Southeast Europe Journal of Soft Computing ISSN 2233 – 1859
Available online: http://scjournal.ius.edu.ba

Vol 13, No. 1, March 2024, pp. 86-91

Modeling the Advancement of Sanad Services Implementation in the Sultanate of Oman

[1*]Muhammad Azeem Qureshi, [1]Mohamed Ashk M., [1]Fatima Naif Fail Al Aamri and [1]Malak Sami Hadid Al Amri

[1]College of Computing and Information Sciences,
Information Technology Department,
University of Technology and Applied Sciences - Salalah,
Salalah, PC211, Sultanate of Oman
*muhammad.qureshi@utas.edu.om

Article Info

Article history:

Article received on 31 12 2023

Received in revised form 21 01 2024

Keywords:

Sanad Services, Visa Application Processing, Visa Renewal Processing, eOman, Digital Transformation

ABSTRACT: One of the widely most used service providers across the Sultanate are Sanad Service Centers. They provide number of services for various purposes to facilitate people. Some of the services are related to Government offices such as Ministry of Labor and Royal Oman Police [3]. The Sanad Service Centers are licensed offices [3] and few of their services are intermediary in nature between the applicants and Government bodies. The Sanad Offices are operating physically and processing the request of different types of applications for individuals and companies such as visa processing, visa renewal and many others. To avail the offered services, physical handling of documents and visits are needed which can be transformed based on the idea of this paper is presenting. The advancements in this sector will have a major impact in a bigger scope to facilitate the large number of end-users with convenience and simplicity.

The paper highlights the transformation and implementation of Online Sanad Services and will discuss the advancements of digital transformation to mobilize the services accessible to end-user in better, fast, timely, remotely, and secure manners. The transformation of Sanad Services from brick-and-mortar to click-and-mortar scenario will be an advantage and beneficial for all the stakeholders. It will reduce the chances of documents misplacement and ensure the availability of the contents for reuse as some of the services are required to complete and repeat on periodical basis due course of time.

The study aims to design an industry specific model that can serve in the implementation and development of Online Sanad Services to meet the challenges of modern world requirements. The basic elements discussed and represented in this paper are the solution architecture comprises the system architecture, process modeling, data flow modeling, entity relationship modeling, and system requirements of the proposed system.

1. INTRODUCTION

This paper addresses and deals with the real life problem and provides a mechanism for a better solution using the tools and techniques of information system analysis and design. The Sanad Service Centers are small and medium sized enterprises (SMEs) [4] and providing services to individuals and private sector companies. On regular basis they are dealing with thousands of people and companies to process their number of different types of applications in Government institutions such as visa renewal and processing that includes issuance of new visas, renewal of existing visas. Visa handling and processing is one of their key services though which every expatriate residing in the Sultanate of Oman has to go though and complete their legal existence and work requirements in Oman. Their services are not limited to visa processing. They are offering preparation of contracts, processing contracts, typing of documents, processing online documents, and various other e-services.

Although, the Sanad Service Centers are efficiently handling the processing of applications but requires physical presence of the applicant to be present in their offices to handover and look after the application submitted through them. People reported suffer from crowding in Sanad offices and spending time in waiting queues still exists and is a real world problem that requires ample time and does not help them to finish their applications comfortably, identified through the Survey conducted and is available as Annexure-A.

The idea of this paper is to suggest a model that contains the analysis and design of an information systems that can be implemented and helps in developing an application to digitize some of the services of Sanad Offices to offer online. There is a great scope of this paper to be utilized and implemented to facilitate and help the community. The proposed system will be the first of its kind in the Sultanate of Oman. The system will provide the facilitation services to its clients online and will reduce the physical requirements of meetings in an efficient manners. The implementation of such project will be purely cost effective idea and useful in nature. It will help to view the progress of each application in the system. There will also be an ability to view the requirements of each application as well as the ability to complete applications remotely. The communication mechanism will be there to correspond with the Sanad office. It will be useful to identify the requirements of different types of applications to prepare before its submission. The implementation of the proposed model will be a novel addition in the services offered in the Sultanate.

The proposed model is developed after the explorations from the relevant people through interviews and questionnaires to identify the need of the advancement in the existing procedures. Further, the existing processes are studied and mapped to the modeling of the different technologies involved in the development of a technological solution as an information system.

2. PROBLEM STATEMENT

The main problem with existing methods in taxonomy prediction, OTU clustering, and denoising is the tradeoff between computational time and accuracy. The length of short reads has a huge impact on this challenge. Furthermore, the best performing tools often may not be open-sourced and free.

NGS technologies provide short reads and huge sequencing depth at a much lower cost. Hence, recent metagenomic projects shift to focus on the sequencing of only a single or combination of two or more hypervariable regions. Therefore, specialized tools are needed for highly accurate taxonomic classification of species using these short length sequences.

3. BACKGROUND

There is always a room for improvement and technological advancement in every sector to meet the challenges of modern world and fulfill the requirements. The objective of every sector industry is to provide support and services at utmost satisfaction level within their limitations. The area identified in this research paper are transforming some of the processes of said industry to digitize it and will be cost effective way to manage and promote working environment.

The Sanad Service Centers are one of the biggest service providing entities in Sultanate and any improvement in their business process will have a large impact and promote the society and economy. There might be a possibility that any individual Sanad Service Center is using their own Information System to manage their work effectively. The problem of handing mass level of documentation and requirement of presence will be reduced after the implementation of the proposed system. The proposed model will provide assistance to develop a generic information system

which can be adopted and used by any Sanad Service Center as their operations are uniform in nature. The system will be a game changer and will be available online and convenient for people to access and work 24/7 conveniently.

Usually, any information system consist of application interface following the business logic and rules and a storage where the data is stored. The paper will describe the modeling of all the basic elements required in the information system such as the modeling of database, the flow of information, participating entities, and the system requirements.

4. METHODOLOGY

Initially, the investigation started with informal interviews and then conducted a survey to know the details of the people experienced it. The objective of the questionnaire was to identify the need and importance of transformation in the procedures of Sanad Service Centers. The response rate of the respondents was 85% and they belong from the targeted group those who accessed and experienced the relevant services. The preliminary results were positive and have provided a scope of vital development in this sector.

System analysis and design approach is used to evaluate business situations and develop ways to improve in an optimal manner. Rapid Application Development (RAD) methodology is used which is an adaptive software development model and will be useful is existing situation [5].

5. SANAD SERVICE INDUSTRY MODELING

The modeling process of Sanad Service industry is to build model of part for this industry with their required process models, data models, functional modeling are essentials for the development of the information system.

5.1. System Architecture

According to IBM [2], “Three tier architecture is a well-established software application architecture”. In this architecture there are 3 separate layers describing the functionalities of the system. The following diagram shows the system architecture of the proposed system as shown in figure 1.

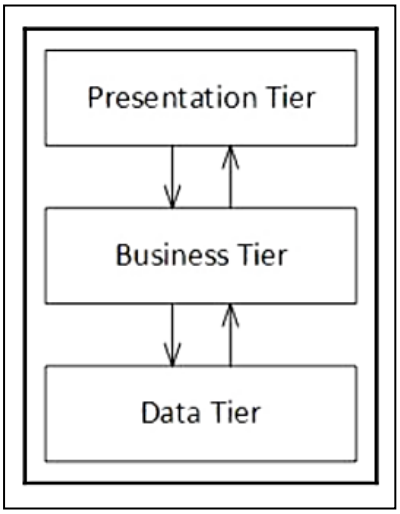

Figure 1: The Tier Architecture [1]

The proposed system follows the 3 tier architecture. In this architecture, the presentation layer consist of user interface through which a user can interact with the system, the business tier represents logic and sometimes referred it as an application tier in which the application executes, and data tier represents the storage or database where the data is stored and accessed by the system or an application.

5.2. Functional Requirements

The functional requirements describe the services the system should provide [7]. It represent what the system should do and its features and functions. It is described as a set of inputs, behaviors, and outputs used in the system. As for the suggested front-end features, below is the list of the functional requirements given in Table 1:

Table 1: Functional requirements of the system categorized by users.

Sanad Admin	Sanad Staff	Client
• Login/Logout • Create Sanad Staff account • Add, update, and suspend accounts • Manage services and documents • Assign application to Sanad Staff • Monitor application status	• Login/Logout • Update account details • Receive application • Process application • Update application status • Communicate with clients • Print Report	• Register Account • Login/Logout • Update account details • Apply for service • View details of service • Check application status • Send/View message • Provide

• View feedbacks • Generate reports	feedback

5.3. Data Flow Diagram

The data flow diagram depicts the logic models and express data transformation in a system [8]. The level 1 diagram showed in figure 2 is depicting the involved external entities and these are Sanad Admin, Sanad Staff, and Client. There are four high level processes namely User Account Management, Authentication, Application Processing, and Service Management.

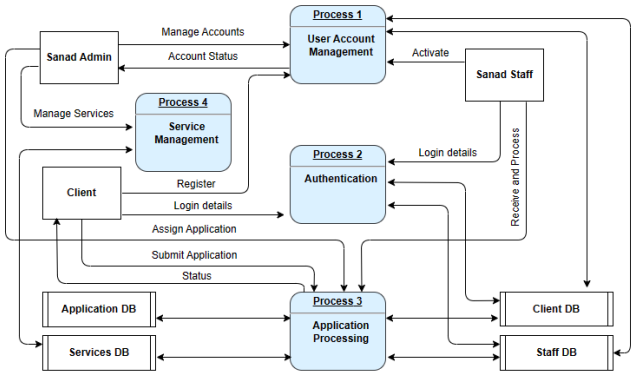

Figure 2: Level 1 Data Flow Diagram of a proposed system

There are three external entities exist in the diagram (figure 2) and these are Sanad Admin, Sanad Staff, and Client as follows:

Sanad Admin: Sanad Admin is responsible to manage the overall processes of the system which includes providing access, and management of Sanad Staff and Client user accounts. The application initiated or requested by Client will be sorted and forwarded to Sanad Staff by the Sanad Admin. Admin is responsible to check the status of assigned application. Further, can add new services and modify the existing services and the details of existing or new documents.

Sanad Staff: Sanad Staff entity is representing the staff working in a company and receiving the applications assigned to them by Sanad Admin. They are processing the application and updating its status and interacting with Clients.

Client: Client entity is representing the client user and having interacting with first three processes.

There are four high level processes exist in the diagram (figure 2) and these are:

Process 1: All three external entities are interacting with Process 1, User Account Management. The Sanad Admin will interact in this process to authorize, activate, and manage Sanad Staff and Client user accounts. The Sanad Admin can change the status of both the said type of user accounts upon need or request. Sanad Staff can update their information in this process. Client can register themselves and upon confirmation they can access their user account by following Process 2. The Process 1 is connected with Staff and Client data stores.

Process 2: The authentication process allows Sanad Admin, Sanad Staff, and Clients to access the application and enable themselves to continue work in the system.

Process 3: The application processing process is a key process which has involvement of all the existing entities and data stores in it. In this process a Client can submit an application or work with the existing services. The application generated by Client will be received by Sanad Admin and will be forwarded to Sanad Staff to process the application and update the status on each step. The status of the application can be seen by all. The process allows comments to interact between Sanad Staff and Client and vice versa. The service data store is used to choose the type of service required in the application. The application will have the information of Client accessed from Client data store who has submitted the application and the Sanad Satff data stores is used to keep the information of staff handling the assigned application.

Process 4: The Service process will be solely used by the Sanad Admin to add/modify the types of services offered by the Sanad Office. It further includes the documents required for each service.

5.4. Entity Relationship (ER) Modeling

The ER-Model is one of the important element of the system design which describes how the data will be stored in the database according to the given requirements. “In relational database management systems, a relation will have the set of records and the set of attributes that are depicted by a logical structure called ER Diagram” [6].

The Entity Relationship (ER) Model showed in figure 3 is illustrating the participating entities in the system.

The model consists of eight entities representing Sanad Staff, Client, Application, Service, Application Service, Document, Comment, and Upload.

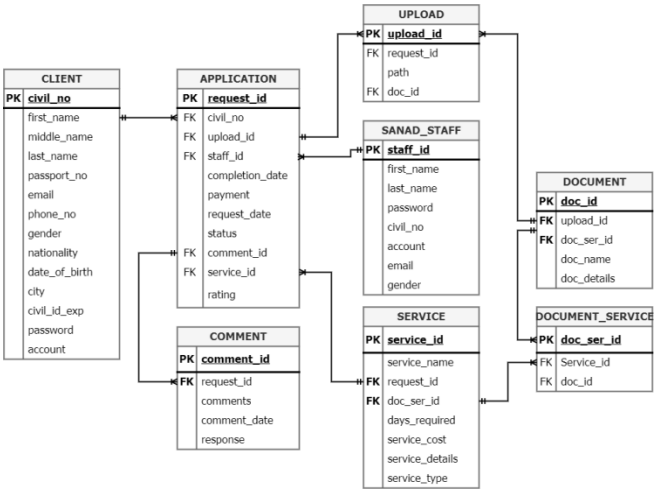

Figure 3: Entity Relationship Diagram of the proposed system

The Sanad Staff entity will store the information of the staff operating in the Sanad office. It contains the details of the staff along with their system login details that contains their passwords which will be visible to the concerned staff to change. The attribute ACCOUNT is used to maintain the status of the account whether it is enabled, disabled, or admin type. The enabled account value states the staff is active and permitted to use the system. In case of leaving or suspending the account, disabled status can be changed. The admin status value is considered enabled and reserve administrative privileges to operate the system. All the account attribute values can be changed by the admin account and can't be seen by other Sanad staff users.

The Client table will keep the information of clients upon their registration in the system. It includes the basic client information and login details.

The Service table will have the types of services offered by the Sanad office like visa processing and renewal services etc.

The Document table contains the different types of documents required in different types of services. The table will contain each type of document as a single instance e.g. Passport.

The Document Service table will keep information of documents required in various services. This table will illustrate the number of documents required in particular service.

The Application table will store the request of application initiated by the Client. The table is connected with Sanad Staff to track the applications assigned to staff to process and having status to display.

The Comment table is used for the communication between Sanad Staff and Client to manage the queries and correspondence.

The Upload table is used to store the location of the documents uploaded by Client associated to each application according to the service chosen.

6. DISCUSSION

A basic industry specific model for Sanad Service sector is developed. The specified model can be used to implement conveniently to design an application software. It is a kind of generic model which specifies all the key elements which are required to design an application software meeting all the basic requirements of particular industry. The provision of payment processing has not been considered as some of the payments are to be made at thirty party ends.

This paper is a part of and derived from the work of B. Tech Project of Database Systems specialization at University of Technology and Applied Science, Salalah. The scope of the proposed research work has its true implementation of a real world problem's solution and undertaken as a project to implement and accomplish to benefit the community.

7. CONCLUSION

The proposed model for development of an information system for Sanad Service Centers clearly presents all the steps and a preparation involved and caters all the involved technical development work. The system is being developed in a Cloud technology to make it accessible for all the operating Sanad Service Centers without the hassle of managing the technical infrastructure at their own premises. Subsequently with minor modifications it can be deployed and become usable.

8. FUTURE WORK

The construction of working system is a critical stage of development. This paper is implementing the proposed planning and development and lies under

implementation stage. Its prototype is under development and will be available to test and showcase the undertaken work as a challenge to promote and support Oman's vision 2040.

The development of the application is carried out using Oracle APEX that delivers the convenient way to build and deploy applications that supports variety of platforms such as Mobile, Web, and Desktop apps. The idea of accessing application from various types of devices and platforms is a key accessibility feature for its users to interact without any limitations. The application development environment is a web browser so can be accessed anywhere without any pre-requisite software installation. The application interface is having three major modules of provisioned services for admin, staff, and client users and each one of the users has to verify its user's identity through the authentication process to gain access to an application. Implementation of data validations at all required places are identified and will be placed. The assortment of test cases comprises is unit testing, system testing, and user acceptance testing. Each of the stated modules will have the relevant features for its user. The development platform uses Session State Protection available in Oracle APEX and it is a security feature that helps prevent tampering with session state values. Session state refers to the information collected and maintained by Oracle APEX for a particular user's session, session variables, including user input, and other session-specific information. The application will be secure as it designed in secure and equipped with well-defined safety features provided by Oracle APEX platform and will be deployed on Cloud for its maintenance free management and better accessibility.

9. ACKNOWLEDGEMENTS

We are thankful for all the support provided by the Information Technology Department, University of Technology and Applied Science, Salalah and our project Supervisor Mr. Muhammad Azeem Qureshi for his continuous support, guidance, and motivation.

REFERENCES

[1] Joseph Ingeno, "Software Architect's Handbook", Packt Publishing 2018, pp 222, ISBN 978-1-78862-406-0.

[2] "What is Three-Tier Architecture", IBM, https://www.ibm.com/topics/three-tier-architecture, accessed on 14 Oct 2023.

[3] "Sanad Service Center Law", https://www.sanad.om/smartformsOnline/PublicSite/Home/SanadCenterService, accessed on 28 Oct 2023.

[4] "Program and Initiatives", SME Development Authority, https://sme.gov.om/en/programs-and-initiatives/sanad-service-centers accessed on 28 Oct 2023.

[5] Riffat Naz and M. N. A. Khan, "Rapid Applications Development Techniques: A Critical Review", International Journal of Software Engineering and Its Applications, Vol. 9, No. 11 (2015), pp. 163-176, DOI: http://dx.doi.org/10.14257/ijseia.2015.9.11.15

[6] Patni, Jagdish & Sharma, Hitesh & Tomar, Ravi & Katal, Avita. (2021). Database Management System: An Evolutionary Approach. DOI: 10.1201/9780429282843.

[7] Philip A. Laplante and Mohamad H. Kassaab, "Requirements Engineering for Software ans Systems, 4th Ed.", CRC Press, p6 pp1, DOI: 10.1201/9781003129509.

[8] Luhach, A. K., Jat, D. S., Hawari, K. B. G., Gao, X. Z., & Lingras, P., "Advanced informatics for computing research". In Second International Conference (ICAICR 2021), Springer, p16 pp1, 2021, DOI: 10.1007/978-981-16-3660-8.