POWERBI APPLICATION FOR SOFTWARE DEFECT MANAGEMENT IN A COMPANY

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Abstract—"If debugging is the process of removing defects, then programming must be the process of introducing them." (Edsger W. Dijkstra)".
In full plan in this paper will be described how the PowerBi application is integrated within the company, namely in the management of various defects occurred during software development. Thus, the proposed project wants to offer an easy-to- use application, in terms of its design, offering a new vision regarding defect management. The application will focus on an intuitive and user-friendly interface, facilitating the process of recording, tracking and resolving defects. The aim is to provide a more efficient and enjoyable user experience, thereby helping to optimise fault management within a project. The main key roles that benefit from the Power BI app developed to manage faults in the enterprise are Quality Manager, Fault coordinator and Team Manager.
Keywords. KPI - Key Performance Indicator, DAX -DATA ANALYSIS EXPRESSIONS , Power BI, SaaS-software-as-a-service

INTRODUCTION

Considering that software debugging and maintenance is an indispensable process when it comes to developing new functionality within an application of any kind, I chose to address and focus on automation applications PowerBi. This IT automation application comes to the aid of companies for better visualization and management of the various branches in which it can be used. PowerBi comes to the aid of users because it involves automating as many tasks as possible, thus saving users time in carrying out the necessary day-to-day activities during working hours.

The most important role of these kinds of applications is to automate the management process present within any company, so that the employees dealing with this branch can easily track these bugs and their impact on the KPI of the company (KPI - Key Performance Indicator).

Over the years, there have been many significant changes in software development, namely the shift from traditional development to agile and DevOps methods, which promote cross- team collaboration and continuous software delivery.

Thus, the frequent changes of requirements in the source code and the needs to implement new functionalities in a short time, often lead to the introduction of new hidden or unexpected defects. Although testing and debugging are essential processes in software development, there is always the risk of missing some bugs that may appear later when the application is used or when new functionality is added that may influence how the source code worked until that moment.

Why is the presence of defect management programs important in a company? To track down these defects, centralizing the process and providing a well-rounded workflow can help solve and avoid certain problems in the future. A defect management program also provides valuable information about the impact of these defects on the product. If these were not well managed in terms of prioritization and planning for future development, there would be huge consequences in terms of customer satisfaction and implicitly the reputation of the company.

In this application has been developed to adapt to the needs of employees working on the management side in this company and beyond. It's an easy-to-build, highly intuitive app with a user-friendly interface for any user. What makes it different from other defect management programs or applications is the design by which all the input data present in the database can be represented by different graphs.

METHODS

In this section, some important features of the PowerBi application will be presented. The functionalities and capabilities of the PowerBI application will be described in detail, thus revealing the reason why the application was wanted for the management and management of defects in a company. In addition, a benchmark will be presented with several similar applications for data visualization, with an emphasis on those used in defect management within software companies.

The maintenance process will also be discussed, presenting the general workflow.

Bibliographic study of the PowerBi application

PowerBI is part of the Microsoft Office suite and is a business intelligence (BI) platform that offers users interesting and interactive methods for aggregating, analyzing, visualizing and sharing data. Given that the Power BI platform has an extremely intuitive design, users who are familiar with other programs offered by Microsoft, such as Excel, can benefit from an extremely versatile tool in combination with the other tools in the Microsoft suite. Like all Microsoft tools, it requires a little training, although it is extremely intuitive for any user [1], [3].

PowerBI Desktop or PowerBI Report Builder are often used to create reports that can then be published for use by other teammates or users. PowerBI is made up of several parts that work together, starting with these three main parts:

- a Windows desktop application called PowerBI Desktop
- an online software-as-a-service (SaaS) service is known as a PowerBI service.
- PowerBI Mobile app for Windows, iOS and Android devices.

Another interesting part of this program is sharing reports across multiple devices. If you want to create, deploy and manage PowerBI reports and all kinds of paginated reports, you can use PowerBI Report Server if you want to use solutions behind a firewall. These solutions or reports are then delivered further to users to be modified and viewed in a web browser, on any mobile device, tablet or via email [2], [4].

Figure 1 shows the creation, implementation and management of reports.

Fig. 1. **PowerBI Report Server** - creating, deploying and managing PowerBI reports, both mobile and paged [3]

2*Funcționalitate	Aplicații					
	Power BI	Tableau	QlikView	Domo	Looker	Google Data Studio
Vizualizări interactive	Da	Da	Da	Da	Da	Da
Conectivitatea cu surse multiple de date	Da	Da	Da	Da	Da	Da
Crearea de rapoarte personalizate	Da	Da	Da	Da	Da	Da
Vizualizări de tip tablou de bord	Da	Da	Da	Da	Da	Da
Funcții avansate de interogare și filtrare a datelor	Da	Da	Da	Da	Da	Da
Suport pentru colaborare și partajare	Da	Da	Da	Da	Da	Da
Integrare cu soluții cloud	Da	Da	Nu	Da	Da	Da
Funcționalitate de notificare în timp real	Da	Da	Nu	Da	Da	Da
Suport pentru analiza datelor geospațiale	Da	Da	Da	Da	Nu	Da
Versiune de baza gratuita	Da	Nu	Nu	Nu	Nu	Da

Fig. 2. Benchmark for data analysis and visualization applications

Benchmark - Similar apps for viewing data

In order to make a comparison as rigorous as possible, the most downloaded and used data visualization programs available on the Internet were researched. It's important to note that an app's popularity can vary by region, industry, and specific user needs. Also, the market for data visualization applications is extremely dynamic, with new improvements appearing constantly.

Figure 2 presents the comparative analysis between the most popular applications for data visualization: PowerBI, Tableau, QlikView, Domo, Looker and Google Data Studio. Most of the features such as interactive visualizations, connecting to multiple data sources, creating custom reports based on your needs, advanced query options, integration with other collaboration tools, real-time notifications and updates are found in all the mentioned programs. above and beyond. The difference is that some of these apps offer a free basic version, which encourages users to explore the program's functionality and learn how it works. If the app suits the user's needs and requirements, he can also opt to download the Pro version for additional features.

All the mentioned applications offer the possibility to create interactive visualizations of the data. This means that users can interact with the views and explore them in a variety of ways, such as scrolling, zooming, or filtering the data presented. Ap- plications enable connection and integration with multiple data sources. This means that data can be extracted from various sources such as databases, Excel files or cloud services and use that data in analysis and visualization. All applications allow for the creation of custom reports, where users can organize and structure data in an easy-to-understand and presentable format. This provides the opportunity to highlight relevant information and communicate results in an effective way. This includes creating tables, graphs, charts, or other visuals to effectively communicate information. The applications provide the ability to create dashboards, which display an overview of key data in the form of visualizations and indicators. They enable real-time performance tracking, trend analysis and quick identification of problems or opportunities. Applications provide advanced functionality for querying and filtering data. This includes the ability to perform complex queries, apply custom filters, and extract relevant information from large data sets. Applications enable collaboration and sharing of data and visualizations between different users. This means users can work together with their colleagues to develop and share analyzes and visualizations, facilitating effective collaboration and communication.

The maintenance process overview

Defect management is an essential component of the product and service development process that aims to identify, document, analyze, prioritize, and resolve errors or problems encountered in a product or system. This requires a well- structured and systematic approach that allows the development team to effectively manage defects and ensure the quality of the final product.

An important aspect of bug management is effective communication between development team members, testing team and users. Close and open cooperation can help identify and resolve errors quickly, helping to increase customer satisfaction and improve product quality.

Within the company, the defect management process de- fines how technology-specific product defects are managed. It applies to the management and resolution of all defects found in integrated products, such as software, test tools and documentation, both for internal defects identified in R&D and for defects reported by customers. Defect management is based on an internal tool used by all lines of business to manage defects found in products and provides a controlled way to manage and maintain the status of fixes[5].
The general flow of the defect management process is shown in the figure 3.

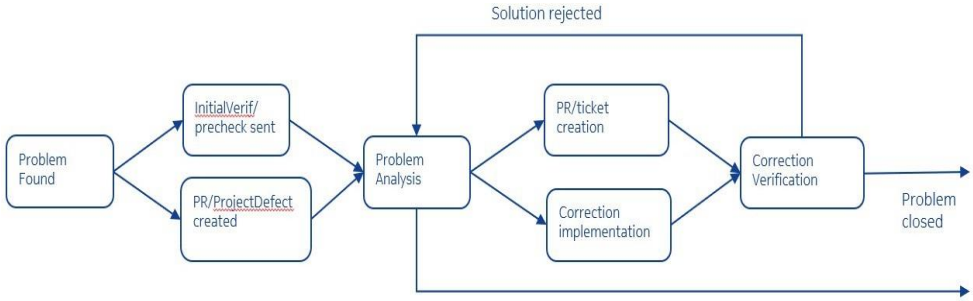

Fig. 3. General defect management process flow

In the following, we will use “ProblemReport” to manage defects found in specific products.

The term ”ProblemReport” refers to problems or errors reported and recorded in the internal management system. ProblemReport defects can include a variety of problems or errors encountered, such as software defects, performance problems, configuration errors, or any other problem that affects the functionality or quality of the product.

By using this system, development teams can organize and prioritize defects, assign resolution tasks, monitor their remediation progress, and maintain a detailed history of reported defects and implemented solutions.

Defect management is an essential part of the internal product quality assurance and continuous improvement process, allowing problems to be identified, understood and promptly corrected to ensure optimal product performance and customer satisfaction.

In the figure 4 the state model for a ProblemReport defect is presented.

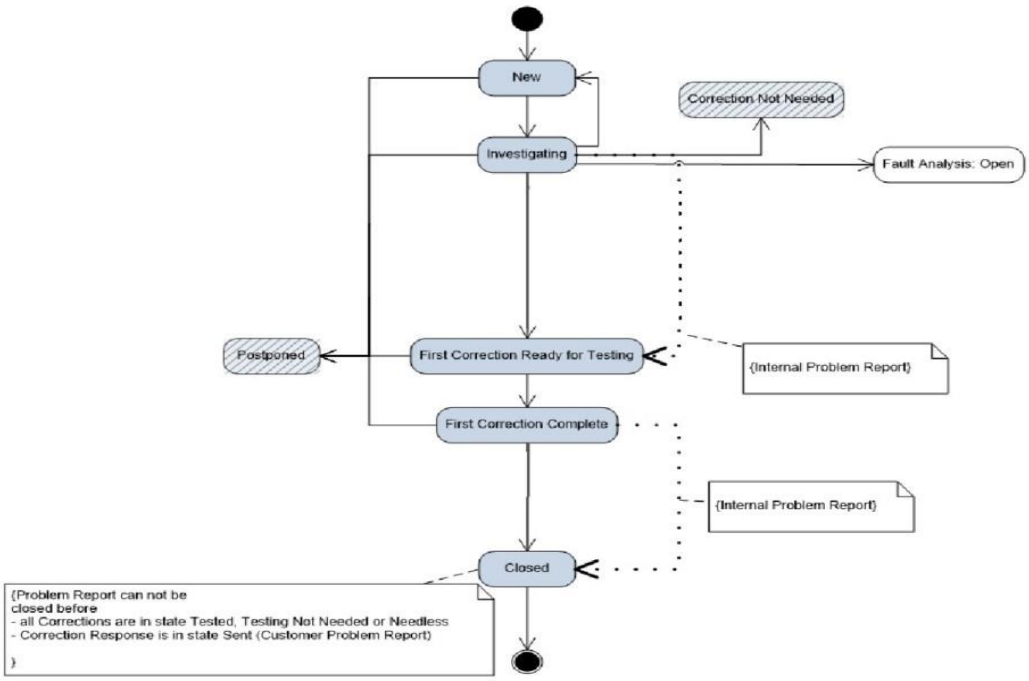

Fig. 4. The state model of a ProblemReport

Steps to deploy a PowerBi application

Needs planning and analysis: Identifying the purpose and objectives of the Power BI application. Assessment of user requirements and needs, available data and existing technology infrastructure. In the present case, the purpose of the created application is to manage, manage and visualize in the most interactive way the defects that enter a functional area, and how their lifetime can influence in a positive or negative way the KPI- the company. In this case, within the company, users can be Quality Manager, Fault Coordinator, Team Manager. This Power BI is of maximum interest to those, although anyone can have access to this application.

Data collection and preparation: Identification of relevant data sources and their collection. Cleaning and trans- forming data to ensure its quality and consistency. In the present case, as I mentioned before, when discussing ProblemReports, there is a site dedicated to these defects, called ”ProblemReports”.

To retrieve the data that will later be exported to Power BI, click on the top right corner: ”More” and then select ”Get Power BI Query”. This is illustrated in the figure 5.

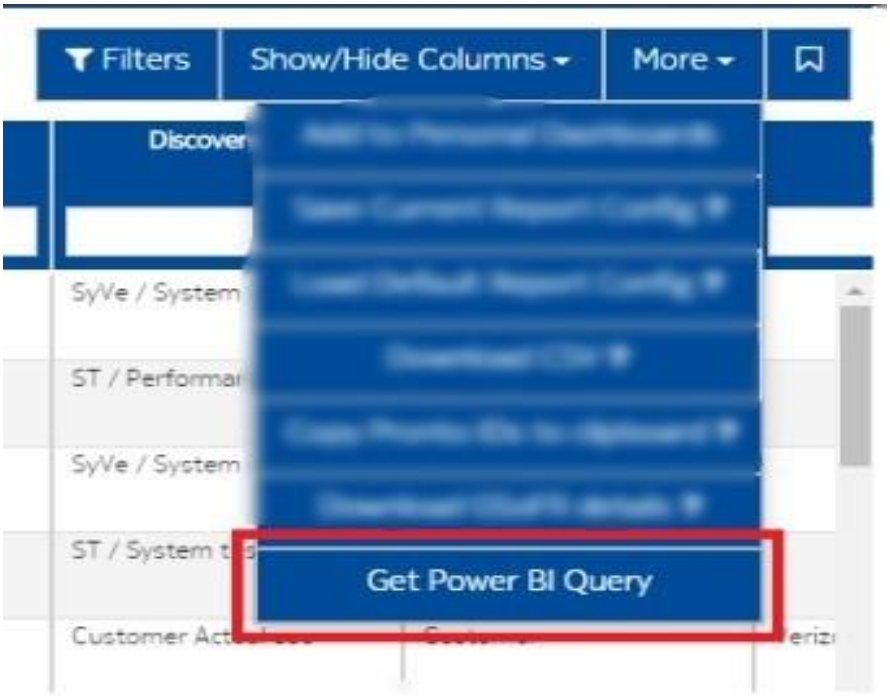

Fig. 5. The state model of a ProblemReport

Create reports and visualizations: Use the report and visualization tools in Power BI to build tables, graphs, etc.
After the database has been downloaded, the next step will be to add the visual part and the necessary filters. Graphics visualization can be added from the right side, namely from ”Visualization”. First, the visualization type will be selected, and then the necessary data will be brought from the created tables with drag-and-drop. Additionally, visual information will be able to be added on both the X and Y axis, both row and column.
This is shown in figure 6.

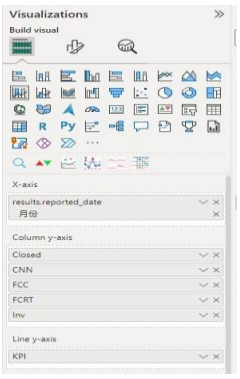

Fig. 6. Viewing and selecting the chart type

Fig. 7. View monthly data flow

After the charts have been selected, filters using DAX (DATA ANALYSIS EXPRESSIONS) formulas will be used to filter data and generate reports.

DAX formulas are a formula language used in Power BI to create custom calculations and measures. These formulas are used to manipulate and aggregate data from data models to achieve specific results. DAX formulas can be used for sum, average, maximum, minimum and other aggregate operations, filtering and sorting data, manipulating strings, managing table relationships, etc. They work across the entire data model, meaning measures can be created to combine and aggregate data from multiple tables. This enables complex calculations and advanced analysis [6].

Performance Testing and Optimization: Performing tests to verify the correctness and functionality of reports and visualizations. Identifying and fixing any bugs or performance issues.

Deployment and distribution: The official release of the Power BI application within the company. Provide user training and support. Distribute reports and views to relevant users based on their needs.

Monitoring and maintenance: Monitor the performance of the Power BI application and its usage within the company. Regular maintenance and updating of data and data models according to the evolving needs and requirements of the organization.

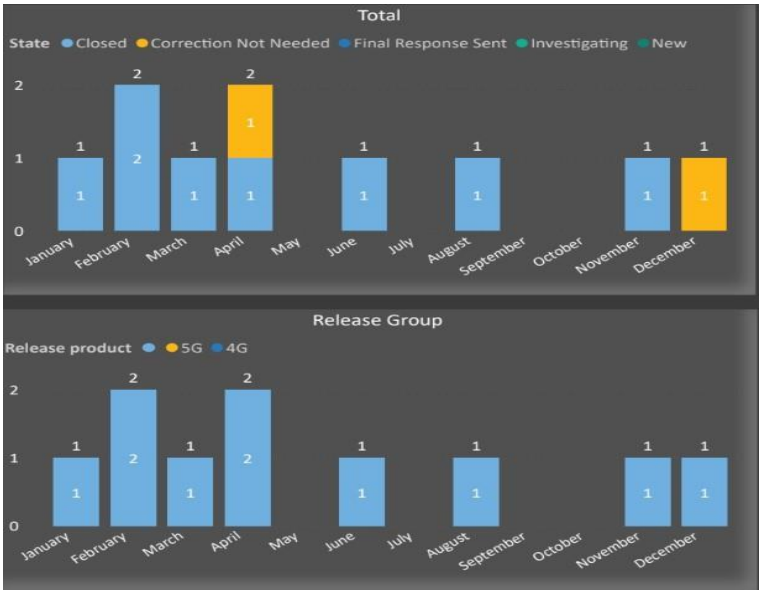

Fig. 8. Data flow for ProblemReports by state and release group

RESULTS

Following the use of DAX formulas and their combination, several graphs presented in the created application resulted, graphs that are presented within each page of the application.

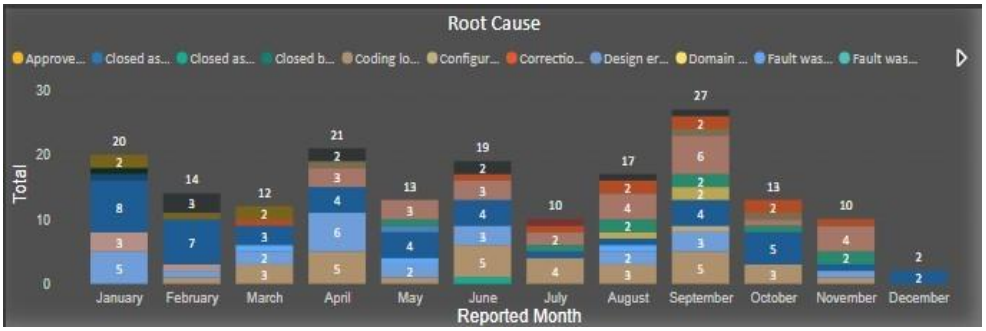

Fig. 9. Data flow for ProblemReports, depending on the root cause.

Figure 8 shows the management of ProblemReports ac- cording to status, i.e. Closed or CNN, but also according to Release Group. It can be observed, for example, in the month of April, for all teams in the department from the year 2021, that the number of closed defects was 1, those that were closed due to the fact that no correction was needed were also 1, and regarding the release group, in April there were 2 ProblemReports whose versions were 4G.

In figure 9 it can be seen, for example, in February, for all teams in the department, both those in FOT(during integration of the feature) and those

that were not, from the year 2022, that the number of closed defects was 11, the which closed due to the fact that no more correction was needed were 3, and the KPI is in the chart, that is, it has the value of 15. Also in February, in the monthly data stream where the number of Total and cumulative from month to month, it can be seen that the total number of defects is 14, and the cumulative number is 34, adding the number of defects from the previous month, i.e. January.

Depending on the cause of the problem, for example, only 2 ProblemReports were found in December, both of which were opened due to implementation errors.

In the figure 10 it can be observed, for example in February, for all teams in the department, both those in FOT and those that were not, from the year 2022, that the number of ProblemReports with a younger age or equal to 20 there were 11 in number, one ProblemReport became a long runner, having an age of between 20 and 25 days, one ProblemReport had an age of between 25 and 30 days, and only one with an age of between 30 and 35 days.

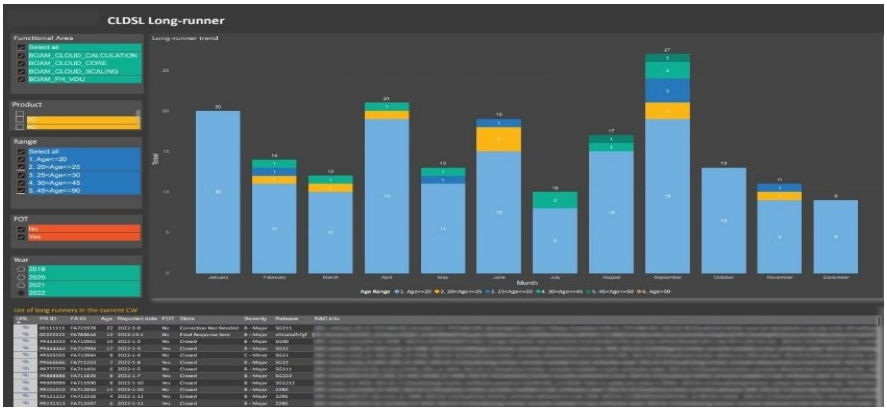

Fig. 10. Department CLDSL Long Runner

Figure 11 shows the average number of ProblemReports each month. This graph will only change based on the year selected by the user, not the month selected. It can be seen in the figure that in January the average number of ProblemReports opened on the ”trunk” branch is 7.35. This number drops considerably until August, then increases, and the highest value recorded is in October, with an average of 10.10.

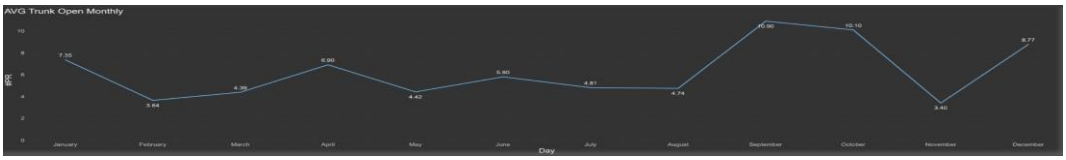

Fig. 11. Average number of Problem Reports each month

Figure 12 shows the average number of ProjectDefects opened daily on the ”trunk” branch. This graph changes its values based on the year and month selected by the user. In this figure, the year 2022 and the month of June have been selected, and it can be seen that by the middle of June, the number of ProjectDefects was increasing. This number then decreased until the 22nd, at which time the number of ProjectDefects increased again to 6, and by the end of the month it had reached 3.

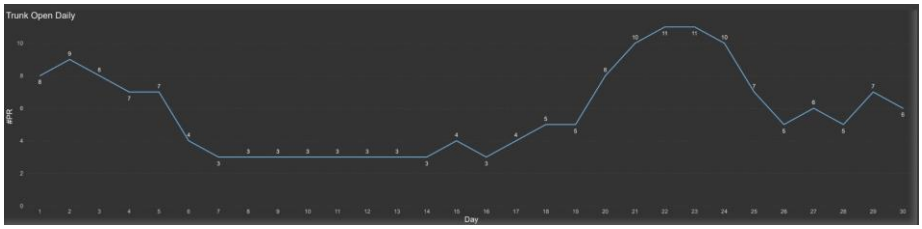

Fig. 12. Average number of ProblemReports each day

I. Conclusion

In summary, choosing to use PowerBi for enterprise defect management is a significant decision with the potential to bring multiple benefits. By creating a PowerBi application, it will be possible to efficiently centralize and analyze the data related to the defects identified in the products or services provided by the company.

As we have mentioned in this paper, the application stands out in that PowerBi allows the creation of interactive dash- boards and customized graphics, providing a visual perspective on the identified defects. This helps to better understand the information and the impact it has on the company. By incorporating the data into the PowerBi platform, it will be possible to benefit from the ability to monitor and analyze the evolution of defects in real time. This functionality allows patterns to be identified, problems to be detected early on, and prompt action to minimize their impact.
PowerBi is a platform that simplifies the sharing and collab- oration of data and information relevant to defect management. Users can access and view reports and dashboards created in Power BI, which will facilitate communication and collective decision making.

Choosing to use PowerBi for enterprise defect management and management is a smart and strategic approach. This will enable data to be leveraged in an efficient way and increase efficiency in the software development and delivery processes. By quickly identifying and solving problems, continuous process improvements will be possible, leading to increased customer satisfaction and long-term company success.

A. Further development of the application

The following will present some concepts that can be added to this PowerBi application:

- A broader set of key performance indicators (KPIs)
- A new page that could be used by team managers for scheduling tasks, distributing tasks and tracking progress.
- Allocation and distribution of people, depending on the resources available to the team, on the maintenance topics.

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