

# University Planning in Africa Through Research: The Urban & Architectural Design of the UAN Campus as an Innovative Educational Complex

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## Abstract

The urban & architectural planning of a campus that aspires to a high standard of quality must draw inspiration from research of the local culture and an exploration of the key spatial typologies that the long history of universities has brought forth, as well as the study of the local circumstances. These factors were present in the genesis of a recent project located in Africa that forms the subject matter of this paper: the planning of the new campus for the Agostinho Neto University. Following a predefined intentional methodology, the first scientific research strategy focused on the study of vernacular architectures and forms of primitive human settlements in Angola, so that morphological ideation was rooted in the local culture; one of the formats that inspired spatial patterns was the “kimbo”. The second line of scientific research already defined in the preliminary methodological approach explored those university typologies that have historically attained to excellence. From the long legacy of compositional patterns used in complexes dedicated to Higher Education, one of the most distinguished is the quadrangle. The third scientific research line explores the academic and geographical conditionings of the project in Luanda. The paper explains the methodology used to generate the planning of the UAN Campus, as inspired by the outcomes of the processes of inquiry. Finally, some conclusions are stated. Among them are the valid methodology used, as well as the potential extrapolation of the design process followed to other possible projects of Higher Education.

**Keywords:** campus planning; architecture; university

## Citation

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## La planificación universitaria en África a través de la investigación: el diseño urbanístico-arquitectónico del Campus UAN como un complejo educativo innovador

## Resumen

La planificación urbanístico-arquitectónica de un campus, en clave de calidad, se nutre tanto de un proceso previo de investigación en la cultura local como de otro que explore las tipologías espaciales más trascendentes generadas en la evolución secular de las universidades, así como el estudio de las circunstancias locales. Estas dinámicas han estado presentes en la génesis de un caso reciente situado en África, que se expone en el presente texto: la planificación del nuevo campus de la Universidad Agostinho Neto. Siguiendo una intencionada metodología predeterminada, la primera estrategia de investigación científica se centró en el estudio de arquitecturas vernáculas y formas de asentamientos humanos primitivos en Angola, para que la ideación morfológica estuviera arraigada en la cultura local; uno de los formatos que inspiraron patrones espaciales fue el “kimbo”. La segunda línea de investigación científica definida en la aproximación metodológica preliminar, exploró aquellas tipologías universitarias que se han distinguido históricamente por su excelencia. De la dilatada herencia de pautas compositivas que han sido empleadas en los complejos dedicados a la Educación Superior destaca el cuadrangle. La tercera línea de investigación científica explora los condicionantes académicos y geográficos del proyecto en Luanda. El trabajo explica cómo la planificación del Campus UAN se inspiró en los resultados de los tres procesos de indagación. Finalmente, se enuncian ciertas conclusiones, destacando entre ellas la validez de la metodología empleada, así como la potencial extrapolación del proceso de diseño llevado a cabo a otros posibles proyectos de Educación Superior.

**Palabras clave:** planificación de campus; arquitectura; universidad

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## 1. Introduction: research, design and planning

### 1.1 *Research and special architectural projects*

When designing a piece of Architecture, urban plan or any singular type of space which demands special cultural background, scientific research becomes a key tool to generate a sound proposal (Milburn, & Brown, 2003). As part of the role of the architect in the initial stages of any project, he must carry out a research approach, formulating ideas, which later should be transformed into formal decisions. Such methodology has been present through History, as described in some relevant works (Hearn, 2003). Making use of such scientific research, integrative and critical thinking in the preliminary design of spaces will be fostered; the basic outcome shall be the increase of inspiration for creativity and architectural quality. The aforementioned scientific research will generate innovative design strategies, rather than simply reviewing antecedents; furthermore, it will help the creation of specific methods to transform those initial thoughts into architectural outcomes with sound meaning, capable of adding value to the physical and social environment (Pressman, 2011). As a branch of scientific research as an unavoidable source for architectural design, some authors have remarked the need of an effective collaboration between specific professionals (architects and urban planners), and social scientists, due to the fact that research about social dimensions can enrich any qualified design process, helping physical environment to act as an element which induces behavior (Zeisel, 1975).

### 1.2 *The need of a specific methodology in university planning*

In the case of campus planning, using specific methodology of progressive approach for its ideation becomes an essential component. It sets a path that combines the conceptual and the practical, in the search for excellence. The task of planning a built complex addressed to host activities inherent to Higher Education has been shown throughout History as a transcendental action, on whose rigor the integral quality of the future will depend, both in terms of spatial configuration and in terms of the experiential model for the community that experiences it assiduously (Lidsky, 2002). Therefore, before starting the process of formal ideation, a solid methodology must always be conceived. It will be extremely useful to establish a strategic sequence called to endorse the value of what is projected, both at the institutional level and in that which affects physical spaces. In the case described in this text (Campus of the Agostinho Neto University in Angola -UAN-), prior to the launching of the planning process itself, it was decided to assume a methodological guideline that would provide the unavoidable conceptual and practical solidity to what was going to be devised. Another factor of considerable importance concerning the methodology itself should be added. As part of this methodological substrate, the intention to focus this project on the human dimension was introduced as a general foundation on which all the planning of the urban-architectural apparatus of the campus would be built (Zhang, & Ru, 2013).

Being faithful to a method that aspires to integrate all the elements that influence the conception of a campus brings an unquestionable value, since it links theoretical principles with the resulting tangible form. In some cases, the methodology used may even end up generating spatial patterns, which are made available to whoever is in charge of the final concretion of the form (both in exterior areas and in architectural pieces); this trend has been evident in recent processes (Iba et al., 2015; Göçer et al., 2018; Hien, & Jusuf, 2011).

In line with all the above, the methodology used for the ideation of the UAN Campus could be expressed according to the following concatenation of theoretical-practical stages: first, several priority lines of scientific research were set, which were the vernacular human settlements, (extracted from the local tradition of Angola), the urban-architectural typologies that have marked the evolution of the university complexes throughout their centuries of evolution, and the sensitive consideration of the academic and geographical “place”. This last activity would incorporate an analysis of the educational, physical, natural and environmental conditions, including the unavoidable visit to the future campus grounds (where some buildings were erected in 2011), and the dialogue with the

institutional leaders of the Agostinho Neto University. Once these resources were activated, the methodological journey led in the second instance to decision-making, in order to select those spatial formats most advisable for the final stage of the process: the urban-architectural composition of the UAN Campus, where the outcomes of the scientific research lines already mentioned were added to the creativity inherent in the formal conception of the complex. It should be reiterated that everything that can be planned for a university institution will enjoy solid roots that will link at all times the urban-architectural composition with the sensitivity required in its adaptation to the person (Zhang et al., 2012). Once the methodological stages have been synthesized in the previous section, it becomes evident that the process of configuring a university project must assume scientific research as a nuclear guiding thread. The ideation of the UAN Campus was drawn on a methodological itinerary started, effectively, by the transcendental attitude that characterizes research, in the meanings that are developed below.

## 2. Specific methodology essential features: research as a universal tool for campus planning (tradition, spatial typologies and “place”)

Some essential notions should be remarked, prior to the description of the campus planning process carried out in this African country. Scientific research is a key feature of any discipline, since it aims to generate new knowledge that brings added forms of value to society. As stated by Gänshirt: “*The indispensable basis of scientific research is to be clear about the precise requirements when a problem is approached*” (Gänshirt, 2021, p. 30). In other words, the design of a precinct addressed to host activities of Higher Education becomes a transcendental academic and physical holistic challenge which has to be treated under a scientific approach, in order to aim for excellence and academic success (Strange, & Banning, 2001). This implies the need of researching precedents and circumstances which converge, regarding the academic, social, cultural architectural and urban contexts (Su, 2012). This reflection is applicable not only to university complexes, but to any architectural project whose social function or material configuration is unique. Thus, it must be stated that research and design are narrowly connected in Architecture, as has been remarked earlier (Megahed, 2017).

Regarding spatial planning, the historical evolution in its procedures and meanings shows an itinerary along which advances, and innovative proposals have given rise to a range of solutions to adapt to the conditions and trends specific to each functional program, stage and environment. Scientific research and planning have always been closely related (Crouch, & Pearce, 2012). When built complexes are designed using research as support, progress occurs in the path of innovation, with valuable consequences for design, structural systems, sustainability, construction techniques and materials (Brookes, & Poole, 2012). But scientific research is also essential as a nutrient of compositional foundations in Architecture, providing methodological keys for the design of a project (Aksamija, 2017).

As has been explained, the most recommendable methodology to be used in the ideation of a spatial complex is scientific research. And this becomes an extremely valid tool in the case of campus planning, due to the transcendence of universities in society, which deserves projects with the highest possible level of quality. Besides research, there is no other more solid, universal and creative resource that is capable of providing design criteria for the layout of a seat dedicated to Higher Education. And to do it under the premise of aspiring to innovation, in its varied applications. And finally, the aforementioned methodological itinerary started with the research activity would end up generating form, that is, the urban-architectural composition of the campus project of the Agostinho Neto University (UAN) in Luanda (Angola), as shall be explained in the present text. Thus, the new extension of the UAN Campus had its center of gravity in scientific research, whose general lines selected for the process are going to be synthesized: tradition, typologies and “place”.

## 2.1 *Research of local tradition as a source for inspiration*

Throughout the scientific research process, project stimuli are discovered that are capable of inspiring several aspects of the work to be designed. Among other components of this inspiration, special importance attaches to the concepts of identity and tradition, in what affects formal composition. When such scientific research focuses on the context where the project is located, the planner starts to compose with a deep sense of adaptation to the aforementioned identity and tradition, viewed through several lenses: cultural, historical and stylistic. Part of this inquiry should establish as a thematic core the prominence to be accorded to the local identity, which the new project should seek to renew and rethink (Castello, 2010). Part of the substrate on which the new planned structure can be erected is the local heritage, so that the new construction becomes deeply rooted in the hallmarks of local identity and finds nourishment in the memory of the local context (Hornstein, 2011).

In the specific case of planning venues of Higher Education, exploring the local tradition becomes quite an interesting source of creativity. Furthermore, it helps to orient the future project towards a sensitive adaptation to the remarked notions of identity. That orientation becomes critical, as it fosters the configuration of a university complex which is singular and responds to the social and architectural legacy of the correspondent country or town (Weber, & Yannas, 2014). In the case of the UAN Campus, such first research line of exploration became an outstanding supplier of induced creativity, due to the interesting findings about the social and spatial arrangements of vernacular human settlements. Those shall be described in detail later.

## 2.2 *Research of History towards innovative composition in university spaces*

The second scientific research line which enriched the planning process was centred in the historical and dimension of university antecedents, carrying out a sound investigation about urban & architectural typologies characterized by their excellence. Such source is both an essential and a highly effective technique of architectural thought in university seats (Turner, 1988). Together with the exploration of local identity, tradition and “place”, these research approaches become therefore tools capable of providing stimuli that boost innovation and creativity. University ensembles have acquired through History a variety of shapes, which are the outcomes of compositional processes. It must be explained that composition entails achieving an appropriate level of order in the assembly of forms that embody a strong creative idea, whose energy must preside over any work of architecture that aspires to reach the desired standards of quality (Balmer, & Swisher, 2019).

The urban & architectural composition of the most exemplary cases of universities has left its imprint over time in the form of generic spatial planning patterns (Hanlon, 2009). A holistic understanding of the compositional stance is that the process ranges from the initial phases of design to the completion of construction. In other words, composition connects ideas with form (Clark, & Pause, 1983); something that becomes evident in complexes addressed to host Higher Education. In campus planning, achieving innovation can be the outcome of a creative interpretation of past compositional patterns, as has been the case in the UAN Campus.

When reviewing relevant cases of campus planning, those show themselves as exercises essentially arising from composition, defined as a dialectical process between the functional program, the features of an architectural language and the characteristics of a given context. The outcome of that interaction is the configuration of formal solutions involving topics such as order, proportion, scale, module, boundary, and mechanisms of geometric assembly. As has been already stated, History provides outstanding examples of urban university complexes, such as linear patterns, concentric solutions, organic schemes or orthogonal grids, amongst others. Besides, quite a large variety of composition typologies are present at the architectural piece scale (Campos, 2012).

No matter the typology chosen, excellence is achieved in all those relevant examples when the planning process has been developed under a sound methodology and design rigor. Thus, good Architecture has always influenced new projects, becoming an outstanding source for inspiration in innovative campuses, as has been the case of the UAN in Angola. What becomes specially interesting in the best university seats ever designed is how they were adjusted for the institutional and academic model to such an extent that the architectural typologies came to induce by themselves some innovative pedagogical practices, as well as a certain lifestyle, where the center of the spatial creativity was the human component (Campos et al., 2022).

One last content should be added at this point, as it is connected to university spaces nowadays. Scientific and social research and progress move hand in hand, and, in that connection, a recent trend deserves mention: the interaction between universities and Information and Communications Technologies (ICTs). Campuses must be sensitive to their time, evolving in parallel to social and technological progress.

Therefore, contemporary dynamics in the field of teaching innovation and digital transformation call for a research task centred on project strategies that, without undermining the irreplaceable role that physical space must play in human education as a medium and inducer of personal interaction, enable intelligent and creative use of innovative technologies (Oblinger, & Rush, 1997).

### 2.3 *Research of the “place” towards campus planning*

In the planning process of the UAN Campus, the main scientific research lines already mentioned (vernacular tradition and historical university typologies) were complemented by a sound study of the “place”, both in its academic and geographical dimensions. This meant a thorough analysis of the future campus terrains (including some buildings situated in a different zone of the campus), as well as a dialogue with the local academic authorities of the Agostinho Neto University.

As stated earlier, the formal composition of a campus is the outcome of a dialectical process between the functional program, the architectural style and the environment. Such dialogue becomes a sound foundation for the design of the university complex, which needs to be conducted with methodological rigor. Among the triad of factors involved in the reiterated compositional dialogue, the essential one is the study the “place” itself, through a deep analysis that embraces geographical, climatological, economic, social and educational considerations. In this approach, from the outset the emerging campus will achieve the intention to create ties with its environment, as advocated at several distinct levels of analysis: “No institution, whether it be an educational establishment or a professional body, can be meaningfully considered divorced from its context in the political and organizational structure of its country” (Chaabane, & Mouss, 1998, p. 84).

This points to the serious error of applying to a new project solution whose validity has been tested only in a different project: without a thorough understanding that the specific circumstances were considered in that case, and that it makes little sense to extrapolate such solutions to another project where the conditions are different. Quality architecture is, by definition, unique, and uniquely engages with its context, which directly influences the formal configuration of the designed work.

At the urban planning scale, the criteria of a university project must emanate from a critical observation of the “place”, with a careful analysis of each factor that may intervene (De Carlo, 1968). This exploration arises from the need to internalize the connections between the emerging complex being planned and the circumstances of the pre-existing environment. This would then afford access to the concept of “locus,” in the sense that Aldo Rossi expressed: “The locus is a relationship between a certain specific location and the buildings that are in it. It is at once singular and universal” (Rossi, 1982, p. 103).

The American architect Thomas Gaines establishes four factors that must underpin the planning process of a campus dedicated to Higher Education: first, the historical period, which will provide keys to development and architectural style; second, local culture and idiosyncrasy; third, systems and building materials; finally, the landscape and climate (Gaines, 1991). All these factors were present in the design of the Angolan university complex, a major project fostered by the Ministério do Ensino Superior, Ciência, Tecnologia e Inovação, and developed in collaboration with the company Globaltec.

The research of the “place” (in its various meanings) enriches the two other scientific research lines already described, which were centred in vernacular legacies and in historical university spatial typologies. But the actual process of planning a new campus needs to transform such theoretical approach into a committed shape: the campus layout. In short, research is a powerful ally of innovative spatial planning, as will be described later in connection with the design of the new complex. In the following sections, the applications of all the conceptual research will be properly explained, in order to accomplish the final design of the UAN Campus project.

### 3. First application of research: vernacular architecture and primitive human settlements in Angola

In the process of planning of the new UAN campus, the first scientific research stage was focused on spatial types of human settlement in the historical tradition of this African country. The aim was to explore compositional patterns that had a cultural and historical foundation, so that from the outset there would be a conceptual and morphological rootedness in the hallmarks of identity of the “place”. The documentary inquiry identified a set of pre-urban settlements in Angola, prior to the colonial period which began in the 15<sup>th</sup> C.: “kimbo”, “buala” and “sauzala”.

These are socio-spatial structures of radio-concentric geometry ordered in a pattern that reflected a hierarchical system, so that the quarters of the highest family authority were located at the center. Architecturally, the simple buildings stood on circular or rectangular plans, with conical roofs. Wood was the predominant material. The interiors were living quarters, while outer thresholds were roofed, and known as “jambos” (Redinha, 1974). The planning of the settlement included an active and direct presence of nature, suggesting synergies with the essence of a university campus, at least as usually configured in the American historical and typological tradition (Hajrasouliha, 2017).

The “kimbo” (also called “Quimbo” or “eumbo”, in “Luhanda”, the local language of Mambandi), offered a suggestive source of inspiration for the UAN Campus project. Originally, the term referred to a complex of houses ranging in number from five to twelve, where a kinship group resided (Pestana, 2004). Figure 1 shows a basic graphic reconstruction of a “kimbo”.

The interdependence between the “kimbo” and a school has been emphasized by several authors, defining it as a public and official replica of a human settlement. Such fact demonstrates once again the positive outcomes of a solid research action prior to the planning of this university brand new precinct. The families, whose residential enclave was the “kimbo”, wanted the school to be viewed as a credible and safe institution that was close to their daily reality (Pires, 2012).

From a social perspective, “kimbos” brought together several generations of a family, suggesting a metaphor for a community of life and learning that could be extrapolated to a university campus. The simple built elements that shaped these proto-urban settlements sometimes resorted to symbolic geometric forms and ideograms in the decoration of the façades, such as “lusionas” (Gerdes, 1997).



Figure 1. Kimbo, perspective and plan



Source: Own elaboration from the author and J.M. Bautista, 2022.

As a leap in scale that could lead to the “kimbo” as a modular human settlement, there emerged the concept of “kimbopolis”, which, according to some historians, in outlying areas and rural regions of Angola was conceived as an innovative planning methodology. The idea was to combine respect for traditional roots with a systematization leading to the creation of urban centres characterized by a search for modernity (Daio, 2011). In terms of morphology, this combination translated into a harmonization between the primitive forms of the “kimbo” (radial, concentric) with the classical legacy of the orthogonal grid, whose traditional axes were the *cardo* and the *decumanus*. From the beginning, the planning of the UAN Campus sought to share that desire for a symbiosis between vernacular legacy and rationalism. This intention was decisive for the university authorities, who wanted the future development of the academic campus to provide stylistic guidelines different from those used in the buildings built in the area in 2011, which did not respond to the aforementioned purpose of directly linking with the local vernacular culture.

#### 4. Second application of research: the heritage of historic university spatial typologies

As has been already explained, in today’s globalized world, devising a new academic environment requires a triple strategy: first, to become conversant with the identity and local traditions, in regard to urban and architectural patterns; second, to seek out models of excellence and educational-spatial innovation extracted from the international scene; and third, a rigorous study of the “place”, centred in the specific characteristics of the context where the structure will be implanted. In the present section, the inspirational ideas derived from the review of university historical patterns will be explained.

Familiarity with the types of proven excellence provided by university history resulted in the interpretation of three planning criteria: landscape; compositional format of the quadrangle; and symbolism of the library.

*Landscape.* Any reading of the university campus tradition (with a special emphasis on the American model) that seeks to bring out a consistent potential for inspiration begins with addressing an a priori terminological question with a certain influence on the landscape dimension. The first published record of the term “campus” with reference to the physical space of a university dates back to 1774 in a text authored by student Charles Beatty, who used it to describe the extensive land located near Nassau Hall, which was (and still is) a prominent architectural piece on the grounds of Princeton University (Martin, 2006). Etymologically, “campus,” a Latin word, is an allusion to the Campus Martius of ancient Rome (Gaines, 1991). Therefore, the first lesson to be drawn from the North American paradigm is precisely the siting of the architectural pieces over a large plot that acquires the rank of a landscape, defined as an aesthetically valued natural setting. Indeed, international university ensembles -and those of America in particular- are characterized by the introduction of nature in a deliberate use of its aesthetic quality (Dober, 2000). From an overarching perspective, nature is beckoned into the university campus to fulfil a threefold purpose. Firstly, to create an attractive physical context that integrates its visual beauty as a background, often optimized through planning oriented strategically to exploit pre-existing resources (relief, tree cover, vegetation, courses or water sheets, and other components). Assuming that such a scenario is imbued with the aesthetics of the natural, mere walking becomes a way to enjoy the experience. Moreover, nature is synchronized with the dimensions provided by architectural pieces. As a result, there are numerous examples of excellence that achieve a harmonious fusion between the two dimensions, resulting in a hybrid landscape. An exemplary instance of this is the Universidad Central de Venezuela, designed by Carlos Raúl Villanueva (Moholy-Nagy, 1964): this emblematic campus was recognized as a World Heritage Site by UNESCO in 2001 (Gómez, 2010). Secondly, the presence of nature on campuses, if planned for the purpose, can provide educational content in itself. Such is the case of the modern Universidad Tras os Montes e Alto Douro (UTAD), whose enclosure in the Portuguese city of Vila-Real is designed as a genuine “botanical campus.” Finally, nature in an area dedicated to Higher Education can be an effective resource for outdoor areas to crystallize as potential sites for innovative teaching/learning modalities (Scholl, & Gulwadi, 2015).

*Compositional form of the quadrangle.* From their historical origins, the colleges of Oxford and Cambridge opted for a morphological pattern that suited their pedagogical and experiential model, the quadrangle, which was, in turn, the heir of the cloisters that had characterized monasteries for centuries. It is to be recalled that the first Western universities of medieval lineage, adopted the cloister as their architectural paradigm. The essentially rectangular plan comprised a series of volumes embracing a central void, resolved as a morphologically delineated space wherein the tutelage of student life was conducted in human proximity. This prolific type inspired not only numerous “Oxonian” projects but was the seed from which sprang the North American campus (evolving into the “quadrangle” compositional pattern), the source of which was the colonial college, instances of which were established on the East Coast from the 17th century onward (Duke, 1996). Some of the most relevant examples have been the campus of the University of Virginia, designed by Thomas Jefferson as an “Academical Village”, and the campus of Stanford University, planned by Olmsted and based on the aforementioned quadrangle compositional pattern. Figures 2 and 3 show images of both North American cases.

To the specifically compositional qualities, a further property is added: multiplication. The quadrangle is deployed in numerous modules along and across the ground, thus gradually building a distinctive identity whereby unity and extension are suitably combined. Over the centuries, the quadrangle has become firmly established as a format endowed with indisputable quality, since it harmoniously merges the educational component with the architectural. Far from being outdated, the quadrangle still claims for itself the status of a current and active paradigm that can nurture new projects and



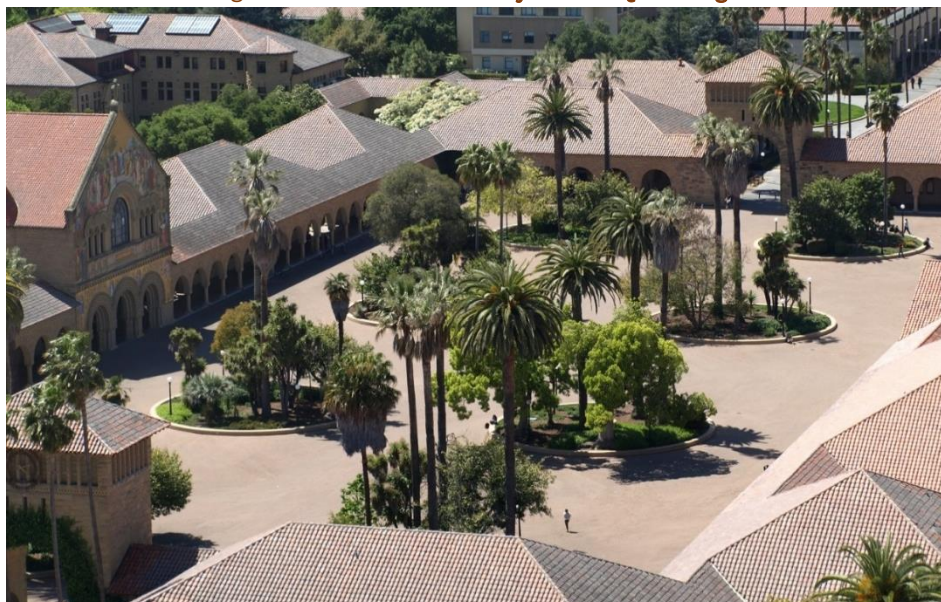
update itself as a valuable guide to recover university quality, in all its meanings (Kohr, 1959). An analysis of the most frequent compositions used in university planning reveals a recurring use of plans based on an orthogonal mesh. This pattern is simple to build, easy to extend and provides flexibility for subsequent modifications of internal distribution. Regular background geometry is especially common in pieces dedicated to basic educational activities: classrooms, departments or laboratories.

**Figure 2. University of Virginia – The Academical Village**



Source: Own elaboration from the author, 2022.

**Figure 3. Stanford University – Main Quadrangle**



Source: Own elaboration from the author, 2022.

*Symbolism of the library.* The design of the UAN campus based its formal solutions on basic geometric forms -rectangle and circle- used so prolifically in the history of architecture, and their later transformations (Chang, & Park, 2022). The reason for this is that it was intended to promote simple and direct planning, while aiding future ease of perceptive internalization by users. In the Higher Education locations, there is often a special case, that of libraries (or its contemporary version, the Learning and Research Resources Center-LRRC). This uniqueness has sometimes been translated into a radial concentric type. The subliminal design strategy aimed to assign to the original symbolism of this type of building (as “repositories of knowledge”) a further symbolism of a geometric nature: circular shapes have certain perceptual and psychological connotations, such as a sense of continuity and movement that is in keeping with the dynamism inherent in the acquisition and organization of new knowledge.

There is another quality that radial concentric and orthogonal geometric configurations possess: flexibility. Since a university is, by nature, a living and changing organism in all its structures, its built corpus should be planned making use of morphological solutions that can be easily modified to adapt to later changes in the academic domain. It has been amply demonstrated that buildings that resort to these simple geometric shapes are able to adapt flexibly to modifications in the functional program. To this we can add another consideration, which links flexibility with quality (Rebecchini, 1981).

## 5. Third application of research: the academic and geographical “place”

The spatial planning of the new UAN Campus was intended to draw sustenance from the cultural background of the vernacular patterns of Angola discussed earlier, but also aspired to receive the benefit of spatial types that have marked the evolution of university campuses over the centuries. Those two research lines were necessarily complemented with the consideration of the academic and geographical circumstances of the project. The planning of the Angolan academic brand-new seat would thus be warranted and enriched by three components: sensitivity to the cultural identity, the proven quality of the morphological patterns drawn from international university history and the lessons received from the “place”.

As a first approach to the academic and geographical “place”, it must be remarked that the UAN Campus was to be the frame of an ambitious educational program involving seven faculties. Since 2011, the extensive grounds located on the southern outskirts of Luanda contained some pre-existing academic buildings left over from the partial implementation of a large-scale urban development plan that was never completed. The planning presented in this paper was required to incorporate the already mentioned pre-existing structures, while implementing a renewed project that would generate a new and encompassing sector that would become the hallmark of the future macro-campus.

The first decision was to insert an innovative alternative centrality to the former structure and locate it in the eastern area of the extensive site, taken as the geographical “place”. This location is equidistant from the pre-existing university buildings and the linear eastern boundary, along Via Espressa da Sapú (leading to the 11 de Novembro stadium). By creating this emerging pole of university buildings, not only was a large area of unoccupied land put to effective use, but the foundations were laid for macro-scale planning of the entire surface area available for the foreseeable expansion of the institution. The existing terrain is pretty large, showing no remarkable slopes and a global uniform topography. As part of the natural landscape, there are several baobab trees (*Adansonia digitata*), which is a local species which has quite an expressive morphology. Figures 4 and Figure 5 show images of the campus site, some of them taken from the pre-existent buildings of 2011.

Therefore, the challenge of the spatial composition was to find a reasonable balance between integration of the old structures and implementation of a new layout so that a harmonious unity would crystallize.



Figure 4. UAN Campus site – view from existing buildings



Source: Own elaboration from the author, 2022.

Figure 5. UAN Campus site – general view and baobab tree



Source: Own elaboration from the author, 2022.

In order to achieve these goals, a careful work plan was drawn up based on the research approaches summarized in the preceding sections. As befits any major project, the planning of the UAN Campus began to take shape after a twofold undertaking of conceptual and typological inquiry that explored both the vernacular roots of the architectural tradition in Angola and the heritage of the university-spatial paradigms that have sown the historical landscape of universities. The result of this symbiosis, once adapted to the physical and academic “place” is a planning that, nourished by that triple inspiration, reached the stage of committing itself to a concrete form. The influences that those three scientific research sources had on the ideation of the university campus are now explained.

## 6. Methodological outcomes: unified research and planning applications in the UAN Campus

### 6.1 *Vernacular architecture and primitive human settlements in Angola: influences in the UAN Campus planning*

The general layout of the UAN Campus opted for a circular type, whose center would be occupied by a piece bearing a powerful dimensional and symbolic charge (the Learning and Research Resources Center or LRRRC). Along its perimeter were located the seven faculties: Science, Economics, Engineering, Social Sciences, Hospitality, Health Sciences and Physical Education, whose respective position could be expressed as the consequence of a centrifugal dynamism. This geometric solution had as its design stimulus the socio-spatial organization of the “kimbo”, at the core of which stood the construction that housed the highest-ranking member of the community (known as the “jango”). With this, the layout of the UAN Campus offered a first spatial metaphor of the local tradition adapted to the university. From a more holistic point of view, the solution sought to achieve a state of equilibrium, both morphologically and perceptually, a duality that, as an ordering principle, helps create effectively balanced systems, where a sense of physical and mental stability is awakened in the human being. In the words of Professor Arnheim: “Potential energy in the system, says the physicist, has reached the minimum. In a balanced composition all such factors as shape, direction, and location are mutually determined in such a way that no change seems possible, and the whole assumes the character of “necessity” in all its parts” (Arnheim, 1974, p. 21).

An additional feature of the circle should be noted, concerning the tensional relationships propitiated within it. As a basic geometric form, a circumference embodies a whole compositional scheme within which tensions between the physical elements that occupy it are rationally arranged. As Harry Helson and Elizabeth Fehrer pointed out in the early 20th century: “If we are to be guided by physical considerations, then the circle, which represents a balanced, minimum distribution of forces, should be the best figure” (Helson, & Fehrer, 1932, p. 99).

The UAN Campus project thus started with a circular surface on which the eight architectural pieces were placed. Acting as a sort of base fabric, the horizontal surface measured nearly 600 meters in diameter. Due to its size, it was located in a clear sector of the available land, to the east of the cluster of pre-existing buildings.

The flatness of the supporting ground, added to the considerable size of the project, led to the decision that an internal landscape be created, since there was no possibility of enjoying attractive views toward the surroundings (which reflected an extremely low degree of landscape maturity). Expressed in other terms, the layout of the UAN Campus was to create an interior landscape within its radius of action through an intentional compositional and perceptual assembly of open spaces and built volumes. This landscape dimension, whose significance in the development of university campuses we emphasized earlier, is particularly important in this project, both because of its enormous size and the need to create a landscape of its own. The American planner Richard Dober stressed the importance of this aspect: “In truth, beautiful campuses are those well landscaped. Fortunately, landscape is again in its ascendancy as a contributor to campus design” (Dober, 2003, p. 179).

### 6.2 *Heritage of historic university spatial typologies: influences in the UAN Campus planning*

As discussed in previous sections, scientific research on spatial typologies that have shaped the history of universities constituted a creative resource of immense value (Kramer, 2010). The model selected to devise the main compositional guidelines for the sectors that make up the UAN Campus

was the quadrangle. Originating in monastic cloisters, and after its transit through the Oxonian colleges, this architectural pattern offered suitable qualities for use in the Angolan case, after its adaptation to local conditions.

The evolution of the quadrangle from its British source underwent a far-reaching metamorphosis in the structure of the architectural framework. Starting from their originally compact configuration, some specimens began a subtle process of fissuring so as to delicately open up their closed interior toward the environs, as in the case of Gonville & Caius College and Emmanuel College in Cambridge, England (Turner, 1984). The move to the Americas with the emergence of the Colonial colleges further developed this incipient trend to open up and crystallized over time in the paradigm of the American “campus” (Kapp, 2018). The most forceful gesture of this typological transformation was the suppression of the fourth volume of the quadrangle. This signalled a new calling to form spatial and social synergies with the context, which implied a different stance of both the built corpus and the academic institution itself. The UAN Campus layout took as a compositional guideline this semi-open quadrangle, whose free interstitial area is oriented towards the center of the general circumference. Figure 6 shows the general plan of the UAN Campus.

Figure 6. UAN Campus, general plan



Source: Own elaboration from the author and J.M. Bautista, 2022.

Another proactive reading of the university’s spatial legacy relates to the notion of “unity in diversity,” which permeates spatial, institutional and social aspects (Banks et al., 2001; Clauson, &McKnight, 2018). In an educational complex, a balance must be found between the uniqueness of each piece and its ascription to common morphological solutions. Architectural ensembles will then crystallize as a metaphor for the human community that inhabits them. In the words of Hillier: “Architectural and urban design, both in their formal and spatial aspects, are seen as fundamentally configurational in that the way the parts are put together to form the whole is more important than any of the parts taken in isolation” (Hillier, 2007, p. 1). The consequences of applying this planning principle to the UAN Campus meant that the seven faculty buildings remained faithful to common morphological parameters, while respecting individual specificity. First, by using the quadrangle archetype, with one of its sides open towards the eighth piece, the Learning and Research Resources Center or LRRC; secondly, by using similar dimensions of lengths and heights, so that this modular bias would provide sufficient doses of unity and act as a measurement module governing the proportions of the different buildings; as a third cohesive criterion of the spatial form, the several pieces accommodate between



their volumes a central void of rectangular shape, evoking the “campus” in its most etymological sense as a space of pedestrian encounter that would support social learning.

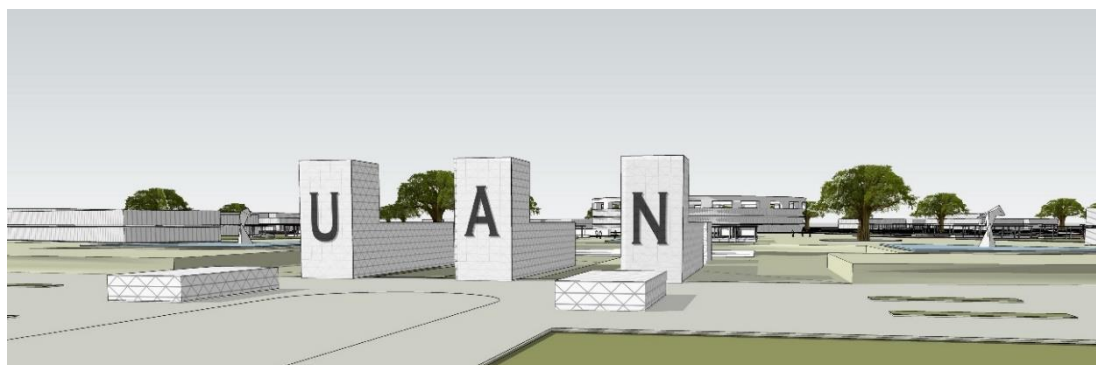
The design of the LRRC began with an inquiry into the basic characteristics of this organizationally and functionally innovative format (Johnson, 2009). Special emphasis was placed on its connection with the European Higher Education Area, EHEA (Cuevas-Cerveró, 2008), but it was also influenced by research on historical university types (Kaser, 1997). The circular floor plan has antecedents in examples of notable significance, such as the iconic Radcliffe Camera (University of Oxford) (Hart, 2017), the Rotunda designed by Jefferson (University of Virginia) (Wilson, 2009), and contemporary examples such as the Osler Library (University of Montreal), the Betty&Gordon Moore Library (University of Cambridge) or the LILLIAD Library-Learning and Innovation Center (University of Lille) Beyond its historical legacy as a morphological solution, the circumference has psychological and perceptual connotations, as already mentioned, such as the symbolic projection of continuity and movement (Alihodžić and Golovina, 2017). Both qualities can be tied to the evolution of knowledge, whose physical representation corresponds par excellence to libraries. Figure 7, Figure 8 and Figure 9 show perspectives of the UAN Campus, taken from different orientations.

**Figure 7. UAN Campus, aerial perspective from the Southeast**



Source: Own elaboration from the author and J.M. Bautista, 2022.

**Figure 8. UAN Campus, perspective of the main entrance**



Source: Own elaboration from the author and J.M. Bautista, 2022.



Figure 9. UAN Campus, aerial perspective from the East



Source: Own elaboration from the author and J.M. Bautista, 2022.

One aspect drawn from the university tradition was the provision for growth in phases, for which comprehensive planning guided by specialists and managers is needed (Hinton, 2012). The new UAN Campus first area (the one described in the present text) will be just the initial stage of a future major complex, since the implantation lands covers a huge area, which will be available for expansion. When a large-scale complex is created, as is the case of the UAN, it is necessary to foresee progressive growth over a considerable period, since -as a living organism- the university may undergo future transformations. Therefore, the layout of its physical space must be flexible enough to adapt to future changes without incurring in contradictions. In the Angolan example, this important aspect was addressed with two overlapping strategies. The first was to adopt a radial concentric and modular arrangement, so that even in the early stages of its construction it acquired a coherent sense, while avoiding its being perceived as an incomplete complex or as lacking unity. The second approach was to set aside locations for the erection of potential buildings not initially planned. Rectangular water sheets were introduced with proportions consistent with the standard lengths of the seven faculties: in this way, even if new architectural elements were to be installed, they would all reinforce the overall compositional harmony of the enclosure.

Finally, it should be noted that another resource was used for the conception of the UAN Campus, drawn from the university tradition: the human scale. As a feature learned from systematic analysis of the most outstanding international benchmarks, the project adopted full pedestrianism, breaking down the extensive overall surface into areas on a smaller scale. Such places are meant to slow down daily experience, encourage leisurely enjoyment, and evoke the poetry of human walking (Schelle, 1802).

### 6.3 *Academic and geographical “place”: influences the in the planning of the new UAN Campus*

The UAN Campus planning process received inspiration from several scientific research lines: local identity and tradition, historical university spatial patterns and characteristics of the academic and geographical “place.”

Starting from the last-mentioned source, it must be explained that the academic managers of the Agostinho Neto University decided to install in the emerging complex the seven faculties already mentioned in precedent sections: Science, Economics, Engineering, Social Sciences, Hospitality, Health Sciences and Physical Education. Each of them responded to different global dimensions, being the largest ones (with an estimated student population of 3.000-5.000) Sciences, Economy, Engineering, Social Sciences; the rest of faculties (Hotel management, Health Sciences, Physical Education) would be smaller, with an estimated number of 1.500-2.000 students each. Such preliminary academic dimensions influenced the built dimension of their correspondent architectural pieces. Besides, a preliminary planning decision was taken: to integrate all the partial library resources initially hosted in every single faculty in a central General Library, as described in precedent sections: Learning and Research Resources Center or LRRC.

Besides the academic one, the planning process paid attention as well to the geographical “place”. To root all the elements of the UAN Campus layout in the physical, climate and natural environment, the overall scope incorporated a set of treatments specifically aimed at achieving this goal. First, the design established a series of ground sectors, resolved in the form of crowns of radial concentric geometry, where landscaped green areas alternate with others of red soil, which is very present in the Angolan landscape. Secondly, the project provided for evenly distributed water ponds to bring a certain bioclimatic benefit to the complex. As a third element in the design of the open space, pedestrian walkways and paths were designed, including pergolas to provide shelter from rain or strong sunlight. These paths, even while under the aegis of the overall radial concentric geometry, allow for creating rectilinear routes between the different sectors.

Finally, the composition superimposed two accessory layers: a grove of baobab trees (*Adansonia digitata*), as this local species has a very expressive visual effect; and a repertoire of large sculptural works representing Angolan art. This strategy merely interprets a trend already present in the evolution of university campuses, which house artworks -mostly sculptures-as a formative substrate that enriches the value of everyday experience (Rodezno, 2011). In sum, the influence of local culture, traditions and geographic and climatic conditions played a meaningful role as creative stimuli in the design of the UAN Campus.

The future process of executive design and construction of the complex will attend to as many actions and strategies as necessary in terms of sustainability. This aspect involves important characteristics that the project must achieve: energy efficiency, bioclimatic solutions, materials, etc. Quite an important application of sustainability is mobility (Arsenio, Martens and Di Ciommo, 2016). It affects not just the internal zones of the university seat, but the urban context as well and the transportation systems between them (Tolley, 2003).

In the case of the UAN Campus, its location in the periphery of Luanda recommends studying this aspect in depth, when the design process comes to solve this aspect (Papantoniou et al., 2020; Dell’Olio et al., 2014). The main access is planned to be channelled through the important highway that surrounds the enclosure from the East: the Via Espressa da Sapú. Regarding this specific issue of mobility, some basic issues should be outlined. Starting from the territory scale, connections with downtown city of Luanda should be properly planned, including the option of a railway or tram. Once inside the campus limits, it becomes essential to implement strategies which foster accessibility and mobility, in order to generate a smart campus (Torres-Sospedra et al., 2015).

Finally, internal systems of sustainable mobility should be studied and implemented, such as bicycles (Becker, & Clemens, 2018). This system will be quite easy to apply in the UAN Campus, as the terrain is quite regular and flat.

## 7. Conclusions: Campus planning outcomes

In previous sections of the present text, the basic lines of scientific research that nurtured the planning of the UAN Campus have been described, not only to explain the process underpinning this major project in Angola, but also to propose that this strategy serve as a potential theoretical and practical point of reference for similar engagements. Those research lines were centred in three main topics: identity, tradition and vernacular settlements in the local tradition of Angola, university spatial typologies through History and the academic and geographical exploration of the “place”.

From a general point of view, the planning of university campuses is a living, changing topics, in need of contributions from diverse perspectives and geographical areas (Chapman, 2006). The task is often affected by various threats and difficulties. Projecting a university complex will always be subject to eventualities and pressures of various kinds (amongst others, budgetary, dimensioning of spaces and uses not made by architects, lack of ambitious vision, or absence of appropriate references arising from the obligatory previous research process). But with proper planning, excellence in Higher Education comes closer within reach (Coulson, Roberts and Taylor, 2010). Aspiring to this high purpose avoids both harmful improvisation and the risk of falling into architectures that are devoid of meaning (Greenberg, 2007), while it is necessary to contemplate such planning from a holistic perspective, encompassing both urban planning models and architectural types (Neuman, 2013).

Among other factors that are currently shaping the evolution of universities is the alternation and diversity of the development entities concerned: “Future campus-city models can be composed from two perspectives: from the university or from the city or regional authority” (Den Heijer, 2011, page 181). Aside from contemporary trends, the planning of future campuses, whether as new buildings or as transformations of existing ones, must satisfy certain premises that have not lost their validity over time: “The elements of good planning are fairly well known; a body of information sufficient for the undertaking and as broad a participation as possible in the process of planning” (Dober, 1996, p. 45). It can be added that the planning of the UAN Campus was based on a participatory approach, both in the sources of inspiration drawn from research and in consultations with professionals. Participation is crucial to projects of this magnitude and has historically been defended as such: “Growth and flexibility in an architectural organism are not really possible except under a new conception of architectural quality. This new conception cannot be formulated except through a more attentive exploration of those phenomena of creative participation currently dismissed as disorder” (De Carlo, 2005, p. 13).

When looking at the full range of the principles and strategies presented throughout this paper, it must be concluded that the planning of an academic complex, such as the UAN Campus, must be conceived as the elaboration of a transition between composition in its architectural sense to the construction of its several components: buildings, open spaces and infrastructures (Prifti, 1997). One of the facets that must necessarily be integrated is that concerning the social dimension, understood as a human settlement with integral functionality: an environment for study and research, but also a fully vital setting, which some authors have even qualified as a “habitat” (Tedeschi, 1976). Historically, university complexes were communities that for centuries remained umbilically linked to the city, both in their physical and social dimension, especially in Europe (Rykwert, 1968).

As part of this vital dimension, the human scale is an unavoidable principle in any university complex, due to the decisive role it plays. The Angolan project embraced this principle, using pedestrianism as one of the strategies to consolidate it, alongside the use of natural elements linked to the local culture. An unhurried stroll is an action that, from an everyday point of view, favors the enjoyment of time and space, and even fosters a state of mind that is conducive to learning. The design of the UAN Campus seeks to offer a range of areas that, linked by pedestrian paths and nooks and crannies, bring about a serene and enriching experience. It should be recalled that an educational facility is a hybrid environment between culture and nature, and when the essence of this duality is understood, the

walk becomes an irreplaceable experience. If we allow that a campus is an intermediate “place” between the urban and the natural, walking becomes even more meaningful as a physical and perceptual connection between the two realities, and a factor that inspires a sense of subtle experiential well-being: “By moving in the liminal space between the country and the city, the Walker experiences the openness of nature, but remains safely bound to an orbit that is centred in urban civilization” (Moser, 2010, p. 44).

Another of the positive readings that can be made of the experience of planning the UAN Campus is related to the overarching purpose of achieving “unity in diversity,” which has been of great significance here, both due to the wide scope of the project and the intentional search for the foundations of historical and typological connection with the local culture. The “unity in diversity” is a whole philosophy of intervention, whereby the urban-architectural reality constitutes a metaphor constructed from that same philosophy, applied to the living community that inhabits the site. Several authors have underlined this viewpoint as a virtue to be achieved in educational complexes: “Establish a harmonious balance of unity and diversity. Design each component first as an integral part of the campus (whole) and second as an individual entity” (Kleberg, 1992, p. 8).

In terms of formal composition, the UAN Campus experience leaves a series of final readings with the potential to inspire future projects in widely diverse institutional environments. The main outcomes of the methodology used correspond to the three basic research lines followed in the design process: first, the benefit of analysing the characteristics of the local culture in the most holistic sense of the term, embracing the vernacular architectural tradition and associated identities. Secondly, the quadrangle, the heir to the cloister, continues to be a highly versatile resource for stimulating creativity in the design of university spaces. There is evidence of this in highly visible contemporary projects (Campos, 2021). Third, the research of the “place”, including academic dimensions as well as climatic conditions and the environment.

At this point, it is worthy to underline some important outcomes. One of them is the pre-eminence of the Learning and Research Resources Center-LRRC, as a piece laden with a powerful symbolic dimension associated with the emblematic function it houses. The design decision on this building acquires, in fact, a singular significance, as it is the result of the intentional combination of two vectors. First, to place the cardinal element of any institution dedicated to Higher Education at the nerve center of the campus. Secondly, to adopt a radial concentric geometry, which activates two connotations: the geometric continuity of the circular form and the radial concentric dynamism that emanates from it, thanks to which the architectural pieces of the seven faculties are centrifuged to the periphery of the encompassing circle in which the complex is framed. This layout can potentially be extrapolated to other university campuses, regardless of the geometric solution to be adopted in each case.

In light of our discussion of the design itinerary of the UAN Campus, emphasis should be placed on the immense value of a preliminary research effort, already defined in the methodological approach. Research will enhance the quality of the designed project on three levels: first, considering local identity and vernacular architectural tradition, which is in itself a component of compositional strength; secondly, through judicious application of the historical legacy of physical spaces of the architectural evolution of universities over the centuries; and third, through adaptation to the circumstances of the “place”, both academic and geographical.

As part of a proactive approach towards the future, at this time it is recommendable to proceed in order to develop a line of research and professional praxis in the design of university complexes, which could provide new ideation strategies in any academic, social or geographical scenario. The research process described in the methodology used for the UAN Campus can be enriched in the near future if they are nourished by a set of added sensitivities. One of them arises from the consultation of certain singular groups, in terms of the way of feeling the university spaces in order to foster inclusive campus (Grigal et al., 2012).). As a testimony to this dynamic, it should be mentioned

that an R&D&I Project is currently being developed, promoted by the Ministry of Science and Innovation of Spain (MICINN), titled: “*Inclusive Campus and Architecture. Criteria to promote welcoming university environments and generators of cognitive accessibility in people with intellectual disabilities*”. Its essential objective is to know a unique way of experiencing the various urban and architectural typologies of universities, as in the case of these special people. The way in which they face the perceptual and emotional fact of educational built complexes provides a source of creative resources that have considerable potential so that those in charge of campus planning can have alternative criteria to the usual ones.

These criteria are extracted from the always sensitive and alternative universe of people with intellectual disabilities, in a dynamic that has long had interesting contributions of research profile, which coincide in that the physical environments that generate mental well-being in those people can also do it in any group (Northeast et.al., 2012), (Bumble et.al., 2018). Therefore, this source of ideation, the result of a research process, can be added to the already described exploration tasks from which projects of university complexes arise, as is the case of the UAN Campus.

Finally, the planning of the UAN Campus, therefore, can provide a set of strategies that, transcending their use in the specific Angolan case, can be valid as a source of inspiration for the design of other university campuses, regardless of their geographic location, functional characteristics, academic profile or overall size. For this is one of the key qualities of sound university planning: to be nourished by research work, through a sound investigation of the specific context, in order to achieve “unity in diversity” as a desirable goal in the spatial planning process.

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## Authorship

Here you must detail the work done by each of the authors. For example: Author Person 1 has conceptualized and designed the research; Author person 2 has analyzed the data and written the work, etc.

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