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Declaration

I hereby certify that this report constitutes my own work, that where the language of others is used, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of others.

I declare that this report describes the original work that has not been previously presented for the award of any other degree of any other institution.

Date: 27/04/2023

Signed

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1. Introduction

In this report we will be designing and implement a new system for an organisation, that will allow easy access of the population information for a smooth and operating business. We have been provided with a SQL database that will obtain information regarding on countries and cities concerning population. In this project the aims are to create a user-friendly system for generating reports on population rankings based on provided requirements such as country, continent, region, spoken language, and city population. In addition, the system will also include features such as the system will have the capability to add new data to the database, and potentially integrate security measures with login credentials, and potentially relevant functions to improve the overall usability and efficacy of the system. (1)

Research Question or Problem that will be Addressed:
Research Questions:

- How can a new system for population information using a SQL database be designed and implemented to improve the accessibility, efficiency, and accuracy of generating required reports for an organization?
- Explain what design considerations should be considered to ensure that the system can effectively organize and sort population data by using various criteria, for example country, continent, region, city, and language?
- What are some additional features, for instance data integration and security measures, that can be included in the system to improve its usability and security? (2)

Hypothesis:

The suggestion put forth in the proposal is that the organization can improve its population data reporting and decision-making capabilities by designing a system that permits users to easily access such information. The system ought to generate reports based on different criteria. Moreover, it must furnish a user-friendly interface that allows a seamless navigation and interaction with the database, thereby elevating the system's overall usability and effectiveness. (3)

Aims:

The system being developed aims to provide comprehensive and precise population statistics at different levels, including global, continental, regional, and national. Reports generated will be based on the organization's specifications, covering country, city, capital city, and population data. To ensure a user-friendly experience, the system will integrate supplementary features such as data addition and security measures, with an intuitive interface enabling effortless accessibility to population information. Automating data retrieval and report generation will simplify the population reporting process, reducing manual effort, and minimizing potential errors, resulting in more accurate and efficient reporting. Ultimately, this project aims to deliver valuable data-driven insights, enabling evidence-based decision-making in areas like resource allocation, program planning, and policy development, by analysing population trends, patterns, and demographics. (4)

Objectives:

To achieve the project's goal of delivering a fully functional population data management system, several objectives have been identified. The first objective involves conducting a comprehensive analysis of the organization's population data requirements to determine the specific data elements and attributes needed to meet the organization's information needs. Next, the database system will be implemented, alongside with a user-friendly interface that will be developed, emphasizing usability, accessibility, and visual appeal, to facilitate easy access to population data and enable intuitive user interaction. The system will automate data retrieval and generate reports through different filtering options on different pages, thereby eliminating the need for manual data analysis and reporting, reducing manual effort and minimizing potential errors. The system will be thoroughly tested and validated to ensure compliance with project requirements, with comprehensive training. Ultimately, the project aims to deliver a complete and functional system, ready for deployment and immediate use, including the ability to generate all the reports needed. (5)

Background:

This project aims to address the gap in the existing literature and technology landscape on population data management, its purpose is to develop a tailored and robust system capable of managing large amounts of data with user-friendly interfaces, automated data retrieval and reporting. The project's objective is to design and build a comprehensive, user-friendly, and secure population data management system to meet organizations specific needs. The project's complexity arises from integrating several technologies, including database management systems, data retrieval and reporting tools, user interface design frameworks. This challenging and intricate task is fitting for an MSc-level project, and the background investigation strongly supports its significance, forming a solid basis for its execution. (6)

2. Design or Methodology

For this project, the Scrum methodology will be utilized as part of an Agile project management approach, with a cross-functional team comprising members with diverse skills and experience, including front-end and back-end development, database management, and project management. To manage the project effectively, regular meetings will be conducted for sprint planning, daily stand-ups, sprint reviews, and retrospectives to plan the project efficiently, track progress, and improve the process continuously. Design techniques like user stories and use cases will be used to delineate the application's requirements and features, while industry-standard development tools such as Visual Studio, Git, and Docker will be used to promote efficient and collaborative development. PUG for HTML templating and Node.js and Express.js for building the back end will be employed, with a suitable database management system selected depending on the project's specific needs. To ensure a stable and reliable application, continuous integration and deployment methodologies will be followed, with automated testing and deployment pipelines set up. Collaborative tools such as Microsoft Office, Slack and Monday will facilitate communication, coordination, and documentation among team members, and quality assurance practices will be integrated throughout the project to ensure the application's reliability, security, and performance.

Alternative Approaches

- The choice of technologies for developing the CRUD application is crucial to the success of the project. While other options like Python with Django could have been considered for the back end, and Angular, React, for the front-end, the team decided to use Node.js and Express.js for the back-end, and PUG templates for the front-end. This decision was based on the team's expertise with these technologies and their suitability for the project requirements. Node.js is known for its fast performance and ability to handle many concurrent connections, making it ideal for building scalable web applications. Express.js is a popular web framework for Node.js that provides a minimalistic approach to building web APIs, making it suitable for rapid development. PUG templates are user-friendly and offer a clean and efficient way to generate dynamic HTML content, making them a great choice for building the front-end of the CRUD application.

- The methodological choices made for managing the software development process could have been different, with other Agile methodologies like Scrum, Lean, or Extreme Programming (XP) being considered instead of Kanban. The choice of methodology depends on several factors, such as team size, project complexity, and organizational culture. However, the team opted for Kanban as the Agile methodology, as it provides a well-defined framework for organizing work into sprints, with regular meetings for planning, reviewing, and improving the project. It promotes transparency, collaboration, and adaptability, which are essential for successful project management. (7)

3. Implementation or Results:

The implementation of the design results in the successful development of a CRUD application that meets the requirements and functionalities outlined in the project plan. The application is fully functional, allowing users to read and filter data from a web interface, which is connected to a backend server and a database. The website has different pages, consist of:

- "World database" page, where you can find the population of the world.
- The "Gallery" page, here you can find picture from all over the world.

- The "Data" page, where you can search cities by first letter or by inputting full city name, this page includes three filtering option one is selecting number of rows to display, the other is to select a website to display and the last one is to sort the data.
- The "About" page Is the page you will find information about the team, including introduction each staff members role.
- The "Update Page where you can fill in some information to update the database.
- The "Register", "Login" and "Account" page where a user can register and login to his own account.

Evaluation:

The project team successfully achieved all its objectives and deliverables, resulting in a high-quality and fully functional CRUD application that met all performance, functionality, and quality standards. The team delivered the project on time, demonstrating effective project management and resource utilization throughout the project lifecycle. The team also identified areas for improvement and best practices, which can be applied to future projects to enhance outcomes and efficiency.

4. Conclusion:

Reflection:

To conclude this report explains the steps taken to create a system for organizations to access population information easily using SQL database to gather data on countries and cities' population. The system was able to generate user-friendly reports on population rankings including features for adding new data.

When reflecting on the project, teamwork was an essential part in ensuring that this project was completed successfully. When starting the project, we were able to sit down and communicate with each other about each person's strength and weakness before dividing the work out, this ensured that we were able to enhance everyone's strength and work on helping with weaknesses. As we had organised ourselves from the start, we were able to as a collective complete individual tasks.

Regular team meetings and using Kanban made it easier for the team to stay updated about deadlines and the task we needed to complete. Of the back this we were able to achieve almost all the objectives, each team members were able to communicate if assistances was needed this meant

that we were able to learn new skills as well as improve the current skills we obtained. Due to this the tasks were completed on time resulting to completing the project earlier than the deadline.

Future work:

For future work the enhancement or changes we would make to our website to better it is by adding more features to it such as allowing the user the ability to input a specific number of rows to display. With these additions the project will work at its full potential. Lastly an addition for the team we feel that more practice was needed regarding the use of PUG this would have helped with getting more familiar with the software.

5. References:

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(6) "World population dashboard," *United Nations Population Fund*. [Online]. Available: https://www.unfpa.org/data/world-population-dashboard. [Accessed: 27-Apr-2023].

(7) "Agile Project Management with scrum." [Online]. Available: https://www.pmi.org/learning/library/agile-project-management-scrum-6269. [Accessed: 27-Apr-2023].

6. Appendices:

The following documents are included as references for this project:

- User Stories: detailing the functionality and requirements of the software from the user's perspective.
- Backlog: a list of features to be implemented in the software, prioritized according to user needs.
- Use Case Definitions: describing how users will interact with the software in different scenarios.
- System Architecture Diagram: illustrating the high-level structure of the software and its components.
- Code of Conduct: outlining the standards of behaviour expected from all project participants.

Additionally, all project files and source code are available on the project's GitHub repository.

https://github.com/xdKinso/SoftEngGroup