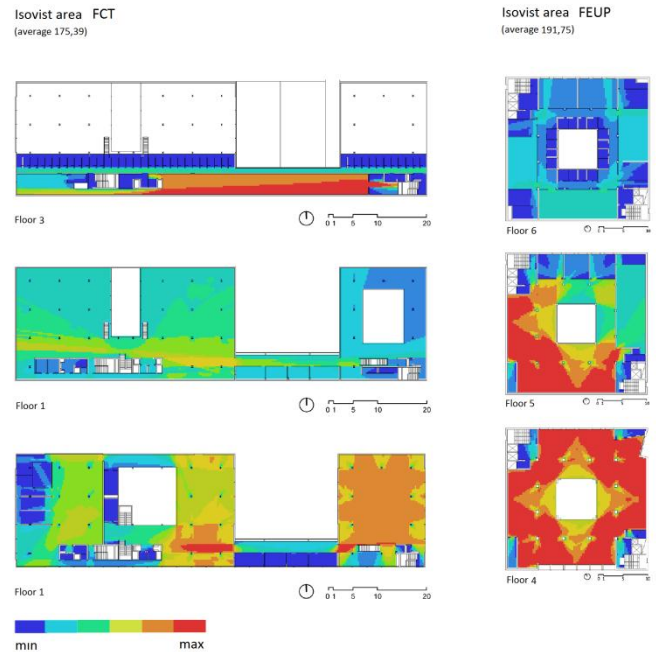

Figure 11: Isovist area analysis of FCT Library (left) and FEUP (right) (there are not represented all the floors). The negative variation isovist area occurs with the greater compartmentalization of space. The spaces with the largest isovist area are the reading rooms while individual offices/for groups tend to have lower isovist area values.

The variation of isovist area value of the libraries spaces does not depend on the total area of the space, but rather, on the amplitude of the compartments. Figure 12 represents the average value of isovist area in each academic library.
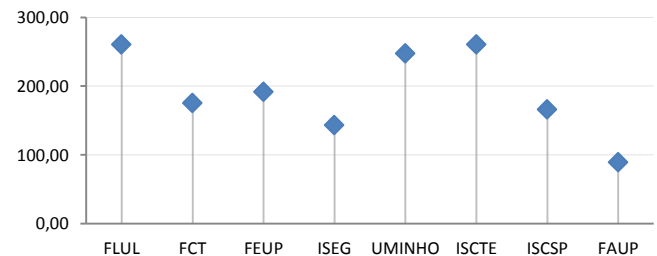

Figure 12: Isovist area average analysis of the academic libraries.

Given the fact that a larger isovist area s associated to wider spaces, led the investigation to the correlation between the libraries' study areas (mainly composed of the reading rooms) and isovist area in order to determine the extent of the visual field areas dedicated to study.

The high correlation coefficient R2 = 0.55 allowed to conclude that 55% of the variation of isovist area is influenced by the variation of the study area (Figure 13).

This relationship reveals the amplitude, openness and visual permeability of study spaces that have a substantial contribute for the co-presence, security and orientation of its users (Holanda et al., 2004), for the agreeable nature (Muga, 2005) and identification of the correct use of space(Barkowsky, Bilda, Hölscher, & Eds, 2007).
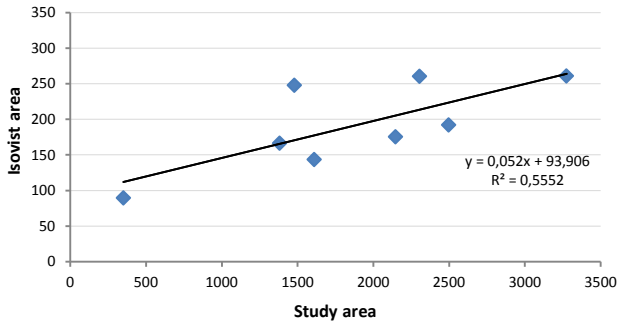

Figure 13: Correlation between the study area and the average isovist area in the academic libraries.

The visual integration analysis, has shown that the most visually integrated spaces of the academic libraries are the public areas and reading rooms with large dimensions and regular configuration. In these spaces the users have a good space perception that let them to simultaneously view several points of the system. The visual integration associated to circulation areas is fundamental for the space orientation and perception of paths. Figure 15 shows the high visual integration value of a continuous space (left) and a lower visual integration value composed by 3 shapes.

According to the comparative study of the academic libraries' visual integration values (Figure 14) and to its spatial configuration, it was concluded that in libraries where the space organization is similar among the floors (in terms of functionality and structure), there exists a higher visual integration. Visual integration also contributes for the user's orientation together with the isovist area and visual control area.
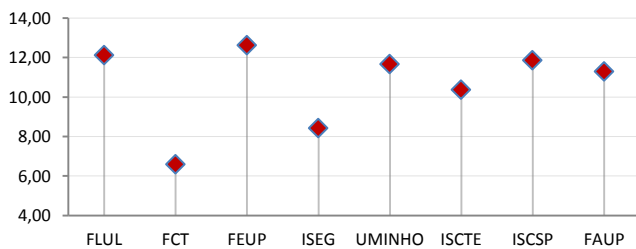

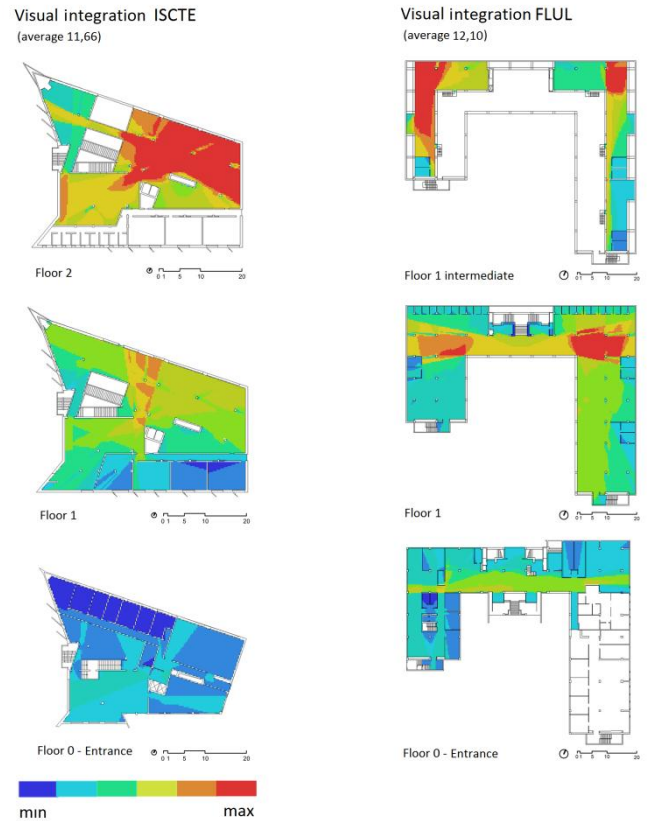**Figure 14**: Visual integration average analysis of the academic libraries studied.

Figure 15: Visual integration analysis of ISCTE Library (left) and FLUL Library (right) (there are not represented all the floors). Note the change in visual integration assumes high values in continuous spaces and lower values in the spaces composed of several forms (the "U" form of FLUL Library has 3 rectangles).

The highest visual control of academic libraries' spaces is associated to the corridors and circulation atriums. These spaces dominate their surroundings seeing simultaneously a set of points with reduced visual field.

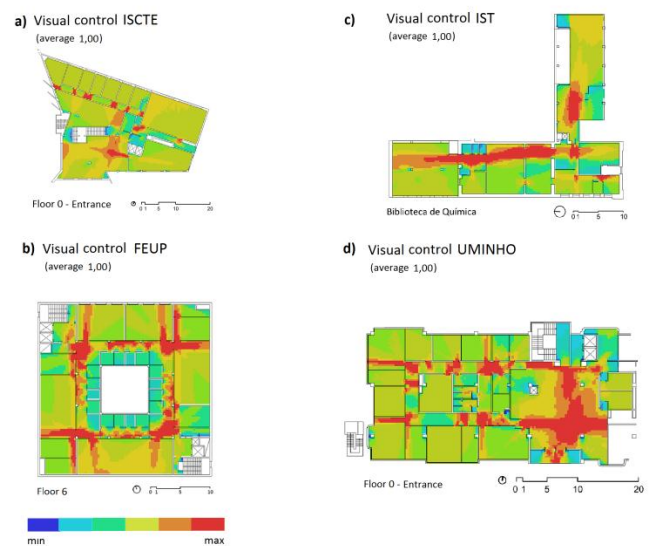**Figure 16**: Visual control analysis of Libraries ISCTE (a) of FEUP (b), IST (c) and UMINHO (d) (there are not represented all floors). Note the highest visual control is attributes to the intersection of circulations halls or in the atriums.

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4.3. Users' perception

The users surveyed in the studied academic libraries have an average age between 23 to 24 years. The majority of respondents (92%) are university students and the rest are professors or researchers. The users' frequency of academic libraries tended to increase with age growth varying between 1 to 3 times a week. User's time spent in the library ranges between 2 and more than 4 hours and the permanency in the library is also growing with age and with the weekly frequency of respondents in the library.

The main activities performed by the academic libraries main audience (Figure 17) comprise the studying, consultation of books and group works. Given the requirements of the current education system, that is increasingly based on the student's autonomy one underlines the importance of the suitability of the libraries to the study requirements of the students.
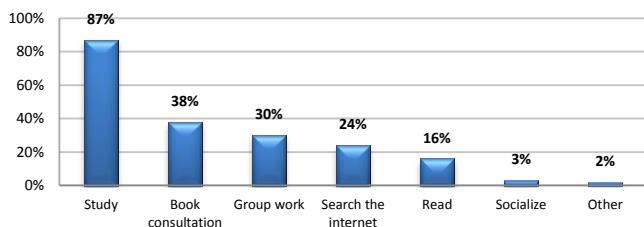

Figure 17: Main activities performed by the users of the studied AL's.

The main conflicts identified by academic libraries' users (Figure 19) are about the lack of seating spaces, noise in the reading rooms and inadequate opening hours. In this sense, the academic libraries will have to adapt their provision with enough seats and an extended timetable to allow the use of academic libraries after school and on weekends.
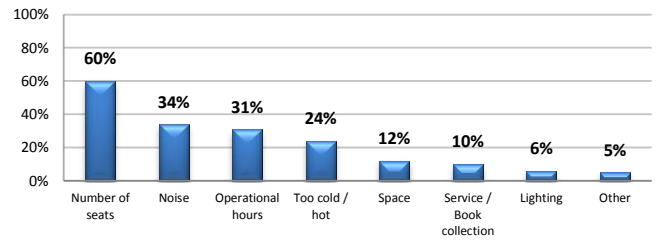

Figure 19: Identified conflicts by the users of studied AL's.

The most appreciated qualities of academic libraries by their users (Figure 20) were the study environment, the quality and extent of space, richness and timeliness of bibliographic and natural lighting. It was concluded that these aspects were the ones that best suit the needs and demands of users relatively to other spatial and functional performance factors of libraries.
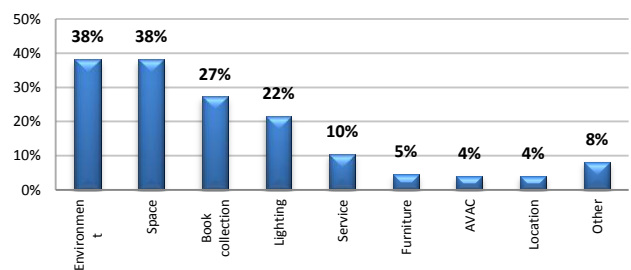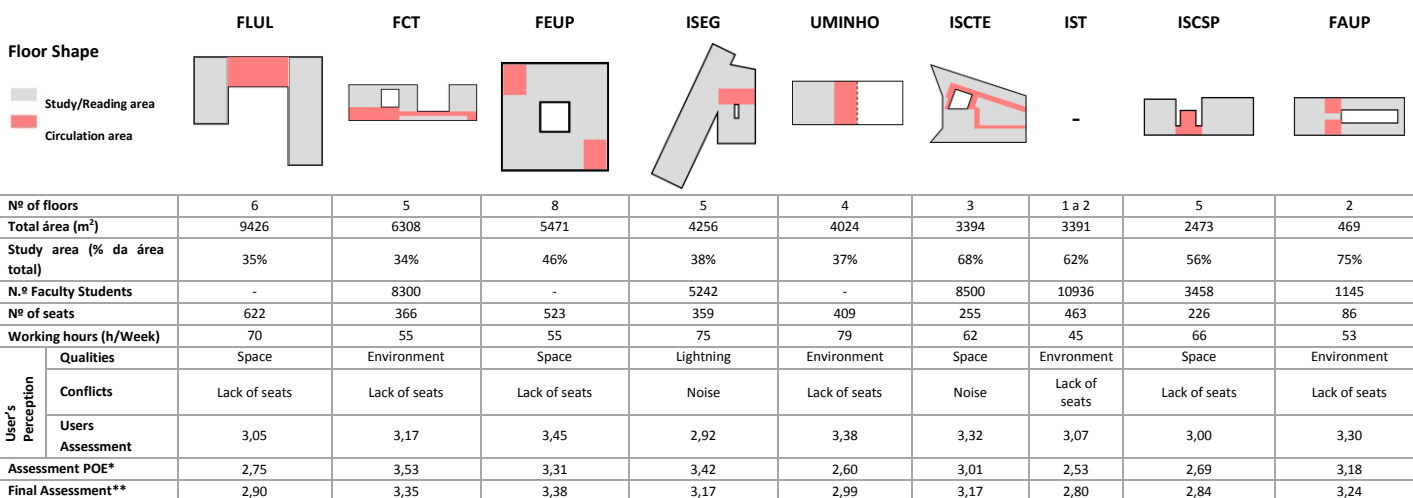

Figure 20: Main appreciated qualities of AL's by its users.

The suggestions for improvement of academic libraries (Figure 21), refer primarily to the increasing number of seats, the extension of opening hours, the reorganization of space and reduction of the noise level. Therefore, these aspects are revealed of great importance to user satisfaction and can be a key factor for the proper functioning of academic libraries.

Floor Shape		FLUL	FCT	FEUP	ISEG	UMINHO	ISCTE	IST	ISCSP	FAUP
Nº of floors		6	5	8	5	4	3	1 a 2	5	2
Total área (m²)		9426	6308	5471	4256	4024	3394	3391	2473	469
Study area (% da área total)		35%	34%	46%	38%	37%	68%	62%	56%	75%
N.º Faculty Students		-	8300	-	5242	-	8500	10936	3458	1145
Nº of seats		622	366	523	359	409	255	463	226	86
Working hours (h/Week)		70	55	55	75	79	62	45	66	53
User's Perception	Qualities	Space	Environment	Space	Lightning	Environment	Space	Environment	Space	Environment
	Conflicts	Lack of seats	Lack of seats	Lack of seats	Noise	Lack of seats	Noise	Lack of seats	Lack of seats	Lack of seats
	Users Assessment	3,05	3,17	3,45	2,92	3,38	3,32	3,07	3,00	3,30
Assessment POE*		2,75	3,53	3,31	3,42	2,60	3,01	2,53	2,69	3,18
Final Assessment**		2,90	3,35	3,38	3,17	2,99	3,17	2,80	2,84	3,24

* The final evaluation is the arithmetic mean between the evaluation and assessment of users' aspects
** The mean assessment POE is the arithmetic mean from the functional, bioclimatic and aesthetic aspects.

Figure 18: Summary data from studied academic libraries and respective assessment.
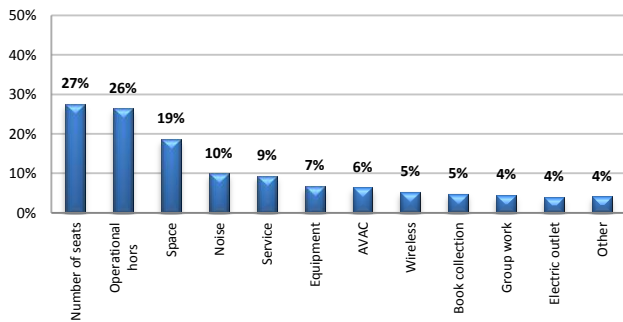
Figure 21: Suggestions for improvements in the AL's, acknowledged by its users.

Finally, the evaluation of the academic libraries by their users focuses an evaluation mostly in the range of 3 to 4, having an average of 3.19, in a scale of 0 to 4, which indicates a general satisfaction of its users before BU's.

4.4. Use diagnosis

From the relationship between the space analysis of each academic library, the comments made by its users and the results of the objective analysis methodology of this dissertation, one may conclude that: *i*) the academic libraries with extent spaces and generous dimensions of the reading rooms were the most appreciated by their users, *ii*) in the academic libraries where the environment prevails as higher quality listed there is greater diversity in the organization of the spaces along the floors, flexibility in choosing the type of space to study (setting tables, diversity of workspaces).

Comparing the results of an objective assessment of the academic libraries, resulting from the analysis method applied, to the user's perception (Figure 22), it appears that in most cases there is a coincidence of the results. This shows the validity of the methodology applied analysis that interprets the space from multiple perspectives.

It should be noted that in cases where the results do not match, although with slight deviations, stands the subjective factor of the user's satisfaction of the library, that on the one hand is dissatisfied with the number of seats, hours of operation, noise, penalizing the library's evaluation (Library of FCT, ISEG), and on the other hand enjoys the study environment above the physical conditions that space offers, overvaluing the AL (IST Libraries, UMINHO).
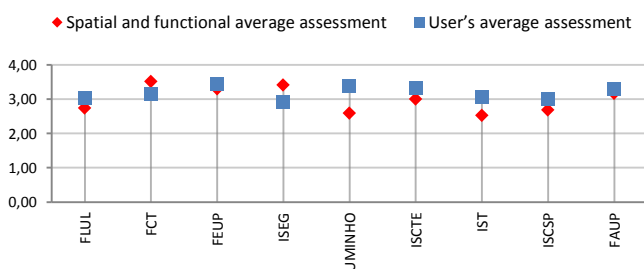

Figure 22: Comparison of objective evaluation methodology for analysis with the average assessment of users surveyed for each AL.

5. CONCLUSIONS

This thesis aimed to explore the strategies adopted by academic libraries to respond to new demands, analyzing to what extent the functional program and spatial configuration are realized to meet the needs and expectations of their target audience. From the analysis of nine case studies and according to the intersection of the results, it has been shown that the morphological conditions of use and operation of space, detect the compatibilities and conflicts with existing functional and space-exploring principles that explain the observed phenomena.

Thus, it was concluded that *i*) the majority of academic libraries lack of reading places, mainly because of the difficulty of managing the gap between the internal college students and external students, *ii*) academic libraries have a deficit timetable due to lack of human resources in post-labor timetables, *iii*) the heavy traffic in the reading rooms to which is added the proximity of the core integration *per si* attracts the move, undermining the silence and concentration of users, *iv*) the requirement of crossing silent study areas is also a factor of attention distraction, *v*) the existence of multiple halls with high ceiling empowers propagation of noise and hinders air conditioning, however the organization of space around them is a factor of great appreciation of users; *vi*) the visual range (the area if isovist and visual integration), the dimension of space and generous natural lighting are the most valued attributes by users of academic libraries.

In general, one points out the importance of the delimitation of noisy areas (like hallways and lobbies of movement conducive to social interaction) from the silence work and study areas through the physical distancing of the spaces or change in the use of the spaces. It was found that the organization-type of academic libraries was led by a principle of hierarchy, being essential in the implementation of the strategic uses of space. It was observed that the coincidence of the nucleus of integration with the reading rooms is related to the generation of noise due to the intense motion in space. However, adapting the use of reading rooms close to the intense traffic areas to study rooms for groups, the distraction of readers with the movement overcomes when creating a space that allows combining the study with social interaction users. Another alternative is to dedicate more accessible spaces (near the core integration) to public use for students from other universities, thus facilitating the management of places.

The rationalization and visual identification of pathways of circulation in the library is an important factor in guiding users and routing flows avoiding disruption of workplaces in silence for those who don't know the space or are looking for their seat. For the same reasons, it is advisable to avoid the mandatory crossing of reading rooms in commuting between important spaces of the library.

Therefore, one may conclude that the reading strategy spaces of academic libraries, as was developed for this dissertation, established its effectiveness and applicability

as a contribution to research and design. The relationship between the characteristics and configurational perception seems to provide relevant information in understanding the dynamics of such buildings, relating aspects of the built form and the perception of use.

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