

# **DEVELOPMENT OF A SOFTWARE ARCHITECTURE TO SUPPORT CONDOMINIUM MANAGEMENT**

**Tiago Miguel Rodrigues dos Santos**

---

## **ABSTRACT**

The management of a condominium includes the building's maintenance, hiring services, human resources management, finances and administration and last but not least the concern about the joint-owners confort and well-being. All these factors make the condominium management a complex activity, which requires a proper organization and structure to be successful.

This dissertation aims exactly to present the development of a software architecture that supports condominium management which includes innovative features able to improve the experience of all stakeholders involved in the process.

The main characteristic of this platform is the fact that it establishes a bridge between all stakeholders, bringing them together, instead of directing it only to the administrator. The design of the platform aims to dynamize the communication between joint-owners/ administration but also aims to promote communication with companies for service hiring related to the condominium, using an e-procurement tool.

## **KEYWORDS:**

Condominium Management; Joint-owner; Software Architecture; E-procurement; Building Maintenance; Innovation.

---

**October 2014**

## 1 Introduction

The owners, as joint-owners of the common areas, have a very important role in the management of the condominium, but it appears that there is a lack of interest in their participation when it comes to main problems associated with the condominium. In these cases, the delegation of tasks to entities of condominium management is sometimes the preferred way to avoid problems that sometimes prove themselves to be ineffective.

Believing that the internet is increasingly the preferred and convenient way for communication between different people, it is believed that through the creation of a management platform that gives relevance and prominence to the role of co-owner can create a greater mobilization and interest for intervening in the management of condominiums.

The intended platform aims to keep pace with new technologies and to make it a more interactive and dynamic activity, promoting greater mobilization by the stakeholders.

The development of the dissertation consists of five chapters divided into three distinct parts:

- Part I - Theoretical Framework regarding addressed issue (Chapter 2 and Chapter 3);
- Part II - Case Study: Development of a software architecture to support the management of condominiums (Chapter 4 and Chapter 5);
- Part III - External Analysis Platform (Chapter 6);

## 2 Theoretical Framework

### 2.1 Condominium Building

A condominium consists of a building with autonomous fractions, such as apartments, stores or garages, which belong to different owners and that, at the same time are provided with common areas for usage of all.

To what it may concern juridically, a condominium is what it is called a horizontal property, as it is written on articles 1414° to 1438°-A of the Portuguese Civil Code, where there are clear regulations associated to the definition of common areas and their administration and the rights and obligations of each owner. According to article 1430°, the administration of the common areas is characterized by the election of two organizations: a reunion of all joint-owners and the election of one administrator, who can be one of the owners or any other entity, bearing in mind that the reunion of owners has a deliberative and the administrator has an executive role.

### 2.2 Condominium Management

Despite scarce information and studies related to this subject, a study carried out by INE (2012) suggests that the average number of houses per building has been increasing for the last decades. It is then possible to conclude that the number of people living in a household with such characteristics to be called a condominium, is 40% of the population living in Portugal. According to Malheiro (2013), the companies of condominium management are equally following this growth being counted as 14000.

According to Calejo (2001), the activities related to condominium management are divided in three areas: technical, economical and functional. The technical has to do with the maintenance of the condominium, the economical is related to the financial charges of the building's running and finally the functional has to do with way the common areas are used and social coordination.

Even though all activities are important, the building's maintenance is simultaneously the most important and the most complex of all due to the fact that it encompasses a multidisciplinary team, such as the owners, engineers, fabricants, builders, accountants and many others. Therefore, it allows the adoption of different strategies such as corrective maintenance, prevention maintenance and predicting maintenance as well as a wide range of tasks like inspections, surveys, cleaning, repairing and replacing.

Therefore, it is possible to affirm that condominium management is a complex activity that needs to be well planned and organized and even though there are computer systems to support it. Brandão (2009) claims that these are more likely to be helpful on the financial features and condominium management.

### 3 Case of Study – Development of the Software Architecture that supports Condominium Management

#### 3.1 Characterization of the Electronic Platform

The platform aims to gather and organize all information of the condominium in order to support its administrator (whether that is one of the owners or a managing company) in a financial and technical perspective. This tool will not only help the administrator but all the owners, providing the fact that all of them are responsible for the decision making and part of the building's management. Also, it is aimed to integrate on this platform, a tool that allows communication between the owners and the administration or any other companies that provide services in all different areas of condominium management, being therefore used as an intermediate. Image 1 represents the basic process of this platform.

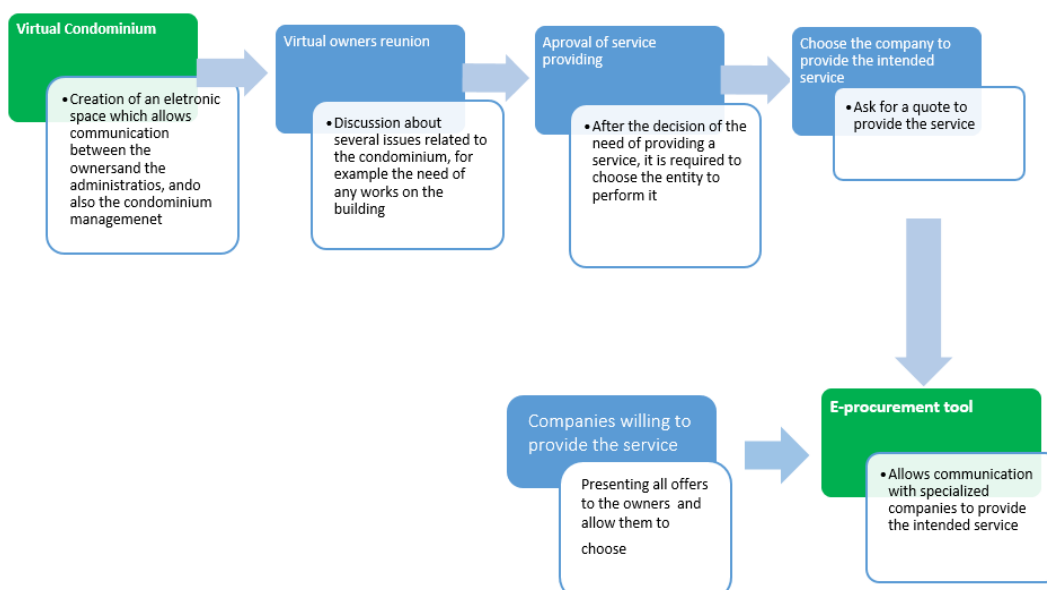


Image 1: Basic process of the platform

Therefore, the main characteristic of this platform is the ability of promoting the communication between all the intervenients in the condominium management, the platform has to take into account the role of administrators, and as such, it is necessary to create an account with specific options for the user that represents the functions of the administration of the condominium on the platform. This way, the user manages the information available to joint-owners.

Similarly, the platform has to create conditions for condominium management companies to be able to manage more than one condominium, unlike the particular condominium administrator which is solely responsible for the management of his own condominium. The service provider companies arise in context with the creation of e-procurement tool, whose duties are primarily associated with proposals to perform services at the request of users of the condominium.

The stakeholders use two different means with different features and functions to communicate with each other: Virtual Condominium and the Sourcing Portal. These are the main services of the platform.

- Virtual Condominium

The virtual condominium aims to represent the relations between the owners, making them closer to what it concerns the condominium administration, making available several tools to reach that end, such as: information records of owners, interactive communication between owners, simulation of works to be done in the building and condominium events consultation.

- Sourcing Portal

This is a toll integrated on e-procurement, which provides the establishment of commercial bonds between the owners and the companies providing services. Some of the intended functionalities for this tool are as follows: publication and submission of proposals, view ongoing contests and evaluation of service providers.

Even though these are the main features of this platform, it is intended to develop other that may be considered useful and important for the platform users, such as: mobile phone application, newsletter and news.

To understand the main characteristics and limitations of this platform, a SWOT analysis was performed, which is represented on Table 1.

**Table 1: SWOT Analysis**

| Opportunities  | Threats  | Strength  | Weaknesses   |
|--|--|---|--|
| Permanently operating platform                                       | Dependence of the number of co-owners to accept the use of the platform                    | Little competition in relation to the purpose of the software | Impossibility of budgets without visiting the site |
| Evolution and adaptation of the condominium to a technological level | Condominium management companies with own software and partnerships with service companies | Social features of the platform                               |  |

**Table 2: SWOT Analysis (Continue)**

| Opportunities   | Threats  | Strength                            | Weaknesses |
|---|--|-------------------------------------|------------|
| Mandatory constitution of a condominium                     | Lack of consumer confidence regarding the security of personal information contained in the platform | Dynamism brought by sourcing portal |            |
| Increase the competitiveness of service providing companies |  | User friendly                       |            |
| Regulation of condominium management                        |  | Innovative concept                  |            |

### 3.2 Technological structure of the Electronic Platform

It is aimed that this platform is 100% web, which means it can be accessed from any computer as long as internet connection is available.

The technological model will consist of a web page where there are restricted areas for each and every user. The web page presents the different intended services through various menus, which are identified and selected into groups according to their nature in order to allow an organized division of the content of the platform. The restricted areas of the users represent the working area and include their own functionalities. There are 3 different user areas on this platform:

- User registered as owner / administrator of a private condominium
- User registered as management company of condominiums
- User registered as a service provider company

| User Area  | Functionalities   |
|--|---|
| Particular Condominium Administrator/Joint-Owner | Access the portal "My Condominium"<br>Access the "Sourcing" portal as a buyer   |
| Condominium Management Companies                 | Access the portal "Our Condominiums"<br>Access the "Sourcing" portal as a buyer |
| Service Companies                                | Access the "Sourcing" portal as a supplier                                      |

#### 3.2.1 Usability of the portal "My Condominium"

The structure of the condominium administrator and the structure of the owner's account are equal, however, these have different features and so there are certain parameters that differ in the areas of the two actors. The account of the administrator of the condominium is responsible for creating, editing and production of documents on the platform, while the owner can view these documents and interact with other joint-owners or management.

The administrator of the condominium on the platform is the one who creates the account of the condominium, being therefore responsible for inviting the joint-owners to register on the platform. The platform also allows the passage of the administrator roles.

### 3.2.2 Usability of the "Sourcing" Portal

This tool aims to be the bridge that connects buyers (apartment owners, particular condominium administrators and condominium management companies) and service providing companies, where the first call for the provision of services and those that are interested elaborate a proposal that is sent to buyers.

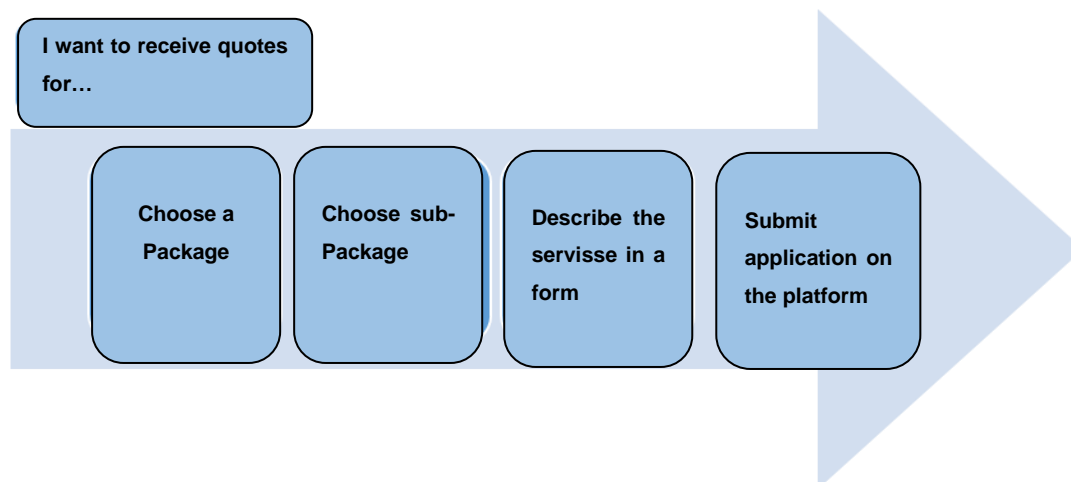
To simplify the whole process involved in this sourcing portal, the platform provides a set of packages that will cover all categories of services that are considered relevant in the management of condominiums, particularly in the technical side (maintenance and upkeep of buildings), the financial aspect (Audit and Tax Consultancy) and the administrative and legal aspects.

Regarding the buyer, the platform provides a list of existing services that are associated with packages, making the choice of the service more intuitive. For businesses, they can choose packages that represent their area of activity, thus filtering, only packets of interest. Each packet is divided into "sub-packets" that aim to differentiate the type of intervention possible in the highlighted category in the package. Table 2 represents an example of the organization of one of the "packages" created.

**Table 2: Example of the organization of the "packages"**

| Packet              |                   | Sub-Packet             |                           |
|---------------------|-------------------|------------------------|---------------------------|
| Building Facilities | Elevators (Lifts) | Maintenance Plan Lifts | Simple Maintenance Plan   |
|                     |                   |                        | Complete Maintenance Plan |
|                     |                   | Repairing of Lifts     |                           |
|                     |                   | Modernization of lifts |                           |
|                     |                   | lifts Consultancy      |                           |

It is intended that the process of sending a request for quotes is simple and practical as presented in the diagram in Figure 2.



**Figure 2: Process of sending a request for quotes**

### 3.3 Implementation of the model of the electronic platform

By implementing the developed model, it is necessary to take into account the structure of the homepage of the software and the restricted areas to each key stakeholders.

- Homepage of the software

The homepage is the entry page on the platform and intends to display the website and all its contents. This page is aims to disseminate the concept and operation of the platform, as well as the advantages associated with its use by the stakeholders.

- Client Area of the Joint-owner / Particular Condominium Administrator

For the ability to structure all services related to this area, there is a main menu that will be the way of navigation throughout the client area, as shown in Table 3.

**Table 3: Client Area of the Joint-owner / Particular Condominium Administrator**

| Item                        | Functions   |
|-----------------------------|---|
| Homepage of the client area | Displays a summary of the key information associated with the condominium activity in the platform  |
| My Condominium              | Displays all information for the management of the condominium, such as matters related to accounting, maintenance, community and others. |
| Sourcing Portal             | Provides all the information related to requests for proposals for services   |
| Message Centre              | Works as an email platform that allows communication between the various stakeholders   |
| Settings                    | Allows you to change settings regarding user data and account created on the platform   |

The main items and where the main focus of the user will be at, are the "My Condominium" and the "Sourcing Portal".

The "My Condominium" menu aims to compile all the information associated with the condominium, such as information on financial and technical, in other words, it is intended to be used as a tool to support all stakeholders in the management of the condominium. Also it will have a section to promote communication between apartment owners and a file section; where it gathers various information and documents relating to the condominium. Table 4 demonstrates the division of this menu.

**Table 4: My Condominium Section**

| Main item      | Division of the main item                     |
|----------------|---|
| My condominium | Condominium Profile                           |
|                | Condominium Financial Management (Accounting) |
|                | Condominium Maintenance Management            |
|                | Condominium Room                              |
|                | Condominium Calendar                          |
|                | Files   |
|                | My Area                                       |

The "condominium financial management" section aims to include all matters related to the accounting of the condominium, such as the movements of the account associated with the condominium, budget analysis and expense of the condominium affairs, as well as the organization of fees to be paid by joint-owners.

The "Condominium Maintenance Management" section aims to organize all maintenance activities that occur in the building such as: a list of works, the surveys made and the listing of companies contracted by the condominium. It is also aimed to provide a simulation tool for future works to support the user in choosing the ideal time to perform maintenance works.

The "Condominium Room" is an interactive portal that promotes communication between the owners, encouraging them to participate in all kinds of subjects related to the condominium and it will consist of a forum, a book of occurrences, a service of the surveys and possibility of creating an electronic journal of the condominium.

The "File" is intended to bring together a set of documents related to the condominium of which it is possible to highlight the minutes, and the regulation of condominium legislation.

"My Area" is reserved for each owner which has private information such as personal data and a map of quotas. In the administrator area in the same section, it also allows the transmission of administration and user management.

The "Sourcing Portal" mediates between the owner / manager of a condominium and service providers and is composed of the menus shown in table 5.

**Table 5: Sourcing Portal Section**

| Main item                                  | Division of the main item      |
|--|--------------------------------|
| Sourcing Portal<br>(Management Procedures) | Elaborate Request for Proposal |
|  | Proposals Received             |
|  | Order History                  |

The "Elaborate Request for Proposal" tab allows the user to choose the service package that better fits the type of service desired and the sub-package associated with it, and then fill out a form to complete the request.

The "Proposals Received" tab allows you to manage the number of proposals received to requests made as to accept or reject the proposal, terminate the procedure and view / request clarification.

In the "Order History" tab the user can access the entire history of your requests on the platform.

- Client Area of Condominium Management Company

Because these companies are equipped to manage more than one condominium, the Main Menu client area, instead of having "My Condominium" will present the item "Our Condominiums" and on that tab you can choose the condominium you want to read. After entering "Our Condominiums", the one responsible for the company's account will have to identify the condominium that want to see and that is the database platform.



- Client Area of the Service Provider Company

The interface area is distinct from other areas of users because the functions of this user are different. To structure all services related to this area, there is a main menu that will be the means of navigation throughout the client area, as shown in Table 6.

**Table 6: Client Area of the Service Provider Company**

| Item                        | Functions  |
|-----------------------------|--|
| Homepage of the Client Area | Displays a summary of the main information related to company activity on the platform (notifications and statistics)                            |
| Message Center              | Works as email platform that allows communication with the various stakeholders in the system  |
| Management Procedures       | Displays all the information relating to the management procedures   |
| History Feedback Received   | Displays the history of comments and reviews made by users (Owner / Condominium Management Companies) concerning the provision of their services |
| Statistics                  | Displays statistics on the company's history on the platform   |
| Settings                    | Allows user to change settings relating to enterprise data and of the account created to represent the company on the platform                   |

The activity focuses mainly on “Management Procedures” menu, since this section manages the entire flow of procedures that are placed on the platform. Table 7 presents the division made in this main menu item.

**Table 7: Management Procedures**

| Main item             | Division of the main item |
|-----------------------|---------------------------|
| Management Procedures | Procedures for Reply      |
|                       | Replied Procedures        |
|                       | Procedures History        |

The "Procedures for Reply" tab is considered the entry of new procedures box. This section lists all requests for proposals whose term of response has not yet finished and awaiting proposals for service delivery. Regarding the procedure, the user has the possibility to choose to produce or edit a proposal (if the user has already begun to draft the proposal and intends to continue to develop it), or not being interested, the user may refuse the procedure and can still ask for clarification or view details about the procedure.

The "Procedures Answered" tab displays the set of procedures that the service provider has applied. The proposals that were accepted can be viewed as well as those not accepted and those which the buyer has not made a final decision on yet.

In "History Procedures" tab the user can view the history of all the procedures of the platform, which includes those who responded and procedures for which no proposal was sent.

## 4 External Analysis Platform

After developing the model of the platform, it was submitted to a responsible management of condominiums entity, "Associação de Inquilinos Lisbonenses", which believes that the platform

concept, in general, is a very useful tool because it integrates all related processes related to the management of a condominium. The same entity considers that the software presents an innovative concept and it is more interactive than the usual concept of existing softwares, which might provide the most efficient management.

## 5 Conclusion

The condominium management is still a topic that generates many conflicts and is considered to have a major impact on joint-owners and on the management companies and so, the software can overcome any difficulties and transparent communication among stakeholders.

The creation of the platform favors maintenance actions and alert for the need of preventive maintenance, which may have consequences on the maintenance policy adopted by owners and condominium management, which may reveal a reduction of maintenance costs and consequently a reduction of the owner's burden.

Thus, the implementation of the software can revolutionize the management system of condominiums, and it is considered that is a distinctive and innovative tool, able to cope with the competition, which holds media which enables a reduction of costs for condominiums while allows the disclosure of companies, causing a greater dynamism in the construction and maintenance market.

## 6 References

- PGDL, "Portuguese Civil Code", [http://www.pgdlisboa.pt/leis/lei\\_mostra\\_articulado.php?nid=775&tabela=leis](http://www.pgdlisboa.pt/leis/lei_mostra_articulado.php?nid=775&tabela=leis), consulted in September 2014
- INE, "Censos 2011 – Definitive Results" (in Portuguese), [http://censos.ine.pt/xportal/xmain?xpid=CENSOS&xpgid=censos2011\\_apresentacao](http://censos.ine.pt/xportal/xmain?xpid=CENSOS&xpgid=censos2011_apresentacao), consulted in September 2014
- MALHEIRO, A., "Condominium Management - Redesign Services in Search of Sustainable Development and Promotion of Social Innovation" (in Portuguese), Msc Dissertation in Services and Management Engineering, FEUP, Porto, 2013.
- CALEJO R, "Building Maintenance - Technical-Economic Model" (in Portuguese), PhD Thesis, FEUP, Porto, 2001.
- BRANDÃO, A., "Manager of Residential Condominiums - Contribution to the Response to Issues of multifamily buildings" (in Portuguese), Msc Dissertation in Rehabilitation of Building Heritage, FEUP, Porto, 2009