

Employee performance management system

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Executive summary

This project presents an employee management system, which aims to improve communication between managers and employees, enhance workers' efficiency and simplify administrative processes. The project was developed throughout the year. The system includes a feedback system, report system, messaging tool, performance management and goal setting tools.

Various tools were used in the development of the project. The solution involves computing-based principles such as UI design, backend, and secure data storage. The result is a finished system, that works, stable and secure. Most of the requirements were met.

Introduction

In many organizations bad communication and lack of systematic employee performance tracking lead to inefficient work. Managers often struggle to manage schedules, give tasks and monitor progress without some software.

By creating such a system, we aim to provide companies a tool for clear communication and improving productivity.

Our solution provides a centralised system to monitor workers and communicate with them tailored for both small and mid-sized companies. The system has a simple design and interface, so it is quite easy to integrate into companies' management systems.

This report presents the background and related work, project approach, execution process, evaluation results, conclusions, and future work.

Background and related work

In fact, similar systems already exist, e.g. BambooHR, Connecteam, Clockster. However, the features of most virtual employee management systems focus on salary, attendance and leave management [1]. Our approach is to create a system that mainly relies on a feedback system, so employees can track their productivity and improve it based on statistics. It was proven scientifically that managing performance may impact workers' productivity in a positive way. "When employee evaluation is consistent with the strategic mission of the organization, it can help the development of an effective performance management system"[2].

Therefore, our approach was slightly different so our system could be unique.

Project approach

System design:

There are three user types in the performance management system: employee, manager and system admin. They all were stored in the same table “users” because they share the same information: ID, email (served the purpose of login), password, name and surname. To distinguish between the roles a boolean feature “is manager” was added. Also one more boolean feature “first login” was added, so newly added employees and managers would be able to set a password by themselves when they log into the system for the first time.

Special role - system admin was introduced in order to add new employees and managers and to set an employee-manager relations between them. ID “1” is reserved for the system admin and they are the only user and the only record in the entire database added directly to it, after the database is created. System admin has their own web-pages available in the system to add new users and relations between them, so, as a result, no one has direct access to the database. This feature of a system helps with data availability.

When an admin creates a new user they set a randomly generated password to the new user which is messaged through email. When the new user logs into the system for the first time, they are redirected to another page where the system asks them to create a new password. After that, a new hashed password is stored in the database and the “first login” field is changed to false. A user won't be able to function without changing password.

The way only certain data being available to certain users is further maintained for employees and managers. An employee can access their personal information, their own goals list, own reports and feedback to these reports given by their manager. An employee can add goals for themselves only and message their own manager only. The manager can access own personal data, view goals and monthly reports of own employees only. The manager can add new goals to their employees, send them feedback and message them. In conclusion, an employee can communicate and exchange information with their manager only; and a manager can communicate and exchange information with their employees only.

As it was said before, the goals can be set either by employees themselves or by their managers. Goals are set for employees only. The start date of a goal is set automatically to the current date when a goal is created. Title, end date (the deadline) and description is provided by the author of the goal. The manager additionally chooses who the goal was created for. Each goal has its own status: “in progress”, “early”, “on time” or “late”. When the goal is created the status is “in progress” by default. When the goal is marked as completed, its database record is updated. The “completed at” field which is NULL by default is set automatically to the current date and goal status is changed either to “early”, “on time” or “late” if the goal was completed before the deadline, at the day of deadline or after the deadline, respectively. This is done by comparing “end date” and “completed at” fields. Only managers can delete goals.

Goal status is used to evaluate the performance of employees. Two metrics are used for it: completion rate and efficiency score. Completion rate is the percentage of goals completed “early” and “on time” out of all goals set for the month. Efficiency score is also shown as percentage. It calculated by this formula: (number of “early” goals * 1.2 + number

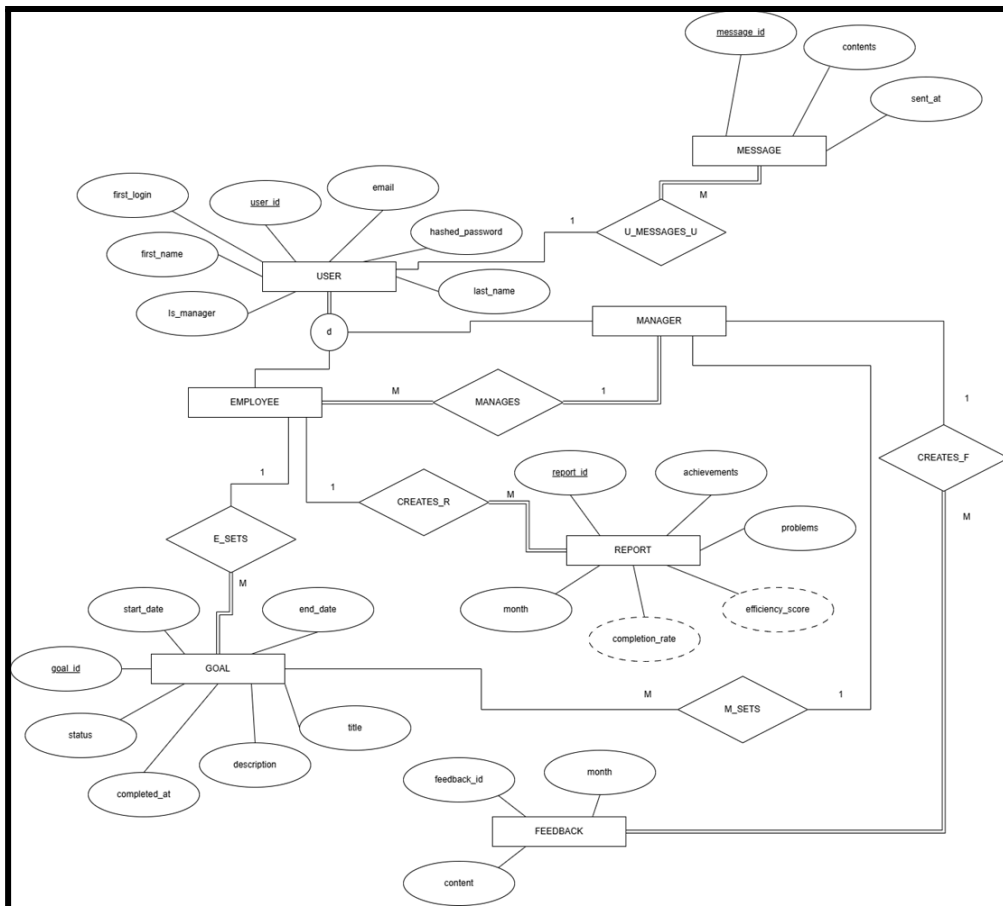
of “on time” goals * 1 + number of “late” goals * 0.5) * 100. When calculating completion rate and efficiency score for the month only those goals whose end date (deadline) was in that month are considered.

In order to share their own performance with the manager, an employee generates a report. Report includes completion rate and efficiency score calculated automatically by the system. An employee also enters a month, achievements and problems by themselves. Default value for month is the month before the current one.

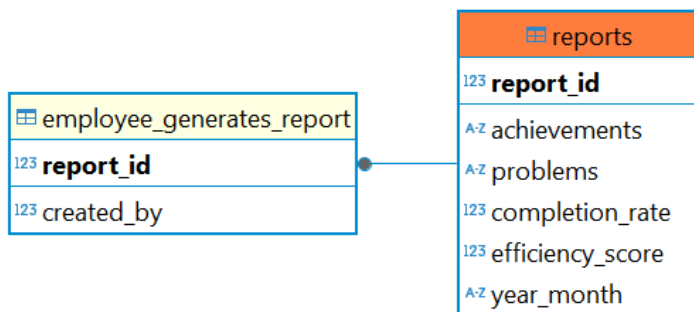
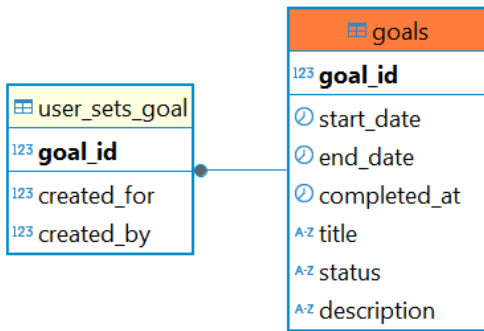
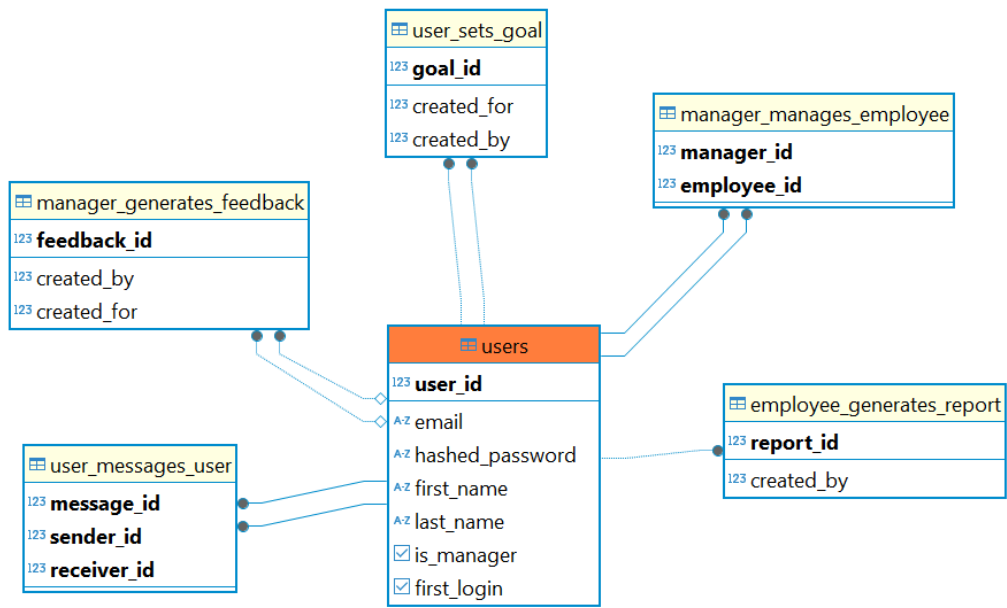
In response to the report the manager can send feedback to the user. The month is set automatically based on the month of the report. Manager writes the feedback by themselves and sends it to the employee. Each manager can only send feedback to their own employees.

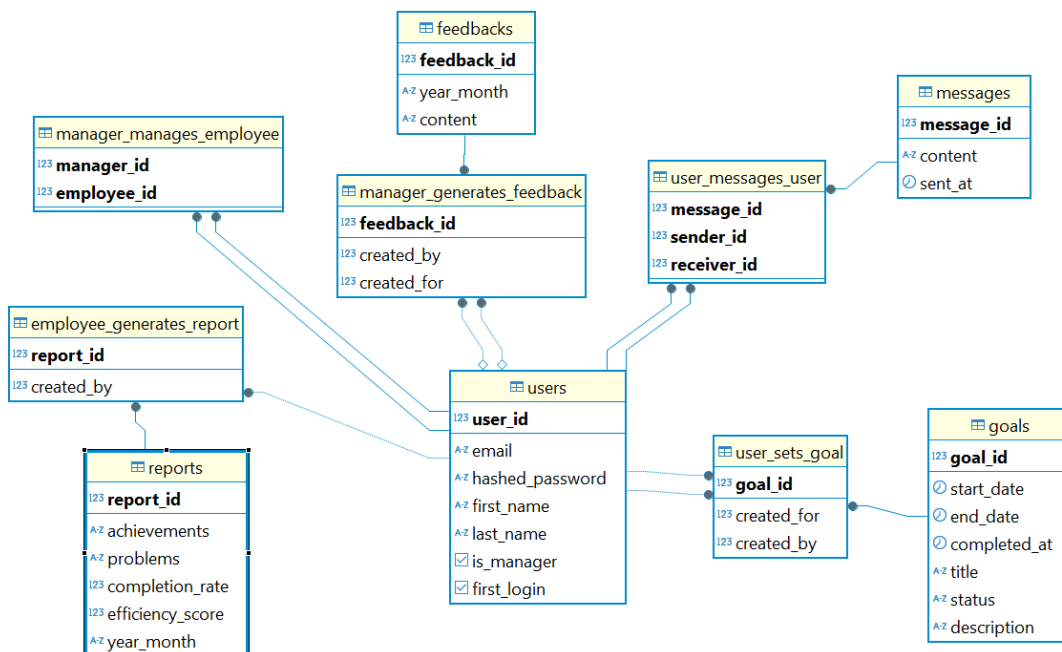
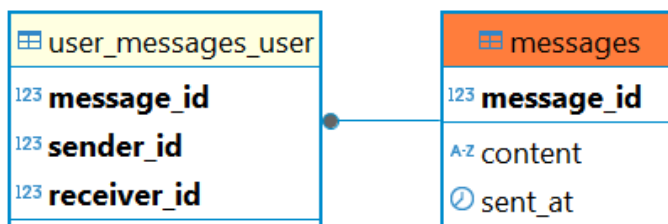
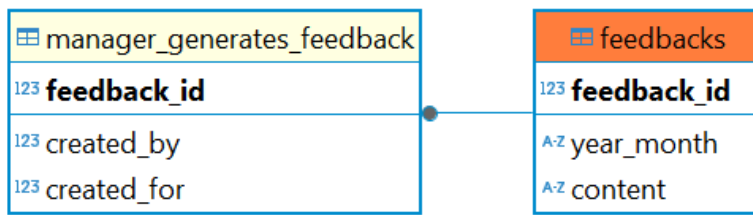
For better communication between managers and their employees messaging is introduced. An employee can only message their manager; a manager can only message their employees.

An employee can view their performance for the past months in the form of completion rate and efficiency score comparison.



Database implementation:





Various SQL functions and triggers were added to the database to ensure correctness of entered data and that roles and access levels of employee and manager are maintained properly.

Functions ensure that:

- In the table “manager manages employee” employees are added to the “employee id” field and managers are added to “manager_id” field
- In the table “user set goals” goals can only be created for an employees
- In the table “user set goals” goals whether manager creates a goal for own employees or an employee creates a goal for themselves
- In the table “employee generates report” only employee can be the author of report
- In the table “manager sends feedback” only manager can be the author of feedback
- In the table “manager sends feedback” manager can only create feedback for their own employees
- In the table “user messages user” an employee can only message their manager
- In the table “user messages user” a manager can only message their own employees

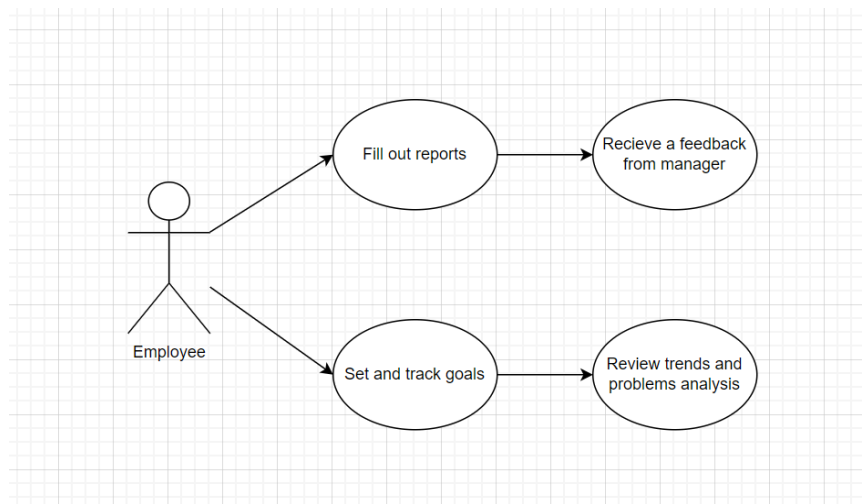
Functions of the front end:

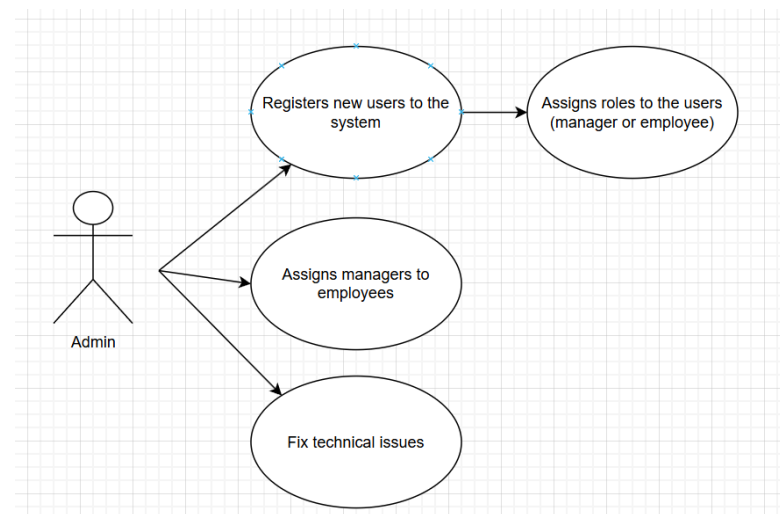
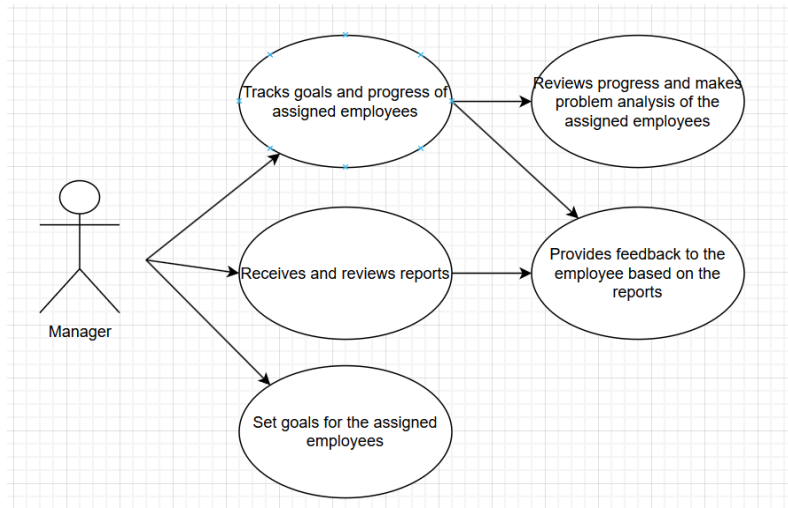
- Providing user-friendly interface, that can be understood intuitively
- Providing easy-to-understand forms for accessing the database and communicating with other users

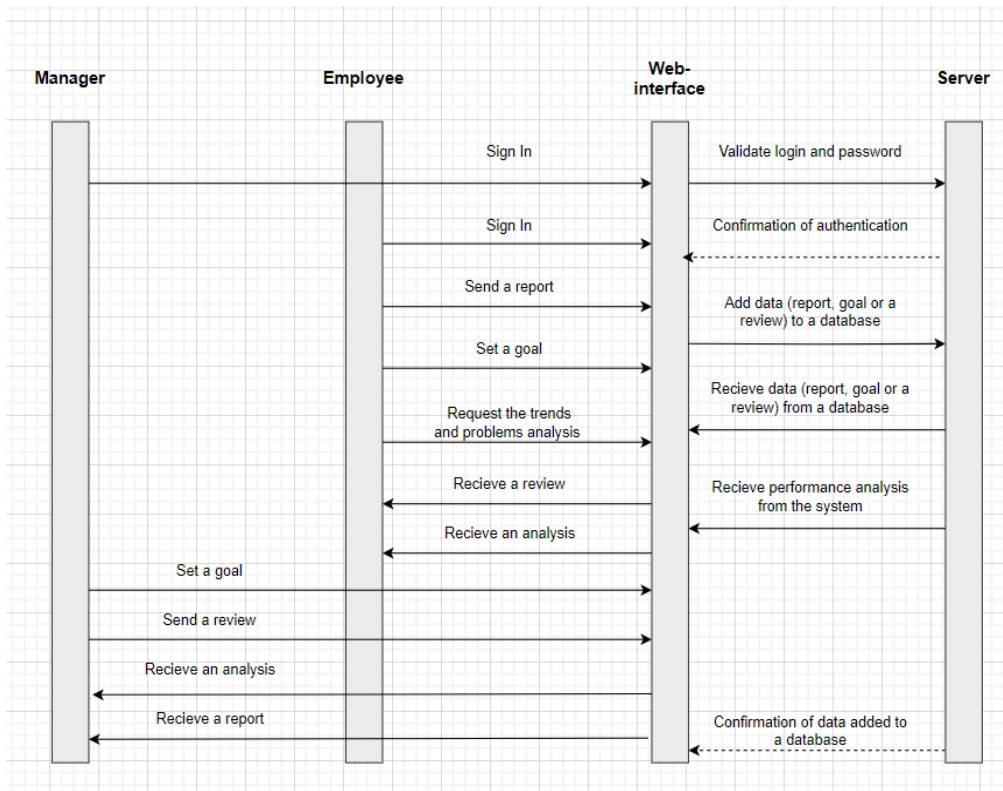
Functions of the back end:

- Connecting users to the database so insert, select, update and delete functions can be implemented without the need to access database directly
- Generating a random password for a new users for the first logging into system then forcing them into changing password
- Calculating completion rate and efficiency score
- Providing user communication

Use case diagrams:







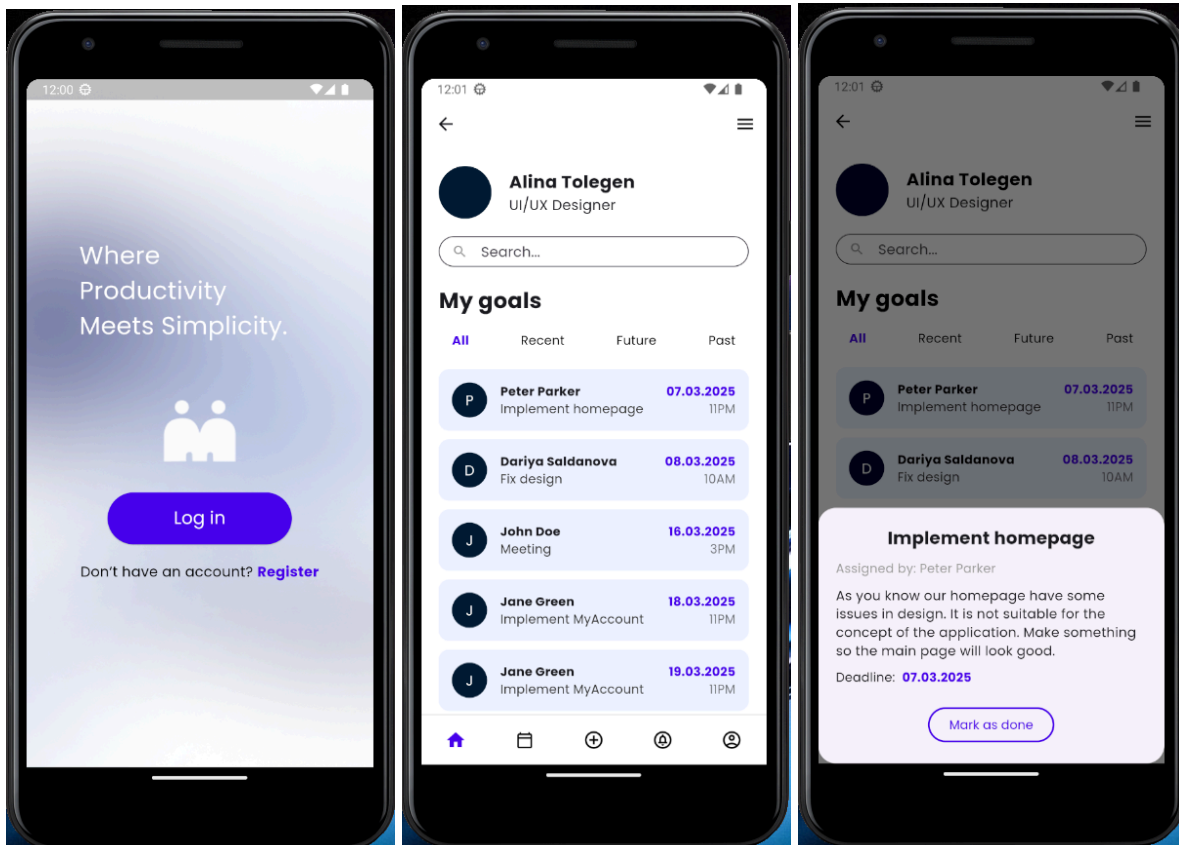
Project execution

Over the course of two semesters we did a lot of work. It began with working on system design, analysing what features should be implemented. Mainly our project relies on the initial proposal and we tried to implement everything that was asked to implement.

System design was initially created in September, we approved it in the first semester and haven't changed it since then.

In the beginning, we thought that it would be a good idea to create a mobile application for employees, so they can always see the tasks, however it was time consuming to create a mobile application along with the website, so we decided to focus on the website. Here are

some screenshots of mobile application that was made using Flutter SDK and Dart language:



The application has a main page, bottom navigation bar, calendar page, add new goal page, notifications page and account page.

Initial design was in orange and dark blue colors, but after some research, we found out that white and blue color combinations are more associated with productivity, so we changed the design. We also created a logo, which represents two people and the letter M as for the name of our app “ManageMate”. Similar design was created for the website. We wanted the User Interface to be simple and easy to use.

In the beginning, there were 5 of us in the team, however, in the spring semester one team member left the team, so since then each member of the group had an increased workload. Despite the fact that the team was created spontaneously, we worked well together. None of our team members was the leader of the group, every team member did their job with responsibility. We started to use our system to set goals to each other when it was mostly done. Regarding each student’s contribution, Dariya S. and Danilyas mostly worked on the backend of the system, Alina created design and mobile application and worked with Darya P. on the frontend. Other work was divided evenly and each team member contributed.

Evaluation

The product definitely solves the problem of lacking systems that focus on the performance. However, there are many points that could be improved in our system. Regarding the fact that

we want users to improve their productivity by using the system, adding more employee management tools, such as salary tracking, attendance tracking would be great to make the system more useful.

One of the key ways our evaluation validates the computing-based solution is by the system's ability to generate visuals based on employee performance data. These graphs allow managers and employees to track progress over time, identify trends and make decisions.

We shared early versions of our system with other students that weren't involved in the development. There were 12 participants, they were assigned with different roles and asked to use the system. We provided them with following criteria:

- Ease of use
- Evaluation of feature usefulness
- Visual design
- Personal opinion about the system in general

100% of the participants reported the ease of use and liked the visual design, 83.33% responded that the features were useful and 91.7% of the participants responded that they liked the system in general.

As an addition, many participants suggested adding more features, such as calendars, salary and attendance trackers and tools for creating administrative papers.

Conclusion and possible future work

In general, our system satisfied the initial requirements. All of the features were implemented. This project was made from scratch, each team member learned something new from making it. To create it, we used knowledge that we gained at computer science courses.

In the future it is possible to implement a full working mobile application, so companies from different areas could use our system, as sometimes employees work out of office and only have mobile devices. Moreover, as was suggested by our testing group, more features could be added. In fact, adding more features may not only help to improve performance, but also simplify the employee management process itself.

References

[1] S. Nanayakkara, U. Ekanayake, G. Subasinghe, C. Jayasena, D. I. De Silva and D. Cooray, "A Web Based Employee Management System," *International Journal of Engineering and Management Research*, vol. 12, no. 5, pp. 82-89, 2022.

[2] E. Grigoroudis and C. Zopounidis, "Developing an employee evaluation management system: the case of a healthcare organization," *Operational Research*, vol. 12, pp. 83-106, 2012.