

WEB-BASED MANAGEMENT SYSTEM IN TEXTUAL FORMAT FOR OFFERS, CONTRACT AND PAYMENT FOR CONSTRUCTION COMPANY

Jetmir QAZIMI^{1*}, Festim HALILI¹, Eip RUFATI¹, Gazmend XHAFERI¹

^{1*}*Sector for IT, Office for Management of Registers of Births, Marriages and Deaths, Ministry of Justice, Government of RNM*

¹*Department of Informatics, Faculty of Natural Sciences and Mathematics, University of Tetova, RNM*

^{*}*Corresponding author e-mail: jetmir.kazimi@gmail.com*

Abstract

Construction companies do not differ much in methods of effective management and organization of work, in the evidence of services, how they control processes optimized through clear rules. Therefore, a well-organized digital management system is needed.

OCP is a web application for the realization of work services for construction companies, in the System of Managing Offers, Contracts and Payments, uses template in textual form clauses in order to act systematically to standardize their own workflow in a central place, automates until their execution.

The web application is in Albanian language, while documents are printed in Albanian and Macedonian languages, helps to consistently realize the services of the construction company to the client in three phases:

The Offer created and is only issued by the company and given to the client, has written containment for the services it offers, such as cost and other details.

The Contract contains a lot of information is the second phase when client and construction company agree on the way of project implementation such as cost, term of realization, payment deadline, third intermediary etc.

Payment is the document that includes the deadline and the payment of the project implementation, additional payments for works carried out of the agreement.

The three completed documents have a unique identification number, title and containment of the document, with clear attributes to which client they belong, the employees who are issuing the document and the data of the company that carries out the project.

A summary of reports in the form of a table for all processes carried out from the beginning to the end of the process, as well as the printing of reports by filtering them by client, periods between dates.

System users have two privileges, Admin Staff having full access to the entire system while the user Staff with limited access can only create offers but not contracts and payments. Any data created is identified user data.

The OCP system can be installed in Webserver or Cloud, using technologies PHP MySQL and JavaScript, implemented in the Web-PWA (Progressive Web App) platform and responsive design for use on PC, laptop, tablet, phones, depending on the country and time it operates.

In terms of security, soft-delete techniques are used for deletion of data, this allows you to mark some records as deleted without actual deletion from the database, Effectively, you prevent the selection of a soft-delete record, while all old records can still be referred to.

Therefore, this particular menu article has systemic management of Offers, Contracts and Payments because they contain periods of time between them from the beginning of projects to the realization. They are created and supported safely and clearly for selecting and adapting to constantly changing conditions. Digitizes and stores all three documents in a central location in the database and system; Automates the workflow focusing on the creation and execution of the offer, contract and payment, expands in volume with the addition of new data.

Keywords: Construction Company, Online Management, Offers-Contracts-Payments, Documents.

1. Introduction

Regardless of their size and complexity, construction companies need a way to process and access their offers, deals and fees to know what rights and commitments they have to clients. However, although this seems self-evident, many companies lack a centralized bid and payment management system that constantly provides information, such as dates and key details in writing, of changes during the construction phase of project implementation.

The fact is that OCP's management software can deliver business excellence by simplification of the process in steps - from modeling the Offers document, to creating Contracts document to the final workflow ending in Payment document.

- The company saves a lot of time.
The entire process is simplified, and any employee authorized under the privileges is able to create a standard Offer, Contract and Payment using textual content.
- Remove risks.
Such a system will reflect changes in real time, so that all parties involved have consistent data. In addition, there will be a record of all changes, so you can reset any previous steps.
- Easily accessible data at any place and time.
The system consolidates all data in one place. So, you can easily search through reports, and Access data to identify possibilities of errors and new risks. To make more informed decisions.

Both sides of the construction project should cooperate on the principle of justice and voluntary and sign a written contract and payment. The content of the offer, contract and project payment, includes many information such as construction cost, quality of construction project, time of construction project, etc. In the process of contract execution, things that cannot be evaluated, such as the strain of misuse, will directly or indirectly affect the contract itself, even lead to the change of the contract. If the change is negative, it is likely to cause the construction of the project itself, which could result in immaculate losses. To ensure the interests of both parties, we need to strengthen the level of project management and optimize the treatment according to occurrence.

2. Problem Definition

Project analysis is related to the realization of project construction by construction companies to be as accurate as possible in management, because projects in the process of construction, many times they encounter the demand for change from investors, and that made the offer, the contract and the payment more difficult.

We believe that implementing a Web-based bid offer, contract and payment management system, with the characteristics of electronic documents, it can improve the efficiency and time performance for construction companies.

3. Research Methodology Used in the Present Study

Secondary data was used for the present study. The secondary data were collected from university literature, the various research publications, books, journals, magazines and bulletin etc.

4. System architecture and implementation

The web system is a responsive design, framework in MVC (Model View Controller) built in PHP programming language and MySQL database, as well as for frontend, JavaScript, bootstrap 4.1 is used. It can be installed on a web server or cloud server.

Before you start using the system, Admin Staff User.

- User Staff (limited access) and Admin staff (full access) users are registered.
- Data provided in settings, company name and responsibility, logo, email, contact number, Bank Rekords.
- Register the client, filling out the form with inputs: name, surname, selected type is a physical person or juridical person, identification number, mob number, address etc.

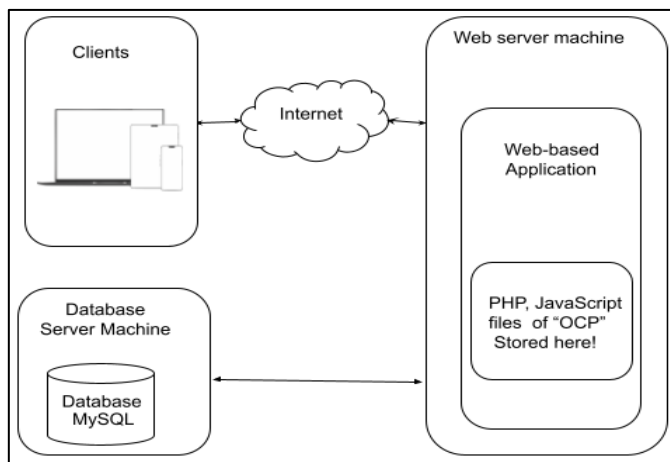


Figure 1. System

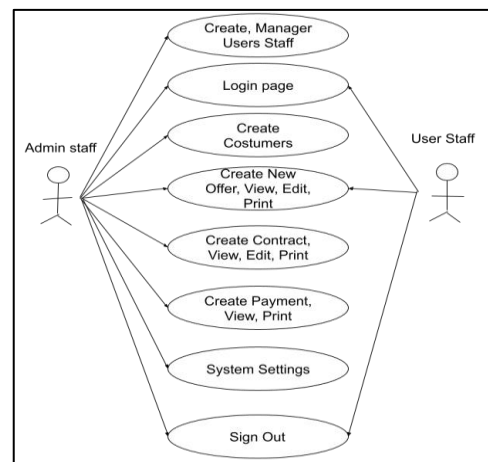


Figure 2. User Case

As seen by user case diagram in figure (Fig. 2) Admin Staff has full access to the system, due to serious competence and the escape of misuse, Admin staff can change settings, create clients, offers, contracts and payments, while the limited User staff has access to system login, creation of offers, search for offers that are made according to user id, which identifies the user itself. The system code maintenance and the way of execution, have special hierarchy and security. For each document submitted in the database, the "Transactions" function is used to ensure that the data is entered complete, in cases where there is interruption during the process of code execution.

Soft-Delete technique is used throughout the system, as employers, Admin staff and user staff, Deletion of Offers, Contracts and Payments.

To clearly show the operation, steps and connection of work in the system, we have shown it through the activity diagram, see (Fig. 5).

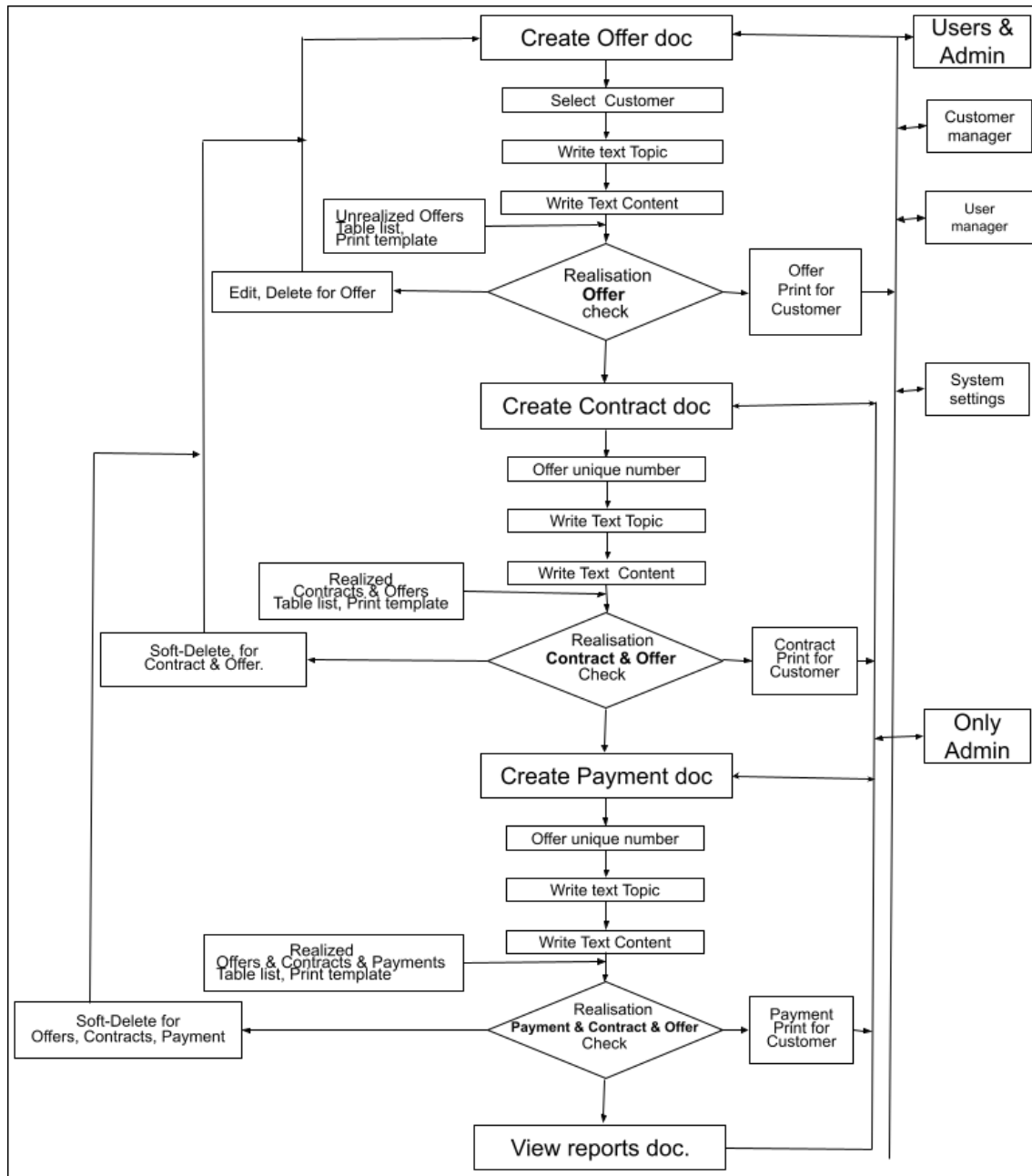


Figure 3. Activity diagram

In an interactive way, we filled out the forms with the data for Offers, Contract and Payments, as well as registering clients, info for the construction company and system settings.

4.1 Create Offer. As seen in figures (Fig. 4) the offer creation is done by users staff that has limited access, a client is selected from the list of options, In the “Title offer”, we write the name of the project that will be implemented, while in the text area the description of the offer, the content of the offer is written. To (Fig. 5), we may search offers by name and surname of the client, or ID number of client, search between two dates, after that in table we have button for view print template and button for Edit Delete.

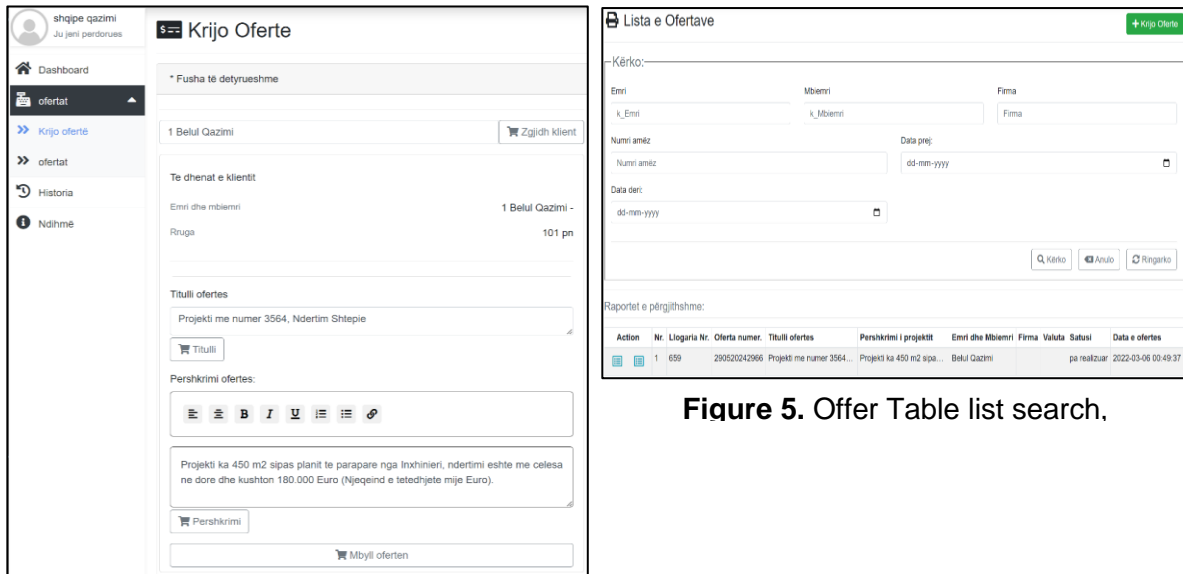


Figure 5. Offer Table list search.

Figure 4. Create

In (Fig. 6) we have a template document for printing, then the costumer is handed the document printed on paper or in an electronic PDF document. By this act the offer is called created.



Figure 6. Offer Print Document

4.2 Create Contract. Creation of the Contract is the second stage, after the client accepts the offer, the process begins with entering the unique number of the Offer that is autogenerated by the system.

Usually, in terms of content the Offers have fewer details, in order to make it easier to create the Contract, we get the data from the Offer that is displayed in gray text, such as the title and content of the offer, which we can then use as reference, or text clause, to create the title, which can be the number or name of the project created by the civil engineer, as well as the content of the contract to create the new contract, by writing the title of the contract that can be a text or number that includes the name that also contains text containing the details of the project to be carried out, such as the deadline for the realization, the payment of contract, the mention of the mediating parties, etc.

And finally press the Submit button to insert the data into the database, then the window for printing the document template will appear, which is given to the client, in printed form on paper or in electronic PDF document format.

The screenshot displays a web application interface for creating a contract. On the left is a sidebar menu with the user profile 'Jetmir qazimi, Ju jeni Admin' and navigation items: Dashboard, Konsumatori, ofertat, marreveshjet (selected), Krijo marreveshje, marreveshjet, fletepagesat, Stafi, Konfigurime, Historia, and Ndihmë. The main area is titled 'Krijo Marreveshje' and contains a form with the following sections: 'Fusha të detyrueshme' with a field for 'merr numrin e ofertes fatures' containing '290520242966' and a 'Merr numrin e ofertes' button; 'Te dhenat e klientit' with 'Emri dhe mblemri' '1 Belul Qazimi -' and 'Rruga' '101 pn'; 'Titulli ofertes' with a text area containing 'Projekti me numer 3564, Ndertim Shtepie'; 'Pershkrimi ofertes' with a text area containing 'Projekti ka 450 m2 sipas planit te parapare nga Inxhinieri, ndertimi eshte me celesa ne dore dhe kushton 180.000 Euro (Njeqind e tetedhete mije Euro)'; 'Titulli marreveshjes' with a text area containing 'Realizimi i ofertes me numer 290520242966, per projektin me numer 3564.' and a 'Titulli marreveshjes' button; and 'Pershkrimi marreveshjes' with a rich text editor containing 'Projekti ka 450 m2 sipas planit te parapare nga Inxhinieri, ndertimi eshte me celesa ne dore. Nga oferta, cmimi eshte dakorduar te ndryshohet ne 178.000 Euro (Njeqind e shtatedhete e tete mije Euro). Pagesa behet ne 3 keste. Projekti perfundon ne Tetor 2026' and a 'Pershkrimi marreveshjes' button.

Figure 7. Create

In (Fig. 8), we can search for Contract according to the client's first and last name, or ID number of client, search between two dates, after that, in the table we have button for view print and button for Edit or Delete. As seen in the table, the contract is a branch of the offer. Now the offer is not on the waiting list, because it has been negotiated.

Marreveshjet e mbyllura & Raportet + Krijò Marreveshje

Kërko:

Emri: Mbiemri: Firma:

Numri amëz: Data prej:

Data deri:

Raportet e përgjithshme:

Action	Nr.	Llogaria Nr.	Oferta numer.	Titulli projektit	Pershkrimi i projektit	Emri dhe Mbiemri	Firma	Valuta	Statusi	Data e ofertes	-----
<input type="button" value="Print"/>	1	659	290520242966	Projekti me numer 3564...	Projekti ka 450 m2 sipa...	Belul Qazimi			realizuar	2022-03-06 00:49:37	
Action	Nr.	marrveshja numer.	Titulli marreveshjes	Pershkrimi i marreveshjes	Emri dhe Mbiemri	Firma	Valuta	Statusi	Pagesa	Data e marreveshjes	
<input type="button" value="Print"/>	1	290520242966	Realizimi i ofertes me numer 2...	Projekti ka 450 m2 sipas planit...	Belul Qazimi			realizuar	pa paguar	2024-05-29 00:48:03	

Figure 8. Contract and Offer Table list search, print and

In (Fig. 9) we have a contract document template for printing, then the customer is handed the document printed on paper or in an electronic PDF document. With this act, the offer is called created.

Print **Marrëveshje/Договор:** 290520242966 Data/Датум: 2021-12-17 22:34:32

Prej/Oд: **Ndërmarrje ndërtimore/Градежно претприатие VIA BAU** Deri te/До: **Stopanska Banka / Стопанска банка**

Kontakt person/Лице на контакт: **Harun Ibrahim** Person fizik/Физичко лице: **Xhiro Llogaria/Жиро Сметка: 210-5017191150-44**

Email/Емаил: **via-bau@outlook.com** ID kons./ИД конс: **49373677** Numri i tatimit/Дабочен број: **1221245452**

Mob./Моб.: **076292660** Chelopez/101 pn, Tetove Mob./Моб.: **070564452**

Titulli marrëveshjes/Наслов на Договор:
Realizimi i ofertes me numer 290520242966, per projektin me numer 3564.

Përmbajtja/Соджина:
Projekti ka 450 m2 sipas planit te parapare nga Inxhinieri, ndertimi eshte me celesa ne dore. Nga oferta, cmimi eshte dakorduar te ndryshohet ne 178.000 Euro (Njeqind e shtatedhete e tete mije Euro). Pagesa behet ne 3 keste. Projekti perfundon ne Tetor 2026.

Kushtet dhe vërejtjet/Услови и забелешки:
Kushtet dhe vërejtjet - Pas nënshkimit të marrëveshjes mes dy palëve, eventualisht edhe detyruesues, kjo marrëveshje vërtetohet në mënyrë ligjore. Çdo shprehje rreth jashtë marrëveshjes paraprakisht pas nënshkimit, klienti duhet të bëjë pagesë shtesë. - Avansi pas marrëveshjes
 Услови и забелешки - По потпишување на договор помеѓу двете страни, евенуално и посредничок, овој договор се потврдува и законски. Секое додатна работа вон потпишаниот договор, клиентот треба дополнително да ја плати. - АВАНС по договорот.

Dorëzoi/Предал: jetmir qazimi Kryetari/Преседател: _____ Konsumatori/Потрошувач: _____

Ju faleminderit që na besuat! Благодариме на довербата!

Figure 9. Contract Print

4.3 *Create Payment.* During the construction process, there are many cases when the project must be modified, as a result the contract also changes. The changes to the contract and the cost of the additional service that the construction company has implemented and realized are written in the payment section.

- The creation of the Payment begins with entering the unique number of the contract, we receive the data that appears in gray text, such as the title and content of the offer, which we can then use as a reference, or text clauses to create the title that can be the number and name of the project that the civil engineer created and the content of the contract to create the document, writing the title of the contract, that can be a text or number that includes the name that also contains.

\$

Krijo Pagese

* Fusha të detyrueshme

merr numrin e Marreveshjes Merr numrin e Marreveshjes

Te dhenat e klientit

Emri dhe mbiemri 1 Belul Qazimi -

Ruga 101 pn

Titulli Marreveshjes

Pagesa e Marreveshjes dhe Ofertes se realizuar me numer 290520242966, per projektin me numer 3564.

Pershkrimi Marreveshjes

Nga Marreveshja me klientitn ka patur kerkesa per pune shtese, ndertimi i 2 (dy) ballkoneve me vlere 4.000 euro (kater mije euro), si rrejdhoj cmimi eshte ndryshuar nga 178.000 Euro (Njeqind e shtatedhjete e tete mije Euro). ne 182.000 euro(Njeqind e tetedhjete e dy mije Euro). Dhe me kete dokument projekti

Titulli Pageses

Pagesa e Marreveshjes dhe Ofertes se realizuar me numer 290520242966, per

Titulli Pageses

Pershkrimi Pageses

☰
☰
B
I
U
☰
☰
🔗

Nga Marreveshja me klientitn ka patur kerkesa per pune shtese, ndertimi i 2 (dy) ballkoneve me vlere 4.000 euro (kater mije euro), si rrejdhoj cmimi eshte ndryshuar nga 178.000 Euro (Njeqind e shtatedhjete e tete mije Euro). ne 182.000 euro(Njeqind e tetedhjete e dy mije Euro). Dhe me kete dokument projekti konsiderohet i perfunduar.

Pershkrimi Pageses

☰ Mbyll Pagesen

Figure 10. Create Payment

Similar to the Offer and Contract, we can search Payment according to the client's first and last name, or by ID number of client, search between two dates, after that, in table we have button for view print and button for Edit or Delete.

As can be seen in the table, the contract is a branch of the contract and the offer. With the act of payment, the project is called closed and completed. In one place, the three tables are branched as separate documents, which reflect the evidence of the project from the beginning to the realization. It is also a history of electronic archiving report documents that can be used for the needs of the construction company.

Fletepagesat & Raportet + Krijo Fletepagese

Kërko:

Emri: Mbiemri: Firma:

Numri amëz: Data prej:

Data deri:

Action	Nr.	Llogaria Nr.	Oferta numer.	Titulli projektit	Pershkrimi i projektit	Emri dhe Mbiemri	Firma	Valuta	Statusi	Data e ofertes	-----
<input type="button" value="Print"/>	1	659	290520242966	Projekti me numer 3564...	Projekti ka 450 m2 sipa...	Belul Qazimi			realizuar	2022-03-06 00:49:37	
Action	Nr.	Marrveshja numer.	Titulli marrveshjes	Pershkrimi i marrveshjes	Emri dhe Mbiemri	Firma	Valuta	Statusi	Pagesa	Data e marrveshjes	
<input type="button" value="Print"/>	1	290520242966	Realizimi i ofertes me numer 2...	Projekti ka 450 m2 sipas planit...	Belul Qazimi			realizuar	paguar	2024-06-29 00:46:03	
Action	Nr.	Fletepagesa numer.	Titulli fletepageses	Pershkrimi i Fletepageses	Emri dhe Mbiemri	Firma	Valuta	Statusi	Pagesa	Data e Fletepageses	
<input type="button" value="Print"/>	1	290520242966	Pagesa e Marrveshjes dhe Of...	Nga Marrveshja me klientin k...	Belul Qazimi			realizuar	paguar	2024-06-29 00:46:03	

Figure 11. Payment, Contract and Offer Table list search,

Print Data/Датум: 2021-12-17 22:34:32

VIA BAU **Pagese/Наплатница:** 290520242966

Prej/Oд: **Ndërmarrje ndërtimore/Градежно претпририате VIA BAU** Deri te/До: **Stopanska Banka / Стопанска банка**

Kontakt person/Лице на контакт: **Haxun Ibrahim** Person fizik/Физичко лице: **Belul Qazimi** Xhiro Llogaria/Жиро Сметка: **210-5017191150-44**

1227, Çellopek/Челопек, Tetovë/Tetovo MK ID kons./ИД конс: **49373677** Numri i tatimit/Дабочен број: **1221245452**

Email/Емаил: **via-bau@outlook.com** Chelopek, 101 pr, Tetove Mob./Моб.: **076292660** Mob./Моб.: **070564452**

Titulli pageses/Наслов на Наплатница:
Pagesa e Marrveshjes dhe Ofertes se realizuar me numer 290520242966, per projektin me numer 3564.

Përmbajtja/Содржина:
Nga Marrveshja me Klientin ka patur kerkesa per pune shitese, ndertimi i 2 (dy) ballkoneve me vlerë 4.000 euro (kater mije euro), si rejdhoj cmimi eshte ndryshuar nga 178.000 Euro (Njeqind e shtatedhete e tete mije Euro), ne 182.000 euro (Njeqind e tetedhete e dy mije Euro). Dhe me kete dokument projekti konsiderohet i perfunduar

Kushtet dhe vërejtjet/Услови и забелешки:
Fletepagesa duhet te ruhet.

Dorëzoi/Предал: jetmir qazimi Kryetari/Преседател: Konsumatori/Потрошувач:

Ju faleminderit që na besuat! Благодариме на довербата!

Figure 12. Payment Print

In (Fig. 12) we have a payment document template for printing, then the customer is handed the document printed on paper or in an electronic PDF document. With this act, the payment is established.

5. Functionality Testing

All functionality in the web application, database connections, and forms used by users to enter data to display, edit, retrieve, or delete information were examined. The web application has been tested.

Some functionality requirements were tested during the test:

- Security Testing,
Security was tested by pasting the internal URL directly into the browser address bar without login by User Staff with limited access or not an authorized user.
For the database is used PDO connection, to prevent SQL injection. SQL MAP tool, Acunetix Web Application Security Scanner was used to test all pages in the web application.
Also, when the employer (User Staff) or external user abuses, or needs to edit marks or information for other customers if he edits the ID in the URL the system will redirect to the logout page or home page.
Ex: (index.php?page=konsumatori_edit&id=6) if the user tries to edit the ID number to access other customer information or other hacking.
- Validation and Required.
(Fig. 8) is showing function code for the user identification number that is Required field and validation, you can write fixed 6 numbers for the customer Juridic person and 13 numbers for the customer Physic person with no space, same validation for Cyrillic's, Albanian letters, numbers, etc.

```
if (empty($_POST["nr_amez"])) {  
    $validated = false;  
    $nr_amezErr = "Numri amëz i detyrueshëm";  
} else {  
    $nr_amez = clean_input($_POST["nr_amez"]);  
    if (!preg_match('/^[0-9]+$/', $nr_amez)) {  
        $validated = false;  
        $nr_amezErr = "Lejohen vetëm numra (pa hapësirë)";  
    }  
    if (strlen($nr_amez) <> 13 && strlen($nr_amez) <> 5) {  
        $validated = false;  
        $nr_amezErr = "Lejohet vetëm gjatësia e numrit për person fizik deri në 13 shifror dhe person juridik 6 (pa hapësirë)";  
    }  
}
```

Figure 11. Validation and

- Remove risks.
Security was tested by pasting the internal URL directly into the browser address bar without login. SQL injection SQL MAP tool was used to test all pages. Also, when the employer (Admin Staff, User Staff) needs to edit marks or information on the settings page if he edits the id in the URL the system will redirect to the logout page, home page, Error 401 not authorized access, Error 404 page not found and error page when JavaScript is not installed.
Ex: (index.php?page=konfigurime) If the user staff with limited access tries to edit the ID number to access to other user information or other hacking.

- Database Testing.
Data consistency is critical. Data integrity and errors were checked for corrections, deletions, document changes, or any DB-related operations. Additionally, ensured that database queries were executed correctly, and that data were properly retrieved properly updated, and backed up.

6. Conclusion

In the context of rapid development of small and medium-sized businesses, the number of construction projects per year increases, as well as the construction methods and project content being updated. In this process, the well-centralized management of contracts, offers and payments is a powerful guarantee. Quality, cost and timely delivery of the project can also promote efficient operation and coordinated management of both parties to the contract. Currently, there are still many problems in contract management and construction project claims. All parties need genuine evidence during the project implementation, to create a complete offer, contract and payment management mechanism and to implement dynamic management. The system promotes the further development of construction projects in the Republic of North Macedonia.

References

- [1] "Intelligent Contract Management" - This research paper published in International Journal of Scientific and Research Publications, Volume 3, Issue 1, January 2013 ISSN 2250-3153. [Online]. Available: <https://www.ijsrp.org/research-paper-1301.php?rp=P13650>
- [2] "What is a management system?" – Article [Online]. Available: <https://www.dqsglobal.com/intl/learn/dqs-knowledge-center/what-is-a-management-system>
- [3] "Payment management system" – Article [Online]. Available: <https://www.avidxchange.com/glossary/payment-management-system>
- [4] "Offer Management" - In book: The Evolution of Yield Management in the Airline Industry, Origins to the Last Frontier (pp.241-269) [Online]. Available: https://www.researchgate.net/publication/351964889_Offer_Management
- [5] Kenneth C. Laudon and Jane P. Laudon Inc., 2014. *Management Information Systems; Managing the Digital Firm*. 3rd Global ed. Kenneth C. Laudon New York University, Jane P. Laudon Azimuth Information Systems.
- [6] "What Is Service-Oriented Architecture?" – Article [Online]. Available: <https://medium.com/@SoftwareDevelopmentCommunity/what-is-service-oriented-architecture-fa894d11a7ecm>
- [7] "Towards a Maturity Model for IoT Adoption by B2C Companies " – Article [Online]. Available: https://www.researchgate.net/publication/367818216_Towards_a_Maturity_Model_for_IoT_Adoption_by_B2C_Companies