The paper presents some results from the dissertation “Hospital master plan: a methodological approach to complex problems”, developed in the Post-Graduation Program of the Faculty of Civil Engineering, Architecture and Urbanism, at the State University of Campinas, Brazil. It shows some main difficulties through which hospitals have passed to re-structure their area after the Brazilian process of globalization, when more updates were demanded to attend new programs and technologies. In this context, “hospital master plan” comes as an important management tool once it links strategic planning and the establishment architecture. The objective of this paper is to analyze master plans while understanding the role of the architect and his/her importance in hospital planning process; and to identify methods of master plan elaboration in current Brazilian production. The research is divided into bibliographical review, interviews and case study. The results show that the architect participation is important and must occur from the beginning of hospital planning, once he/she helps to clarify the logic of space and its program and area organization. It is observed the architect preoccupation in not acting as a simple drawer, but to discuss the proper viability of the hospital, which requires specialized knowledge and constant professional actualization.

Keywords: healthcare design; hospital planning; master plan
1. INTRODUCTION

With the insertion of Brazil in the globalized world at the end of the last century, Brazilian hospitals have been required to control their production costs and add quality and productivity to the services provided through the modernization of their administrative and productive processes. To address the challenges posed by the need to update technology and training teams of professionals, pre-established models of operation were reviewed, which led to significant changes in the same architecture (GOMEZ, 2002).

However, area improvisations and technological gap situations are found in most Brazilian hospitals, reflection of periods of crisis and empirical growth, which has brought great difficulties to the required modernization. A serious of other aggravating issues can also be cited, such as increasing demand and rapid development of medical sciences and technologies, which only further intensify the problems faced by the institutions.

Besides, and above all, many hospitals were built and expanded over time without any planning, what has often led them infrastructure and functional obsolescence. A survey on area transformations of public hospitals in Sao Paulo, Brazil, is an example of this situation, once it highlights the lack of planning, through the elaboration of a master plan, as one of the causes of conflicts generated in those buildings (FERNANDES, 2003).

For the resumption of hospitals as modern and flexible buildings, able to receive the most diverse technologies, master plan comes as an important guiding tool for this process, because it helps area organization and choice of actions by institutions. Considered a product from the planning process, the plan can be approached from different perspectives, especially in multifunctional establishments such as hospitals, and that in the present paper it will be seem in relation to its area aspect.

Thus, the goal of this work is to study hospital master plan through the understanding of the architect’s role in this process, the methods for their preparation and characterization of the production of plans in Brazil.

2. BIBLIOGRAPHICAL REVIEW

2.1. Master Plan and the Role of the Architect in Hospital Planning

In general, the process of hospital planning is developed by a multidisciplinary team coordinated by a qualified professional who can be either an architect or not, since the experience and knowledge of the health sector are the elements that really matter to the consultant.

According to Mavalankar and Abreu (2002), in many developing countries, where there are few consultants, this function is often fulfilled by the administrator of the institution or by a medical authority. In Brazil, this situation is also found, but frequently with architects specialized in healthcare facilities. Rino Levi, a Brazilian architect, for example, have clearly fulfilled that function working with hospital programs that, according to him, involve such complexity and demand a multidisciplinary team, that should have the architect as the coordinator for being "the only one capable of overcoming the limits of the particularized vision of each of the professionals involved "(ANELLI, 2001).
Bross (2002) and Carvalho (2002) also agree in saying that the role of the architect goes beyond the architectural project, it is necessary to have a global vision of the institution and participate in all stages, including decision-making; therefore, the architect does not constitute in an accessory or absent part of the planning stage.

The increased participation, and perhaps success, of the architect as a hospital planner and consultant may be explained by his/her own design activity that is both a task to identify problems and to solve them, as defined by Lawson (1997). Complex situations, full of diversity, seem to draw the attention of experienced designers who are not only technically capable, but are trained to activities that require decision-making. Besides, the work of the architect is much more prescriptive than descriptive because, unlike the scientists who describe how the world is, the designers suggest how it should be.

2.2. The Complexity of Buildings and Design Methods

Working with hospitals is not a simple task, by contrast, requires constant study and knowledge to overcome its inherent feature that is the complexity. From simple places of shelter and confinement of patients, hospital today has come to signify a broad and diverse organization, and that, consequently, has elevated complexity in its design.

However, this situation involving design process is not exclusive of hospital buildings, but presents itself as a common theme in architecture, especially from the years of 1950 and 1960, when complexity becomes present in a remarkable way due to a sum of factors, such as: increasing size of the projects, major unresolved anthropic problems (traffic, pollution, problems from the products of design), higher levels of hierarchy, and others.

In Brazil, the growing design complexity can be seen from decades of 60 and 70, when architecture, even under strong influence of central-European modernism, met new areas of expertise, with the participation of architects in multidisciplinary teams of major development projects of the military regime, such as the master plan for the administrative building of the Alberto Pasqualini Refinery, from Petrobras, in Canoas-RS, Brazil (SEGAWA, 1999).

Thus, to overcome these difficulties, it is evident in contemporary architecture the search for design methods, now seen as a process and not as an individualistic and elitist act anymore. Dissatisfaction with the results of the Modern Movement, the attempt to minimize subjectivity, the systematization of work in teams and the application of information technology also helped in the search for design methods, with the goal of improving the process mainly on its scientific aspect (JONES, 1992; KOWALTOWSKI et al., 2006).

Therefore, we can say that the growing complexity of design has been a transforming agent in the history of architecture, which, among other consequences, boosted the development of instruments that allow or try to improve the way of working with this active feature. These instruments are the design methods that can be understood as organized procedures to drive the creating process to a particular result, while trying to rationalize the creative tasks and support the designer in the search for solutions to increasingly complex problems involving decision, namely, the choice of actions among many possibilities (LAWSON, 1997).

So, starting from the principle that hospital buildings tend to become increasingly complex, as the very history shows, and that it will be necessary to adapt the existing buildings to new forms of assistance, technology and equipment, it is of great value the study
of instruments that permit the organization and prioritization of adjustments and rearrangements in area, such as the hospital master plan.

2.3. Conceptualization and Methods of Master Plan

Several authors (BROSS, 2006; NAGASAWA, 2007; SALGADO, 2005; SILVA, 2006; Walker, SHEN, 2002) demonstrate the importance of studies on the early stages of the design process, where master plan can be considered as one of those steps or not, depending on the author and his/her area of expertise. It is possible to find some references to master plans, but usually more superficial and with other names in the literature on architecture in general, and closer to be a planning activity, not necessarily connected to design process, when in the literature on healthcare facilities.

One way or another, authors claim that the plan helps to ensure the quality of the process through the transmission of information necessary for the following stages of design and construction, facilitates the understanding of the complexity of the object and allows flexibility and agility during the execution of works. The generation of this knowledge helps to increase the chances of success and reduce the problems in hospital buildings, since the plan directs the area arrangements to be designed by aligning the strategic planning and the architecture of the enterprise.

It is possible to see that the same way master plan definition is diversified and extensive, are their methods of elaboration, what makes it difficult in some ways their identification. In this sense, some methods are described in general architecture literature, although not including specific health issues, as epidemiological analysis, for example, but where some related components to master plan are found, such as in Christopher Alexander’s and others’ reported by Jones (1992).

In specialized literature more complete methods of master plans are found, although sometimes they are not very detailed, from Brazilian authors such as: Bross (2002), Miqulén (1992), Mazzieiro (1998) and Góes (2006), and foreign authors as: Foqué and Lammineur (1995), Nagasawa (2007) and Maze (1975).

So, due to the fact that there is a certain lack of publication and discussion on the subject, it is that this paper aims to study the elaboration of hospital master plans and research in practice how architects define and conduct them.

3. METHODOLOGY

This research is the result of the Master's dissertation entitled: "Hospital Master Plan: a methodological approach to complex problems", developed in the Post-Graduate Program of the School of Civil Engineering, Architecture and Urbanism, at the State University of Campinas (UNICAMP, Brazil). The work tries to bring together concepts and information on the preparation of hospital master plans.

For that, three Brazilians architects were interviewed, who are representative for the national hospital architecture and planning, in order to study the plan through the following purposes:

a) the understanding of the role of architect in the hospital planning process;

b) the method of drawing up the plans, and
c) the characterization of the production of plans in the country.

To achieve the first two purposes, interviews were conducted with each of the three architects, using a semi-structured guide divided into two parts: Part 1) the role of the architect in hospital planning process, and Part 2) method of drawing up hospital master plans. For the last purpose the curriculum of those architects was examined and which, for their importance, characterize a significant sampling of the production of the plans in the country.

The selection of the architects was made based on the following criteria:

- be an expert in healthcare facilities design, having developed master plans for hospitals with more than 200 beds;
- have published work or held lecture on the subject of the research;
- be or had been member of ABDEH (Brazilian Association for the Development of Hospital Building), preferably with a director position;
- have been highlighted by tributes, awards, competitions or remarkable specialization;
- have a teaching activity at a course in the area with national scope.

Besides the criteria above, the selection tried to choose professionals of different generations that could contribute with different views and methods. Thus, as well as meeting the criteria listed above, the selected architects have respectively, 58, 50 and 25 years of work in the healthcare field.

After the interviews, data were analyzed qualitatively where similarities and differences between the answers were observed, and also compared with the concepts found in the literature review. The data obtained from the curriculum of the interviewed architects were organized in spreadsheets as follows:

1st.) Selection by decade of the master plans made by the three architects;

2nd.) Listing of the institutions for which the plans were made and characterization of them into: public or private, profit or nonprofit, general or specialized, school-hospital or not, new or existing building; and

3rd.) Characterization of the master plans by the average number of beds and area in them.

It is important to note that this is a partial characterization of Brazilian master plan production and has the aim of contributing to the main objective of the research, namely to gather information about the plans, but without the pretension to be a statistical study that translates the whole reality of the country.

4. RESULTS

Among the results found in the research and the comparison with the bibliographical review concepts, the most relevant information were selected and are presented in the following topics.
4.1. The Role of the Architect in Hospital Planning Process

In the first part of the interview several similarities were found in how the respondents see the role of the architect. The three architects said they frequently participate in the planning process as hospital consultants and/or coordinators of the process, directly hired to perform this function or as a result of the need originated from a hiring of architectural design. The involvement of the architect is considered important because it sheds light on use of space to facilitate the enterprise, valuing the logic of it. His/her role is to decoder needs of the customer to the space, trying to translate all the theoretical and psychological of the individual for the design, while also contributing to the design of the venture, making it more competitive, efficient and humanized.

Meanwhile, the architects were unanimous in answering that this participation has not occurred as much as it should in the country. One of the interviewees concluded that at some point the architect lost the tradition of discussing the problem, since it expects all "chewed", by exempting himself/herself from his/her role as a decoder of the client’s desire. With this view there is no innovation, once it is essential that first the architect discusses with the customer to then dedicates himself/herself to drawing and not take the existing area as a absolute truth.

Another interviewee shares similar vision, asserting that the architect should first deeply understand what is the institution's strategy to be able to design the environment that would house the business. For him, the architect is leaving school without knowing what is the reason of his knowledge, that his role is to generate a new expertise, whose composition does not seem to be properly informed, since he goes for the pencil part without the conceptual part. So the architect must participate in the decision of the business from the start, leading the client in relation to future trends, encouraging him to "believe to see", and not the contrary.

In that sense, for the architect to participate more in the planning process it is necessary his/her search for knowledge in general focus of "hospital", that is, despite the specialization in hospital architecture, he/she should build a diverse and broad knowledge on the theme. For this it is important that the architect discards his/her prejudices and develop sensory perception so that information can reach him/her making it possible to understand the behavior in the workplace, including customers and other professionals involved.

One concern mentioned by the three interviewees is that the architect can not act only as a doctor’s drawer, but on the contrary, he/she must have a performance of commitment to the institution as a whole, beyond the activity of drawing. Therefore, the largest source of professional upgrading is the very professional performance, because it is when all other sources are combined, or when from a real problem the architect has to look for legislation, experts, suppliers, and others, to resolve it.

Finally, when comparing the data obtained in the interviews with what was briefly reported in the bibliographical review before, we can say that: 1) the architects fulfill the function of hospital consultants as defined by Mavalankar and Abreu (2002), 2) this performance demonstrates the observation of those authors that it is common, in developing countries, the role of consultant be occupied by another non-specific professional, such as the interviewed architects, and 3) it is clear the work of the three architects as “visionaries of the future”, according to Lawson’s definition (1997), since the essence of their work is to analyze and suggest how healthcare facilities should be.
4.2. Methods of Hospital Master Plans

In the second part of the interview the answers were not as similar as the first part, what does not mean they are not complementary. Although it was not identified a common method of elaboration of hospital master plans among the interviewees, it is observed that there is a similarity in the process of each related to the need for demographic and epidemiological analysis, and deepening the speech with the client before developing the design.

Basically the methods used by the three architects can be organized into three stages:

1) Diagnostics, where he/she addresses the statistical data of the health sector (epidemiology, demography, etc.); and the services offered by the establishment (if they are available);

2) Development, where the information found in diagnostics, including forecasts of future trends, are worked with the verification of services to be expanded, reduced or eliminated; and

3) Graphic Representation, where the solution of the problem is graphically built after being theoretically built in the previous step, detailing up the guidelines for the institution’s development.

It was also highlighted that there are differences between preparing a master plan for an existing building and a new building. In the first case, the plan is usually more complex by involving other issues related to the existing conditions which must be taken into consideration. Planning proposals and area changes must be designed from existing conditions, and not letting them aside what is usually easier to do.

On the other hand, a master plan for a new building requires the architect’s help to make the customer build a "picture" of the enterprise, when he creates a virtual model of the building, followed by the property acquaintance. In this case, it is important to include in the process an outline of the maximum occupancy of the property to confirm if it meets the business expectations, to then make the site plan and guidelines for future growth.

In addition to the similarities found in the methods presented by the architects, it was a consensus the answer that the goal of the master plan is to create conditions of future, sustainability and continuous monitoring to the institution. Other recurring issues in their process are summarized in following Table.
<table>
<thead>
<tr>
<th>HOSPITAL MASTER PLAN</th>
<th>ARCHITECT “A”</th>
<th>ARCHITECT “B”</th>
<th>ARCHITECT “C”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guiding Principles</td>
<td>Needs and demand, availability of resources, programs, health care plans, etc.</td>
<td>Analysis of the market versus services that are provided.</td>
<td>1º. Addressing the general to the specific; 2º. Risk to patients, employees, professionals and others; 3º. Issues of practical order; 4º. Analysis of the market.</td>
</tr>
<tr>
<td>Internal data collected</td>
<td>- sanitary conditions - area and functional obsolescence - expansion needs - new equipment, techniques and procedures</td>
<td>- production versus consumption</td>
<td>- administrative planning - Accreditations - indicators: what, how and how much the institution produces - area analysis mainly on health issues - culture of the institutions</td>
</tr>
<tr>
<td>External data collected</td>
<td>- social, economic, demographic, political and health programs changes</td>
<td>- market versus cost</td>
<td>- potential in the market - how the hospital is seen in the region and in the health scenario</td>
</tr>
<tr>
<td>Main sources consulted</td>
<td>Not obtained information.</td>
<td>- Administrative Department of the hospital</td>
<td>- questionnaires applied in the institution - official sources: DATASUS¹, IBGE², ANS³ etc.</td>
</tr>
</tbody>
</table>

TABLE 01 – Guiding principles, main data collected in the institution, and main sources consulted by the three architects interviewed to develop hospital master plans.

Source: interviews

Finally, the respondents stated that a hospital’s master plan has to be aligned to the needs of the institution, besides being logical, dynamic and flexible, because if there is no decision-making tools and upgrade enabling its maintenance, it is abandoned and does not survive the “storms”. That episodic and static plan can not come up with the speed of change in today's world, so it must be a flexible and accessible document to really fulfill its function.

4.3. Partial Analysis of the Production of Hospital Master Plans in Brazil

The analysis of the curriculum of the three architects interviewed shows that master plans in Brazil has apparently started in the 80, bearing in mind that this is not a conclusive statement due to the limitations of the research. Anyway, it is a relatively favorable period for that since its succeeding decades are marked by the emergence and development of studies on design methods, or organizing procedures of the creative process in the search for solutions to increasingly complex problems, example of the hospitals themselves.

The study shows that in the decade of 90, there was an increase of almost 50% in the production of master plans in the country, but their representation in the total of work done, reduced from 18% (decade of 80) to 12% (decade of 90). This situation occurs because the work in administration and consulting area increased considerably, according to the architects’ curricula. In the period 2000 to 2006, the representative tends to remain low, which

¹ Departamento de Informática do Sistema Único de Saúde (SUS).
² Instituto Brasileiro de Geografia e Estatística.
³ Agência Nacional de Saúde Suplementar.
does not mean, necessarily, that the number of plans decreased. It is important to remember that the analysis of that last period is preliminary, since the decade is not over yet (Graphics 01 and 02).

Comparing the interviews to the data above, one could say that the evolution of the concept of master plan in recent years – seen as a more dynamic and flexible process, directly aligned with the market and the enterprise sought – may be restructuring the new hospital master plan of the XXI century, in order for it to meet the demands of contemporary world. This could also be seen as a reaction to the criticisms made to urban master plans, for its territorial determinism and lack of commitment to the reality (NYGAARD, 2005), which in the case of hospital plans seems not to have devalued and not reduced the production of the same in the country.

On the characterization of health facilities in Brazil, the analysis showed that most of the institutions for which the plans were made is private (68%), among which more than half are non-profit (58%), and only 16% of the total are school-hospitals. Whereas, among the specialized healthcare facilities, those that stand out are the care of cancer, probably by its greater complexity. It was also observed that only 34% are new units, while 66% are existing institutions, confirming the importance of responsibility and commitment of professionals who work with hospital planning and architecture, once that "men go and the institutions stay" (Graphic 3).
The study also showed that these institutions were planned with an average of 264 beds and approximately 28,000 m², which results in 106 m² per bed. It is interesting to note that even though much of the work of one of the architects interviewed is for smaller institutions, almost half of the size of the institutions of the other two architects, the average of square meters per bed is relatively close, with values of 97.37, 100.71 and 106.04 m² per bed.

5. CONCLUDING REMARKS

The observation of insecure and poor situation of most Brazilian hospitals at the same time that it is increasing the need to reverse this scenario, front to market requirements,
justify the elaboration of hospital master plans as an assessing and actions-directing mechanism in order to give conditions of future to health facilities.

In this sense, one can conclude that it is of great importance the architect’s participation in hospital planning processes, from the earliest stages of defining the enterprise, whose role is to shed light on the logic of the use of space and to translate the customer needs to its area, which requires specialized knowledge and continuing training. Although such involvement has not occurred as much as it should, it is possible to see that the architect’s actions go beyond the activity of design, once he/she can be considered as a researcher of the object’s reality to propose solutions to complex problems.

In the methods of drawing up hospital master plans, their identification was not possible in full, despite the observation of certain common items and concepts among the interviewed architects and bibliographical review. This is also due to the fact that there are some diversity in its understanding and concept, sometimes even divergent, at the same time there are very few studies and publications on the subject.

Anyway, the research enabled to draw a preliminary outline of the healthcare institutions’ profile with a master plan in Brazil, and to demonstrate the potential use of this tool for planning, especially of more complex arrangements. Despite the coverage limitations of the research, it is confirmed the idea that hospitals are buildings that remain active for many years, which requires mechanisms to keep them upgradeable, flexible and ready to receive the most numerous advances that science will produce.

6. ACKNOWLEDGEMENTS

To the three Brazilian architects, who conceded the interviews and enriched the content of the present research.

7. REFERENCES


