

Software application development for real estate activities

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Abstract – The real estate industry is in the early stages of software application, in constant search of new tools to make the industry work more efficiently and effectively. The real estate market is differentiated by certain needs, respectively each segment of the real estate market is looking for software solutions to meet the main needs. In order to meet the requirements of the real estate market, the authors come up with a proposal to create a prototype (iMoPal), including software application development, for a product, namely an online real estate platform for property management, and the creation of a scoring system for tenant and landlord. The application offers a proficient time management solution between tenant and landlord.

Keywords software, application, program, product, real-estate.

I. INTRODUCTION

In recent business practices, there is no industry in this world that has not incorporated a software program. The real estate industry is one of the huge industries that cannot function without the predictability offered by a software program. The indispensable use of a software program comes due to the rapidly growing flow of information in the real estate market due to the proliferation of company websites, e-mails, cell phones, personal digital assistants, online connections to financing sources, and others. technological advances [1]. Due to technological progress, the real estate market attracts a very large number of workers, agencies, and even subcategorized enterprises. For example, each segment of the real estate market has its own needs. If a company focuses on customer retention, it will find software such as CRM to use its resources. In the case of employee records in large enterprises, transaction records would become a mandatory acquisition. A creative start-up or recently set up in real estate to deal with their clients could use enhanced and easy-to-use portals to connect with their potential clients.

However, the real estate industry is in the early stages of the software application, in constant search of new tools to make the industry work more efficiently and effectively [2]. Today, most solutions offered in

the real estate industry are based on Web 1.0 services. Experts believe that these services are outdated and much more work is needed. Also, in the literature, there are debates about exploring much deeper the needs for each real estate market segment and develop software applications that answer to those needs [1], [2], [3].

The present paper started from the hypothesis that the real estate market is differentiated by certain needs, respectively each segment of the real estate market is looking for software solutions to meet the main needs. In this case it is necessary a short presentation on the existing software programs and what is their utility in the real estate market.

- *Transaction Management*: This type of software is crucial and supports successful training for a real estate professional. This program provides support for sales, marketing, customer service, accounting, legal and more. Also, provides ease in managing high volume transactions.
- *Enterprise Resource Planning*: ERP software solution manages inventory and operation transactions of industrial, residential, office, properties, etc. The operation refers to the allocation and management of space, their acquisition, rental fees received land maintenance, and many other functions.
- *Data Procurement*: There is a huge amount of data that a real estate developer can store. The software automates purchases and manages purchase orders and B2B relationships. The aim of the solution is to help streamline the public procurement process, with a view to limiting documents and the challenges that come with real estate operations in remote portfolios.
- *Data Quality & Integration*: Data are stored after mapping all buildings in the interest area and helps provide a quality score for each building based on location, building status, history, environmental metrics, etc. When a huge amount of data is stored there are high chances of data being redundant and even

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unauthentic at times. In big data systems, there is a lot of repetition of data which just creates confusion and too many expenses.

- *Data Governance*: This is a tool that every real estate business faces. One needs to be very legitimate and warranted under the law. Every country has different terms and conditions which one must adhere to. Data and policies need to be in line with the law.
- *Data Segmentation*: There are times when a real estate agent wants to distribute their data based on numerous parameters, like, Gender, Age, Income Group, Location, Budget other ways are into customer segmentation, market segmentation, product segmentation, etc. The segmentation is chosen based on the decision tree technique, CART, or regression-based technique. This segregation is tedious and takes forever to sort.
- *Data Modelling*: This software model was designed to handle Brokers, their Listings, and Sellers attached to those Listings, as well as the Buyers interested in the Listings. Modeling data requires skill sets to connect everything and concluded, otherwise, the collected data are useless. The next step is to interpret the data from his conceptual basis, to make a higher grade, and to connect the data with the rest of the available information.
- *Business Intelligence*: Employing business intelligence, or BI, tools make more accurate decisions, realty firms, investors, and even home seekers stand to benefit greatly. But there is always a probability that wrong measures taken or lack of certain factors make the results not optimal. Predicting possible changes considering all parameters, factors, and possible data errors are debatable and questionable.
- *Predictive and Prescriptive Analytics*: Predictive analytics is an instrument that has never produced 100% precise results. If only one could be sure cent percent as to where to invest or where to pull back, nobody would struggle to keep their real estate business skyrocketing.

Every business, or even small, medium, and small companies, face various obstacles in this industry. Each company has its own obstacle. They know their shortcomings and where they are prone to errors. Using appropriate software programs, it will help them reduce their costs and increase their income. When adopting a

software program, in the real estate industry, it is important to classify essential business data.

In the real estate industry, it has become very vital to be able to decode and decipher the key information that draws from it. The ability to extract intelligent information from data management is still a challenge for many industries. Extraction is not the only major problem they face, including storing, analyzing, cleaning data, sharing, searching, transferring, viewing, and even the confidentiality of information. Problems can be reduced if high accuracy can be obtained in the analysis of data management. Efficient data management is the most crucial and prominent area where every segment of the real estate market stumbles [3]. Every firm needs an analysis tool to assess market conditions and trends. In today's world, there is no survival in the industry without proper tools to function [4], [5].

In order to meet the requirements of the real estate market, the authors come up with a proposal to create a prototype, including software application development, for a product, namely an online real estate platform for property management, and the creation of a scoring system for tenant and landlord.

II. PROJECT DEVELOPMENT

The name of the project is called *iMoPal*. In order to obtain the necessary data, the authors went through the necessary stages for the project development. (Fig. 1.)

- Create / update logical Data Model.
- Create / Update Physical Data Model.
- Create / Update Data.

The initialization of the project took place on 16.03.2020.

The team members were defined a day later under the guidance of the project manager. The timing of the project was based on the delivery requirements given by the client. The follow-up of the plan, of the degree of accomplishment of each task, was done periodically, usually with a frequency of 1 maximum 2 times a week. In the higher stages of realization, the frequency of meetings increased because of the increasing complexity of the taxi and the need for high communication.

The follow-up meetings took place through the ZOOM meeting, considering the current situation generated by the COVID-19 pandemic. The interdependence between tasks was presented in the project plan.

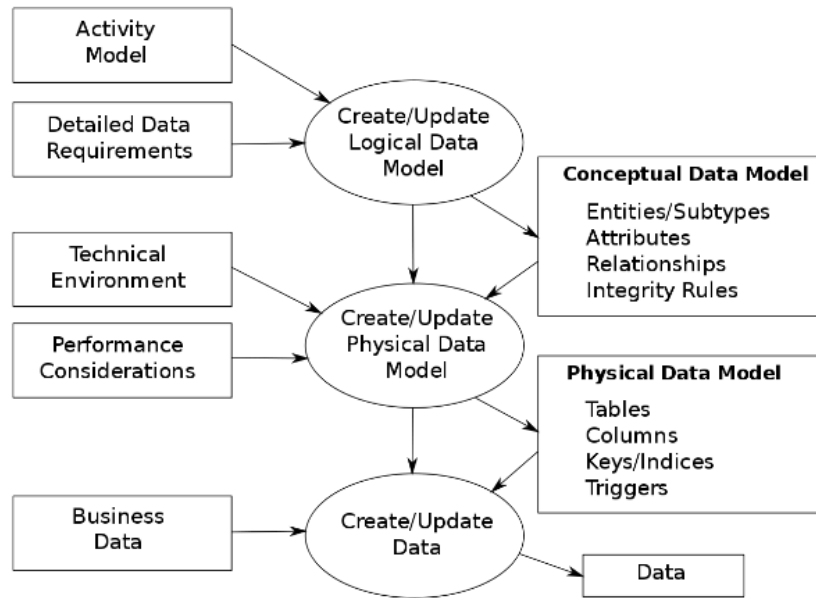


Fig. 1. Software application development

III. CREATE / UPDATE LOGICAL DATA MODEL. CONCEPTUAL DATA MODEL

In order to make an optimal software integration of the online real estate platform, the authors investigate the three operating modes described below.

1. API Module (Web server)

The web server is written in AWS (Amazon Web Services) for JavaScript in Node.js. Node.js provides a collection of built-in modules. AWS helps take the complexity out of coding by providing JavaScript objects for AWS services including DynamoDB.

We used the API (Application Programming Interface) principle to transmit information to the client or to modify or save information in the database. The application uses a NoSQL database, more precisely DynamoDB. DynamoDB was chosen because it has good performance in terms of the number of requests (10 trillion per day) and can support more than 20 million requests per second.

2. UI Module (Web site)

It is a React type application. React uses mainly three languages: HTML, CSS, and Javascript. HTML is used to create components and elements in the interface, CSS is used to customize these components. HTML and Javascript are used to create some logic for these components. React makes it painless to create interactive UIs. Design simple views for each state in your application and React will efficiently update and render just the right components when data changes. Declarative views make the code more predictable and easier to debug. The connection between this module and the webserver will be made through a "client-server" principle of the "API binding" type. In other

words, http requests are made to receive or transmit data.

3. Android and iOS Module

Mobile application versions are developed using the Kotlin programming language for Android and Swift for iOS. Swift is a compiled programming language, developed by Apple, using the open source LLVM compiler. It is designed to work with Objective-C, Apple Cocoa and Cocoa Touch frameworks. Kotlin is a statically typed programming language that runs on the JVM and is completely interoperable with the Java programming language. Kotlin is an officially supported language for developing Android apps, along with Java.

After the requirements were integrated the next section of the research starts with presenting the project activities, strategic objectives, and product configuration.

IV. CREATE / UPDATE PHYSICAL DATA MODEL. PHYSICAL DATA MODEL AND PRODUCT CONFIGURATION

The project deadlines were considered in the planning activity. These were presented and agreed with the client. These are presented below:

- Specifications completion: 13.04.2020
- Design: 27.04.2020
- Testing: 08.05.2020

The secondary activities were defined as well as the responsible persons so that the execution of the terms is not affected in any way. The project activities are followed within the team, in project meetings with a determined frequency so that the status of the actions

is closely monitored. The planning was done in MS Project.

The developed product falls under the CAEN code 6201 - Custom software development activities (customer-oriented software) and is based on Law no. 31/1990 with subsequent amendments, is an online real estate platform for property management and the creation of a scoring system for tenant and landlord. The activity field is part of the software industry in Romania, which has a value of 6.2 billion in 2019, which is increasing compared to the previous year by 10.4% [6].

Strategic objectives:

1. Increase turnover every year by 20%.
2. Creating a nationally recognized brand image in the first year.
3. Penetration of the real estate sales market in the 2nd year.
4. International expansion in the 3rd year.

Customers/users are all people who want to rent or offer a residential or commercial space for rent. In the case of private properties according to Eurostat, the number of people living in rent is approximately 720,000 in Romania. Another category of clients is real estate agencies and those who rent commercial or office space.

The main advantages of the first versions of the platform are intended for owners who rent directly. The rental process usually consists of the following steps:

- Searching for a home according to certain criteria;
- Viewing of the house;
- Signing the contract;
- Monthly payment rent.

Searching for a home is in most cases on the internet on sites such as imobiliare.ro, homezz.ro or publi24.ro [7].

Quite often the apartments presented in the ads are not the real ones and the agencies take advantage of some apartments that look very good and through this method attract customers to other more attractive apartments. Once the desired homes of interest are found, people are called to watch them. Unlike the iMoPal application where the viewing request is made directly from the application and the date and time are automatically added to the calendar.

The conclusion of the contract is usually made at a later meeting because it must be listed and then signed by both parties.

With the help of the iMoPal application, the owners have the possibility to send the contract in digital format to be signed directly from the application by the tenant, thus reducing it to a later meeting.

To pay the rent, the tenant can:

- make a bank transfer;
- meet with the owner/agent to make the cash payment;
- to deposit the amount in the owner's account.

Through the *iMoPal* application, the tenant is notified on the due date, as he has the possibility to pay directly

from the *iMoPal* application. In addition, the payment history is available for both the tenant and the landlord.

In conclusion, with the help of the iMoPal application, the time lost for finding the desired home, the time for concluding the contract, and the time for paying the monthly rent are reduced.

V. CREATE AND UPDATE DATA. BUSINESS DATA

The platform consists of several parts. For the first version of the platform, only some of them will be available as follows:

After opening the application, the user is shown the login screen where the application logo is displayed. There will be 2 fields for email and password as well as login and registration buttons if the user does not already have an account created. (Fig. 2.)

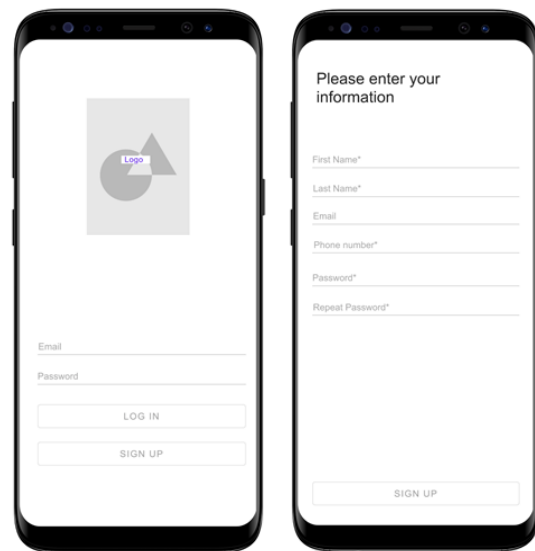


Fig. 2. Data registration

To create an account the user presses the Sign Up button. It is redirected to a screen where it adds its basic data for account creation and validation as shown.

Once the account is created, the user can log in. The user is directed to the main screen where the main property data is displayed and where he can add new properties. The main data displayed are current month's income, current month's expenses and a total representing the difference between income and expenses.

When user press one of the options mentioned above, the user is directed to a screen that displays a table that represents the entire period since he is a user. At the bottom of the application are displayed all the user's properties plus the date of the next rent and the end date of the current lease. (Fig. 3.)

An important feature of the application is when pressing the Property button, for checking the list or the Add Property button is pressed, the user is shown an Add / Edit Property screen. From this screen, you can add details about the property such as images, number of rooms, area, plan, utilities, etc. Also, from this

screen, you can add a new tenant by clicking the Edit Tenant button.

Adding a New Tenant is very simple with just a few basic details of it, once you add these details, the landlord receives a message with one to confirm the action. The tenant in turn receives an email with a link to the application and a code that verifies the phone number. In addition, from this screen, there is the possibility to conclude a contract in digital format between the landlord and the tenant (not available in the first version of the application). After entering the code by the landlord, the property is associated with the new tenant. When he creates his account, he has the possibility to see the payment amount, the payment history, and the possibility to pay online. (Fig. 4.).

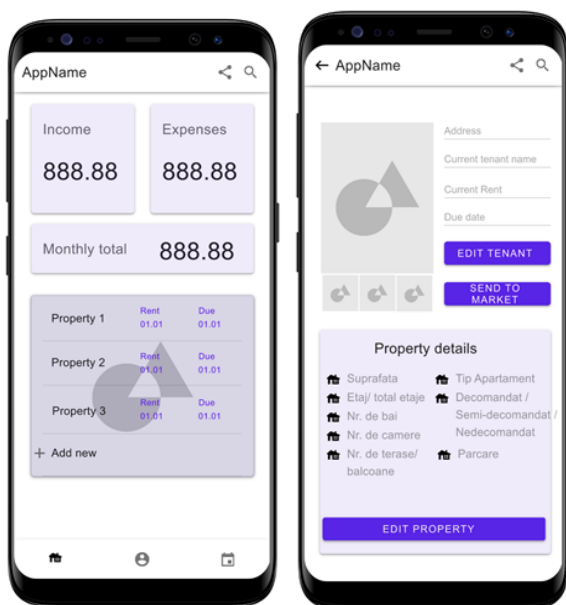


Fig. 3. Edit property details

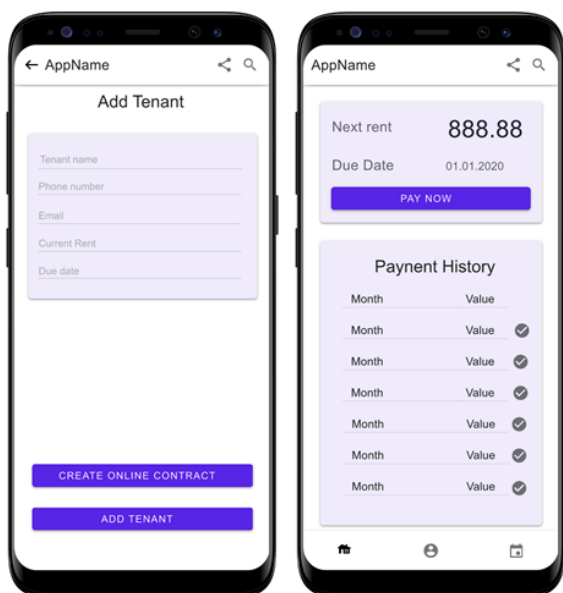


Fig. 4. Add Tenant

Searching properties for rent, users use the catalogue screen where the available properties can be filtered according to the needs of each tenant. The Rent Now button sends a notification to the landlord to let them know that a person is interested in their property.

The next step to make the application accessible, the authors detail the actions of the marketing plan from the business plan. Thereby tariffs charged for using the application are in accordance with the services offered. The pricing strategy is adopted on a long-term basis, and the first receipts are estimated to be recorded after 6 months of activity. We will practice the low-price strategy which is meant to increase sales volume to attract as many users as possible in the initial phase. (Table 1).

The price charged is influenced by:

- The number of properties owned by each owner;
- The position in the list of properties offered for rent.

Table 1. Charges prices

Product type	Price
1 Property	Free for the first 2 months and then 2€/month
More than 1 property	2 €/property/month
Rental ad promotion	5 €/week

Delivery prices are uniform and apply to all users regardless of their geographical location. The platform will be distributed through existing digital platforms such as Google Play and Apple App Store. (Table 2)

Table 2. Digital platforms prices

Platform	Price
Google Play	\$25
Apple App Store	\$100 / year

These intermediate marketing channels are short, wide, and deep. They cover storage, transport, taking over and honouring orders, screening, and merchandising. The promotion policy will be carried out by the blog related to the application site and paid promotion through social networks and Google AdSense. In addition, there will be a promotion campaign at the launch of the platform, which will be worth 500€.

iMoPal will operate in the virtual environment. The platform is distributed free and accessible from Android and Apple Smartphones as well as from any browser. According to the INS in Romania, the number of internet users is approximately 8.8 million who use the Internet with a daily frequency aged between 16-74 years in 2018 [8]. In the case of private properties according to Eurostat, the number of people living in rent is approximately 720,000 in Romania. Which results in a maximum of 720,000 property owners [9].

We calculated the market capacity starting from the assumption that only 50% of potential customers have real purchasing power (N). The average consumption

intensity (I) obtained as a product between the average size of a purchase (q = 2 euro / month) and the average purchase rate (f = 12 subscriptions / year) (1).

$$Cp = N * I = N * q * f \quad (1)$$

$$Cp = N * I = N * q * f = 360.000 * 2 * 12$$

$$= 8.640.000 \text{ Euro.}$$

The authors also identified the main competitors globally and made the matrix of the competitive profile. We identified critical success factors for our production study, we gave each factor a weight, after

which we identified 3 main competitors in the global market and evaluated them relating to each critical factor (Table 3).

The competitor who obtained the highest score is Millu who is also the direct competitor being present only in the Romanian market. The application will have an initial development period for a first version that will be launched for Android and Web mobile platforms, followed by an iOS version shortly. New features will be added constantly throughout the life of the product (Table 4).

Table 3. Main competitors

Critical success factors	Weight	TellUs		LandlordStudio		Millu	
		Rate	Score	Rate	Score	Rate	Score
Reputation	0.1	2	0.2	3	0.3	4	0.4
Market segment	0.3	1	0.3	2	0.6	2	0.6
Recording ease	0.1	3	0.3	3	0.3	3	0.3
Online payment	0.3	1	0.3	1	0.3	3	0.9
Online contracts	0.2	1	0.2	1	0.2	4	0.8
Total	1		1.3		1.7		3.0

Table 4. Development period

Stages		1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month
1	Idea conception and design						
2	API and application implementation						
	Testing						
3	Preparing for launch and launch V1						

The first month is dedicated to conceiving the idea and conceiving the visual aspect. All departments are involved in this stage. Then begins the application development period involving the server side, mobile applications (Android, iOS) and web design.

Testing is done simultaneously with development to provide superior quality. Upon completion of the first version (5 month) the application is tested in alpha and beta (a small number of users to validate the functionality of the application and receive initial feedback). Advertising campaigns are prepared for launch on social platforms and through Google AdSens. Preparing the application for Google Play and App Store.

The technologies used for the development of the platform are the following: For the server side and API are used AWS (Amazon Web Services). Mobile application versions are developed using the Kotlin programming language for Android and Swift for iOS.

The production activity will be carried out through working platforms by the three associates. The

necessary material resources are computer equipment, which are owned by the three partners, made available to the company to carry out the activity. These include laptops and the necessary software.

VI. CONCLUSIONS AND FINAL DISCUSSIONS

The real estate industry must employ digital data gathering and analysis to gain insight into specific business decisions. Software applications have huge advantages for those who want to analyse real estate data. Real estate software applications help to maintain and organize payments, rent and vacancy tracking to contract and insurance management tenants and even craft property website.

As presented in the paper the real estate market is differentiated by certain needs, respectively each segment of the real estate market is looking for software solutions to meet the main needs. Thus, the solution offered by the authors brings added value to a

market segment in the real estate industry by developing the platform iMoPal. iMoPal application improves the time for finding the desired home, the time for concluding the contract, and the time for paying the monthly rent.

The research presents each stage of the project namely client requirements, project activities, strategic objectives, and product configuration. An important stage of the research trying to point out all the strategic aspects of the marketing plan.

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