Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Systems Engineering

Master's Thesis

Implementation of a New Project Management Software in Company Škoda Transportation a.s

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

Bc. Yahya Sa'd

Informatics

Thesis title

Implementation of a New Project Management Software in Company Škoda Transportation a.s

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Objectives of thesis

The objective of this thesis project is to assess the implementation of a new project management software in Škoda Transportation, which is an engineering company in the Czech Republic that specializes in the manufacturing of rolling stock and has been operating since the late 1800s in Plzeň. The study aims to identify the benefits, challenges, and best practices of implementing a new project management software and provide recommendations for successful implementation.

Methodology

The research method for this thesis project will use a case study approach. The case study will gather data using qualitative research techniques such as interviews, surveys, and document analysis. The primary data will be collected through semi-structured interviews with project managers, IT staff, and other relevant people at Škoda Transportation who were involved in implementing the new project management software. The interviews will be recorded and transcribed for data analysis.

Secondary data will be collected by reviewing company documents, reports, and publications related to project management, software implementation, and IT infrastructure. A thematic analysis approach will be used to analyse the data and identify themes, patterns, and issues related to implementing the new project management software.

Procedure:

The following steps will be followed to conduct this thesis project:

1. Literature review: Conduct a literature review on project management software implementation, best practices, and challenges.

2. Case study design: Design the case study methodology and identify the relevant stakeholders for data collection.

3. Data collection: Collect data through semi-structured interviews with project managers, IT department staff, and other stakeholders, as well as through the review of company documents, reports, and publications.

4. Data analysis: Analyse the data using thematic analysis and identify themes, patterns, and issues related to the implementation of the new project management software.

5. Findings: Summarize the findings and provide recommendations for successful implementation of project management software.

6. Conclusion: Conclude the thesis project by summarizing the research objectives, methodology, findings, and recommendations.

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The proposed extent of the thesis

60 – 80 pages

Keywords

Project management software, Agile approach, Software implementation, Change management, Concerto software

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Declaration

I declare that I have worked on my master's thesis titled " Implementation of a New Project Management Software in Company Škoda Transportation a.s" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the master's thesis, I declare that the thesis does not break any copyrights.

In Prague on 30.03.2024 _____

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Implementation of a New Project Management Software in Company Škoda Transportation a.s

Abstract

Project management software encompasses a variety of platforms created to assist individuals in project management. These products vary from basic organizational apps like checklists or calendars for short projects to comprehensive applications that give a complete view of the project lifecycle and include advanced functions like automation and resource scheduling. In this thesis, we studied the implementation of the Concerto software by knowing what the advantages were, determining the disadvantages or problems, and suggesting some solutions. From this software, we take two projects to accomplish the implementation task: 29T3_Bratislava and Tram RNV (Rhein-Neckar-Verkehr). The data is collected from the factory based on interviews. This was done by conducting an interview with three employees in the company from the planning specialist and project management departments. The interviewers will answer the following question: What are the advantages and disadvantages of the given projects? The main disadvantages of these projects are: individuals' updates Accuracy, Communication Issue, Not Suitable with MS Project, Up-to-Date Issue, Slow Down, PERT Diagram Issue, Update Issue, and Data Unused. We suggest some solutions for each problem as follows: implement access restrictions, use another software, perform risk assessments, verify for updates, check compatibility, minimize http requests, optimize code, use Gantt charts, schedule data, load balance, establish precise expectations, appoint communication liaisons, and ensure that unused data is not replicated but must be on demand.

Keywords: Concerto Software, Implementation Process, 29T3_Bratislava, Tram RNV, Project Management, Project Management Software, Agile Approach, Update Issue, Gantt Charts, Slow Down, Communication Issue, Interviews, Software Implementation, Change Management .

Implementace nového softwaru pro řízení projektů ve společnosti Škoda Transportation a.s

Abstrakt

Softwarové nástroje pro řízení projektů zahrnují různé platformy vyvinuté s cílem pomoci jednotlivcům v řízení jejich projektů. Tyto produkty se liší od základních organizačních aplikací, jako jsou kontrolní seznamy nebo kalendáře pro krátkodobé projekty, až po komplexní aplikace, které poskytují úplný pohled na životní cyklus projektu a zahrnují pokročilé funkce, jako je automatizace a plánování zdrojů. V této studii jsme se zaměřili na implementaci softwaru Concerto, abychom porozuměli jeho výhodám, identifikovali nevýhody nebo problémy a navrhli řešení. Pro tuto analýzu jsme vybrali dva projekty k realizaci implementačního úkolu: 29T3_Bratislava a Tram RNV (Rhein-Neckar-Verkehr). Data byla shromážděna prostřednictvím rozhovorů, konkrétně pohovoru se třemi zaměstnanci z oddělení specializovaného na plánování a řízení projektů. Dotazovali jsme se na jejich názory ohledně výhod a nevýhod těchto projektů. Hlavními nevýhodami těchto projektů se ukázaly být: nedostatečná přesnost aktualizací jednotlivců, problémy s komunikací, nekompatibilita s MS Project, aktuální problémy, zpomalení procesů (Slow Down), problémy s diagramem PERT, obtížnosti s aktualizacemi a nevyužitá data. Pro každý z těchto problémů jsme navrhli řešení, jako je implementace omezení přístupu, použití jiného softwaru, provádění hodnocení rizik, ověření aktualizací, kontrola kompatibility, minimalizace požadavků HTTP, optimalizace kódu, použití Ganttových diagramů, plánování dat, vyvažování zátěže, vytvoření přesných očekávání, jmenování komunikačních zprostředkovatelů a zajištění, že nepoužívaná data se replikují, ale musí být k dispozici na vyžádání.

Klíčová slova: Concerto Software, Proces implementace, 29T3 Bratislava, Tram RNV, Projektový management, Projektový management software, Agilní přístup, problémy s aktualizací, Ganttovy diagramy, Slow Down, Komunikace, Rozhovory, Implementace Softwaru, Management Změn.

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1 Introduction

1.1 Overview

A project is any undertaking, carried out individually or collaboratively and possibly involving research or design, which is carefully planned to achieve a particular goal. In addition, a "project" consists of a coordinated series of activities or tasks performed by engineers, designers, drafters, and others from one or more engineering disciplines or departments [1, 2, 3]. If a set of actions and tasks satisfy specific requirements, they can be categorized as a project. These requirements include being multifunctional (i.e., spanning multiple functional lines), having a clear aim, established start and finish dates, funding constraints (if applicable), and resource consumption (including the use of money, people, and equipment). The ability to translate concepts and actions into new undertakings is a characteristic of all projects [2, 3].

Projects by their very nature are dynamic, unpredictable, and unique from one another. The project lifespan includes risk, adjustments, and occasionally even failure and encounters a number of issues, including unclear project objectives, unfeasible deadlines, improper or ineffective team communication, the need to choose the best project software, frequent scope changes, financial constraints, and difficulties with collaboration [4]. Projects play a crucial role in the overall success of construction organizations as they serve as the primary source of revenue. The acknowledgment of the importance of criticality has prompted organizations to investigate methods for enhancing project performance, with project management emerging as a central area of focus [5].

The use of techniques, procedures, abilities, knowledge, and experience to accomplish projects in line with predetermined guidelines and according to predetermined project acceptance criteria is known as project management [5]. Several authors define project management based on their perspectives. In accordance with the Project Management Institute (PMI)’s definition, it "is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements" [3, 4]. Project management can be applied to any different types of projects [6, 7], including engineering and construction projects, business and financial services projects, information technology and telecommunications projects, and software development projects [7].

All organizations that focus on projects, such construction companies, consulting firms, and information and communication technology (ICT) companies, require skilled,

qualified, and experienced project managers. Combinations of knowledge, talent, leadership, ability, and personal attitude are among the most critical qualities for a good project manager and are required for effective project completion [4]. Project managers play a multifaceted role in ensuring the successful completion of projects, while adhering to the triple constraints of scope, time, and budget. Additionally, they are responsible for meeting the quality requirements of the project's objectives and fulfilling the expectations of stakeholders. In order to achieve successful project completion, it is imperative for project managers to possess a comprehensive comprehension of the application of quality project management tools and techniques [8]. They are mostly accountable for the project's success or failure and may utilize various tools, tactics, and procedures to suit the project's needs [4, 8].

Investment is a mandatory requirement for every organization. To effectively execute their project investments, organizations must employ project management techniques that facilitate the seamless implementation of said investments. Undertaking a project can be a highly intricate endeavor, particularly when considering the organizational constraints, utilized elements, involved resources and costs, extensive workforce, and additional complicating factors. Given the intricacy and significance of a project within an organization, the successful execution of said project necessitates the provision of specialized information technology (IT) support [9]. The development of a wide range of IT software solutions has been driven by market demand in this field. These solutions are designed to support the creation, monitoring, and implementation of projects with the aim of achieving predetermined investment goals. The primary objective of project management software is to streamline and enhance the operational processes of a company in relation to project management. These software applications are utilized for the purpose of strategizing, overseeing, and managing projects [9].

Project management software covers the following fundamental tasks [10]: (1) Project planning: A project manager (PMg) can use the software to map project activities and visually depict task interactions in order to build a project schedule. (2) Task management enables the creation and assignment of tasks, as well as the setting of deadlines and status updates. (3) Collaboration and document sharing: Project stakeholders can use a central document repository to boost productivity. (4) Sharing of calendars and contacts: Project timelines contain scheduled meetings, activity dates, and contacts that should be updated automatically across all PMg and stakeholder calendars. (5) Bug and error management: Project management software makes it easy to report, view, inform, and

update stakeholders on bugs and errors. (6) Time tracking: Software must be able to keep records for outside consultants and track time for all jobs.

Project management (PM) methodologies such as critical path and critical chain both consider the tasks that must be completed and the order in which they must be completed. To assist project managers in finishing tasks, they choose distinct approaches.

In order to finish a project as quickly as feasible, critical chain project management, or CCPM, focuses on monitoring essential resources, guaranteeing resource availability for each activity, and arranging dependent actions. According to this strategy, you should tackle a project similarly to a relay race, finishing each work as quickly as you can before passing it on to the next person. Instead, then finishing specific tasks, it concentrates on reaching the ultimate goal.

The longest sequence of jobs and milestones with no time lag between them is taken into account by the critical path method (CPM). Postponing tasks on the critical path will prevent the project from being completed on time. Nonetheless, the project is finished more quickly if the jobs in the critical route are finished earlier than expected. Bottlenecks are found using the CPM approach. It assists in identifying tasks that could lead to project delays and directs project managers in taking preventative action right away. The critical path technique is applicable in practical scenarios. If you have a lot of chores to be done before dark, you can prioritize and finish them by working on the most important ones first.

In project management, CPM and critical chain (CCPM) differ in the following ways:

- Priority: While CPM concentrates on task management, CCPM concentrates on resource and buffer management.
- Resources: Because CPM assumes that all resources will be available simultaneously, it is more of an estimate than CCPM. To produce a realistic schedule, CCPM concentrates on scarce resources and makes use of readily available resources.
- Buffer: In the CPM approach, the buffer is utilized for specific jobs, whereas in the CCPM method, the buffer (extra time) is used for the entire project.
- Multitasking is possible with CPM, meaning that two tasks on the route can be finished at the same time. Multitasking is not supported by the CCPM approach.
- Delays: In CPM, project participants can begin working on non-essential tasks right once, while in CCPM, there are delays on such jobs.

- Real-time activities: When an action requires more time, its duration in CPM may increase. To guarantee on-time completion, however, CCPM employs real-time monitoring and a buffer for every task.

1.2 Problem Statement

The company's decision to adopt the system is due to the delays in their internal activities and project deadlines, which result in substantial penalties for late delivery to clients. The company believes that these expenses are unnecessary and could be avoided by implementing the system more efficiently. Furthermore, the organization intends to eliminate multitasking across all levels, as it can cause a delay in completing tasks due to the need to return to postponed activities, potentially affecting output quality. The company also lacks a consistent approach to project management, clear project priorities, and a comprehensive overview of project status, all of which contribute to a lack of a multi-project and multi-company perspective in project management.

1.3 Thesis Objectives

The objective of this thesis project is to assess the implementation of a new project management software in Škoda Transportation, which is an engineering company in the Czech Republic that specializes in the manufacturing of rolling stock and has been operating since the late 1800s in Plzeň. The study aims to identify the benefits, challenges, and best practices of implementing a new project management software, and provide recommendations for successful implementation.

1.4 Thesis Structure

The reminder of this thesis is organized as follows:

- Chapter 2 presents the objectives and the proposed methodology.
- Chapter 3 describes the literature review on project management software implementation, best practices, and challenges.
- Chapter 4 describes the practical part of this thesis.
- Chapter 5 explains the results of the frameworks and discusses these results.
- Chapter 6 concludes the thesis, provides some recommendations and suggests some future work.

2 Objectives and Methodology

2.1 Objectives

The objective of this thesis project is to assess the implementation of a two projects of management software in Škoda Transportation, which is an engineering company in the Czech Republic that specializes in the manufacturing of rolling stock and has been operating since the late 1800s in Plzeň. The study aims to identify the benefits, challenges, and best practices of implementing a new project management software, and provide recommendations for successful implementation.

2.2 Methodology

2.2.1 Overview

The research methodology for this thesis project will involve a case study approach. The case study will involve collecting data through qualitative research methods such as interviews, surveys, and document analysis. The primary data collection will be conducted through semi-structured interviews with the project managers, IT department staff, and other relevant stakeholders at Škoda Transportation who were involved in the implementation of the new project management software. The interviews will be saved and transcribed for data analysis. The secondary data collection will involve reviewing company documents, reports, and publications related to project management, software implementation, and IT infrastructure. The data analysis will involve a thematic analysis approach to identify themes, patterns, and issues related to the implementation of the new project management software.

2.2.2 Dataset Collection

The data is collected from the factory based on interviews way. This is done by conducted an interview with three employees in the company from project management departments. The interviewers will answer the followings question: what are the disadvantages for the given projects.

2.2.3 Projects Information

In this thesis, we used two projects from the company named 29T3_Bratislava, Tram RNV (Rhein-Neckar-Verkehr). The following points show some information about each project.

29T3_Bratislava

The project, codenamed 29T3_Bratislava, encompasses the production of prototypes in Pilsen and subsequent series production in Pilsen, with a collaborative effort involving Ekova for bogies and welding HS. The contractual scope involves a comprehensive commitment, spanning 10 + 10 units for a one-way configuration, equating to a total of 5 vehicles per train. Current Project Status: As of the latest assessment, the project is positioned on the critical chain. The ongoing focus is on commissioning activities, with a targeted completion date set for May 23, 2023. Subsequent to this phase, the project is slated to transition seamlessly into Software (SW).

Tram RNV (Rhein-Neckar-Verkehr)

A project labeled Tram_RNV was chosen for the first stage of implementation. It is the largest signed project to date for the supply of a total of 80 trams for the German cities of Mannheim, Heidelberg and Ludwigshafen, with an option for another 34 vehicles. This is a very complex project from a management and planning point of view, which is why it was chosen as a pilot project for management in the Concerto system.

3 Literature Review

This chapter presents the previous works related to project management software implementation, best practices, and challenges.

3.1 Historical Project Management

Table 1 shows the summarization of the previous papers related to historical project management in terms of the objectives behind the papers and the outcomes.

The relationship between the application of a project management methodology (PJMM) and project success is examined by Joslin et al. [11], as well as the influence of the project governance setting. A global, cross-sectional online survey received 254 replies. Factor analysis and moderated hierarchical regression analysis were used for the analysis. The study's findings indicated that the use of a PMM accounts for 22.3% of the variation in project success, and that PMMs that are thought to be sufficiently comprehensive to manage the project have higher success rates than PMMs that require the project manager to supplement them. In this interaction, project governance functions as a sort of moderator. The results should help project management professionals by illuminating the selection of PMM in various governance scenarios. Understanding the function of PMMs as project success factors should be useful to academics.

Fielding et al. [12] presented a comprehensive analysis of project management strategies in their study. These strategies are defining success, choose the right team/s, set achievable milestones to track progress, and manage the project's tasks in sprints. The first focus of their study was a pragmatic examination of the core principles of project management. Subsequently, they proceeded to establish the criteria that distinguish an endeavor as a project. They also provided an illustration of several consequences that demand consideration. Then, they examined several project models, as well as challenges related to quality planning, staffing, cost management, and project schedule management, also known as project time management.

MEREDITH et al. [13] presented an extensive and pragmatic manual on project management, with a specific emphasis on fundamental principles and optimal methodologies. The significance of various factors was underscored, including but not limited to efficient planning, effective allocation of resources, adept team leadership, proficient risk management, and diligent monitoring and control, all of which contribute to

the achievement of project success. In addition, project managers were provided with the requisite expertise and tools to effectively traverse intricate projects and achieve desired outcomes within given limitations. They have demonstrated that their study will be beneficial for readers in acquiring useful insights and implementing effective techniques to improve their project management abilities.

A comprehensive framework was presented by Edition et al. [14], which offers guidance in the management of projects across many businesses and sectors. The significance of various factors was underscored, including process-based project management, robust leadership and communication abilities, risk management, and ongoing enhancement. By adhering to the concepts and criteria outlined in their research, project managers may effectively strategize, implement, and complete projects that fulfill their goals while mitigating risks and optimizing value for stakeholders.

Turner et al. [15] provided a crucial resource for project managers, leaders, and those engaged in project-oriented endeavors. They provided practical insights, empirically validated methodology, and implementable strategies for effectively managing projects and facilitating strategic transformations within organizational contexts. The major takeaways elucidate the essential components and principles necessary for achieving success in project-based management and provide important recommendations for adopting these practices in practical contexts.

Table 1: Historical Project Management Summarization

Ref	Year	Objectives	Results
[11]	2015	The relationship between the application of a PMM and project success is examined	The study's findings indicated that the use of a PMM accounts for 22.3% of the variation in project success, and that PMMs that are thought to be sufficiently comprehensive to manage the project have higher success rates than PMMs that require the project manager to supplement them.
[12]	2022	They presented a comprehensive analysis of project management strategies in their study.	-
[13]	2009	They presented an extensive and pragmatic manual on project management, with a specific emphasis on fundamental principles and optimal methodologies	They have demonstrated that their study will be beneficial for readers in acquiring useful insights and implementing effective techniques to improve their project management abilities.
[14]	2018	They offered a guidance in the management of projects across many businesses and sectors.	They showed that the project managers can effectively strategize, implement, and complete projects that fulfil their goals while mitigating risks and optimizing value for stakeholders.
[15]	2019	They provided a crucial resource for project managers, leaders, and those engaged in project-oriented endeavors.	They showed that can effectively managing projects and facilitating strategic transformations within organizational contexts.

Source: own sources

3.2 Project Management Software: Challenges and Determinants

Table 2 shows the summarization of the previous papers related to Challenges and Determinants for Project Management Software in terms of the objectives behind the papers, Challenges and Determinants, and Results.

An analysis was done by Wang et al. [16] to examine the determinants that influence the adoption of project management software (PMS) inside organizations. They conducted their study using a survey methodology, wherein a sample of 200 project managers from various sectors in Taiwan was administered the survey. They utilized the Technology Acceptance Model (TAM) to establish a theoretical framework for their study and identified the key factors that impact the adoption of PMS. The results suggested that the variables that exert the most significant influence on the adoption of PMS are perceived utility, perceived ease of use, and compatibility. Furthermore, it has been determined that the magnitude of the organization and the intricacy of the project have a moderating influence on the effects of the primary factors on the adoption of PMS. They have reached that the TAM provided a beneficial framework for understanding the factors that influence the adoption of PMS. It is recommended that businesses consider the major findings presented in the study when making decisions regarding the selection and implementation of PMS.

El Khatib et al. [17] focused on the topic of e-governance within the context of project management. They presented the challenges in project management pertaining to the identification of decision-making processes and responsible parties, as well as the optimization of project resources to achieve the highest levels of effectiveness and efficiency. The primary focal points in project management pertaining to e-governance revolve around these two concerns. The objective is to gain a comprehensive understanding of the subject matter, with a particular emphasis on its implications. Additionally, they underscored the potential hazards associated with the adoption of e-governance and proposed strategies for mitigating these risks while simultaneously enhancing the efficacy of e-governance processes within businesses. They employed a case study methodology to investigate three organizations, namely the Dubai Police, the Road and Transport Authority (RTA), and the Dubai Health Authority (DHA). They adopted a qualitative research strategy. The data is systematically gathered and meticulously examined in a research endeavor aimed at addressing the existing knowledge deficiencies in this particular subject matter. They posited that the integration of human cognition with technical advancements, such as artificial intelligence (AI), blockchain, and dashboard systems, might provide tangible

benefits and facilitate constructive transformations in the realm of project management governance. These technologies facilitated the decision-making process for project managers and stakeholders, enabling them to effectively manage resources through the utilization of real-time data.

Kagan et al. [18] presented the main problems and challenges that face many companies in construction corporations when project management software is implemented. The companies must take these problems into account when implementing project management software in order to ensure the software is applied effectively. These problems are: (1) the task provided by the customer lacks clarity in its formulation. (2) The imperative for specific restructuring and organizational efforts. (3) There is a necessity to replace existing technological systems with principles of information and business management. (4) The phenomenon of employee resistance. (5) Temporary augmentation of staff workload. (6) The establishment of a proficient team for the purpose of implementing and supporting a system, led by a team leader.

Koggalahewa et al. [19] conducted an investigation into the various aspects that influence the selection and implementation process of Performance Measurement and Management (PMM) systems. They employed a multi-case study approach to investigate the topic at hand. Data collection involved conducting a total of six in-depth interviews with senior executive individuals from various software businesses. The analysis closed by examining the processes of PMM selection, acceptance, and implementation in the region from a strategic perspective. The study elucidated five dimensions that exert an influence on the selection and implementation process that are Internal, External, Process, Content, and Customer. They adopted a comprehensive managerial perspective to examine organizational transitions and change management, with a particular focus on cultural factors and the interplay between individual and organizational social values within the organizational context. They made a valuable contribution to the existing body of knowledge in project management, as there is a notable scarcity of research undertaken in this specific domain.

The effective management of modifications is crucial in bolstering the overall success of initiatives. Arefazar et al. [20] explored a versatile approach to project management that can effectively accommodate changes. This purpose served as the first impetus for undertaking the current research. Agile Project Management offered novel prospects for management within the construction sector by acknowledging change as an inevitable component of the project management process. Nevertheless, the implementation of any

agile solutions would need a substantial initial expenditure. Hence, they introduced and established a hierarchy of agile enablers for the effective management of change in construction projects. In order to achieve the intended objectives, the identification of the most crucial modifications was conducted via a questionnaire survey sent to a sample of 60 Iranian consulting and contracting organizations specializing in the building industry. Following that, a group of 12 professionals with expertise in change management within the context of building projects were chosen to participate in semi-structured interviews. The purpose of these interviews was to identify the most suitable ways for effectively addressing the priority changes in an agile manner. Based on the obtained outcomes, the most efficacious strategies for enhancing agility in change management encompass continuous monitoring and improvement of resources, implementation of flexible workflows, active involvement of clients, facilitation of communication, and the incorporation of requirements throughout the project. These approaches expedited the response to changes by employing a repetitive and incremental process grounded in continuous learning and short-term planning.

Correia et al. [21] outlined a study conducted within an automobile firm with the objective of establishing standardized processes related to the utilization of a project management tool. The development of this tool was carried out internally with the objective of disseminating inside the firm a methodology rooted in their own philosophy of lean thinking. Through a comprehensive examination of the existing protocols, certain issues have been identified pertaining to the insufficient utilization of the tool and its capabilities for project management. These challenges arise from the tool’s intricate nature, its specialized requirements, and the project managers' inadequate training. The primary objective of this project was to establish a standardized utilization of the tool among project managers within the logistics domain. In order to achieve this objective, a comprehensive set of tools was devised, including a checklist, a training plan, job instructions, and a responsibility matrix. An evaluation was undertaken across three distinct initiatives in order to gauge the effects of these proposed solutions. The aforementioned assessment was devised by the organization with the purpose of appraising project management practices in alignment with the company's guiding principles. It employs a rating scale ranging from 1 to 4 and encompasses many factors. The findings suggested that there has been an enhancement in many criteria, resulting in an increase in the level from 2 to 3. This improvement can be

attributed to the adoption of established methods for utilizing the tool and effectively leveraging its capabilities for project management.

Table 2: Challenges and Determinants of Project Management Summarization

Ref	Year	Objectives	Challenges and Determinants	Results
[16]	2015	They examined the determinants that influence the adoption of PMS inside organizations	Magnitude of the organization and the intricacy of the project	The results suggested that the variables that exert the most significant influence on the adoption of PMS are perceived utility, perceived ease of use, and compatibility.
[17]	2020	They presented the challenges in project management pertaining to the identification of decision-making processes and responsible parties.	How and by whom decisions are being made, as well as how to make the best use of project resources in terms of effectiveness and efficiency.	The technologies used facilitate the decision-making process for project managers and stakeholders, enabling them to effectively manage resources through the utilization of real-time data.
[18]	2016	They presented the main problems and challenges that face many companies in construction corporations when project management software is implemented	1) The task provided by the customer (2) The imperative for restructuring (3) The existing technological systems do not have the principles of information and business management. (4) The employee resistance. (5) Temporary augmentation of staff workload.	-

[19]	2021	They conducted an investigation into the various aspects that influence the selection and implementation process of PMM systems.	Internal External Process Content Customer	They made a valuable contribution to the existing body of knowledge in project management.
[20]	2020	They introduced and prioritized the agile enablers for the change management of construction projects.	The change management of construction projects.	The approaches expedited the response to changes by employing a repetitive and incremental process grounded in continuous learning and short-term planning.
[21]	2023	They established a standardized utilization of the tool among project managers within the logistics domain.	Tool's intricate nature specialized requirements The project managers' inadequate training	The findings suggested that there has been an enhancement in many criteria, resulting in an increase in the level from 2 to 3

Source: own sources

3.3 Project Management Software Tools

Table 3 shows the summarization of the previous papers related to Project Management Software Tools in terms of the objectives behind the papers, PM tools, and Results.

Kerzner et al. [22] demonstrated a thorough and practical approach to project management. Methods for project scheduling such as the CPM and the Program Evaluation and Review Technique (PERT) help ensure that time is used efficiently and that the most important tasks are completed first. They also looked into various project control techniques for monitoring progress, mitigating risks, and fixing issues as they arose during implementation. The importance of people in project management was recognized through discussions of team management, leadership, and motivation, as well as the value of clear communication and collaboration. Methods for coordinating project processes and resources

were also stressed to facilitate easier administration. They also highlighted the importance of risk management, quality assurance, and procurement and contract management in seeing projects through to a successful conclusion. They provided invaluable insight into project closure, information transmission, and takeaways for future growth and institutional memory.

Yehorchenkova et al. [23] examined the lessons learned during the creation and rollout of the "Project Management Center" and other elements of the enterprise "Skyeton" s comprehensive project management system. They focused on the junction of production and project activities in enterprise resource management as the primary challenge of project management in a production company. Then, they described how the Skyeton addressed this challenge by creating a PRP system to collect, store, process, and utilize project information for use in financial planning, logistics planning, and human resource scheduling. A PRP system that determines the reasonable terms of task execution and project budgets in the operational activities of the production aircraft enterprise "Skyeton" is the outcome of the project management system's installation. Based on their experiences, implementing these technologies can boost an organization's production performance by 15-50%. Without adding more labor, it was able to enhance manufacturing productivity by 1.5 times, from 8 to 12 airplanes annually, by using the PRP method. As of right now, other productions like the Tutkovsky Company—use this system.

ALVES et al. [24] provided a description of the deployment of a PMS within a Small and Medium-sized Enterprise (SME), which was further assisted by the integration of a Project Management Information System (PMIS). The adopted PMS was intentionally created with flexibility in mind, aiming to accommodate the diverse business areas within the firm. These areas encompassed various sorts of projects, each demanding distinct project management (PM) methodologies. Consequently, they adopted an integrated approach, combining conventional and agile project management methodologies, so attaining the desired adaptability required by the firm, while maintaining project planning stability. Following the implementation of the PMIS, a number of challenges were encountered during the integration phase. The complexity of the implemented system was deemed excessive for the organization's project management maturity level, prompting the need to reassess the implementation's scope. They presented the challenges, failures, and triumphs encountered during the implementation of the PMS in the business. Additionally, it discussed the measures taken to enhance the integration of the PMS inside the organization.

The results indicated that the primary challenges were attributed to the intricacy of some PMIS requirements, the incorporation of more formal project management methods, and the extent of the first system implementation. It was possible to witness the following during the entire PMS implementation process: a) high levels of resistance to change on the part of some collaborators, as well as how they responded to new PM practices and PMIS; b) process development and improvement; c) growing awareness of the value of PM; d) lack of commitment from some elements and top managers; and e) ignorance of PM concepts.

Teslia et al. [25] developed a conceptual framework for integrating project management systems with project provision management systems into a unified information technology platform for managing project activities in enterprises. Additionally, they identified the information management core as a tool for effectively managing information in the context of enterprise project activities. They suggested to utilize software and an information superstructure as a supplementary element in conjunction with project management software solutions. Their proposed framework is handling a several challenges that any company faced them: effectively managing the processes involved in acquiring and delivering resources according to the project plan. This includes budgeting, overseeing interactions with external management entities, and managing operational activities that are geared towards producing project-related products. Many scientific and technological issues were resolved in the process of developing this concept: 1. the functions of the project management systems that are integrated into the tools are specified. The investigation made it possible to learn more about the features that are included in popular project management systems as well as to pinpoint the features that are left out. The project provision management system is in charge of carrying out these tasks. 2. Project provision management systems' functions are outlined. These responsibilities specifically include giving projects access to resources such as money, materials, and information as well as decisions and byproducts of business operations that the project manager is not qualified to embrace. PrimaNad, PrimaLib, and NadProject are three software and information superstructures that were suggested to be created above project management instrumental software in order to carry out these functions. 3. The information management system functions for enterprises and projects are described. This information technology will combine the information environments of project management and project provision systems into an integrated enterprise project activities management system.

Suetin et al. [26] conducted an analysis of applied project management software implantation on several companies in Russia if this software increasing the company performance or decreased. They provided the empirical findings regarding the deployment of agile project management in software engineering companies based in Russia. Their focused on examining the projects managed with the assistance of agile methodologies within a sample of 8 firms, encompassing a total of 35 projects. The data for this study was collected using surveys. In contrast to those researchers who hold a positive view of agile approaches, the data indicate that the implementation of agile project management in the examined projects resulted in a decline in both cost and schedule performance. The use of agile software project management approaches resulted in an improvement in quality, as perceived by clients and assessed by internal technical analysts.

Grandage et al. [27] presented a novel investigation into the application of Earned Value Management (EVM) within the context of state governments in the United States. The EVM methodology is a project management approach that offered a comprehensive solution for defining project milestones, producing timely performance metrics, and conducting outcome analysis. The adoption of EVM offered several potential advantages: the ability to detect project failures, cost overruns, and schedule delays at an early stage, providing an opportunity for timely corrective action and risk reduction. Additionally, EVM can contribute to the more consistent delivery of projects within the designated time frame and budgetary constraints. They investigated the acceptance and implementation of EVM within state governments, specifically focusing on its application in significant information technology (IT) and transportation projects.

Sousa et al. [28] applied project management best practices and lean production processes in order to enhance the overall performance of the organization. In order to a integrate project management tailored tools with the company's strategic strategy, they employed Business Process Management (BPM) and Lean principles. To ensure business continuity and mitigate risk, it is imperative for firms to effectively manage their operations and projects by employing proficient teams and implementing project management practices. Anticipated outcomes included the implementation of a tailored BPM solution within the organization, with enhanced organizational structure and increased operational efficiency, facilitated by the utilization of Project Management approaches.

Krchová et al. et al. [29] examined the utilization of project tools within several organizational contexts, encompassing governmental institutions situated in the Slovak

Republic. To validate the utilization of these technologies, a sample of 154 enterprises engaged in project implementation throughout the Slovak Republic was randomly chosen. They involved conducting a cluster analysis and multivariate regression analysis. The findings demonstrated variations in the utilization of specific instruments, which are influenced by both company size and the nature of undertaken projects. The primary project management methods of utmost significance are to team communication, as well as engagement with clients and external specialists. The findings also indicated that the proficient utilization of tools, particularly throughout the project execution stage and finalization, substantially enhances the achievement of projects.

Dasović et al. [30] outlined the implementation of a mixed-integer nonlinear program (MINLP) and project management tool (PMTL) integration, aimed at facilitating sustainable cost-optimal construction scheduling. A comprehensive framework was developed to provide precise optimization and project management techniques at a higher level. In order to guarantee data compatibility between the optimization system and PMT, as well as to streamline the process of acquiring a cost-optimal timetable, a data transformation tool (DTT) was created within a spreadsheet application. The proposed system has the capability to ascertain the following: (i) an optimal project schedule, represented by a network diagram and Gantt chart, using either continuous or discrete time units; (ii) identification of optimal critical and non-critical activities, including their early start, late start, early finish, late finish, as well as total and free slack times; and (iii) determination of the minimum total project cost, including the allocation of direct and indirect costs. The system offered various functionalities, including: (i) the ability to update MINLP and re-optimize schedules; (ii) the option to save the optimal schedule as a baseline for monitoring changes; (iii) the capability to switch between different optimization algorithms without the need for modifying the model; (iv) the utilization of PMT for tracking task completion in the optimized schedule; (v) the flexibility to modify calendar settings; and (vi) the generation of visual reports to facilitate effective project management. The outcomes of project scheduling that is cost-optimal are presented inside a standard PMTL setting, which suggested the potential for increased adoption of the suggested approach in practical applications. The integration of Mixed-Integer Nonlinear Programming (MINLP) with Process Modeling and Optimization Tools (PMT) enables the utilization of each software for its intended purpose. The integration of these two elements yields further insights and enhanced functionalities in the realm of optimum building schedules, which would pose considerable

challenges if employed in isolation. They provided application examples to illustrate the benefits of the suggested strategy.

Chua et al. [31] investigated the evolution and deployment of a web-based, mobile-responsive project management solution utilizing Platform as a Service (PaaS) cloud technology. The aforementioned software has the capability to monitor the advancement of a project, including its project timeline, deliverables, the project team members assigned, and other relevant project details. The program in question underwent an evaluation by IT project managers, developers, and senior management from a local bank in the Philippines. The evaluation focused on assessing the software's functionality, usability, and interactivity. Based on the obtained results, the participants expressed satisfaction with the program, as indicated by the mean ratings of 3.0, 3.58, and 3.44, respectively. Therefore, they reached the conclusion that the system that was designed possesses the capability to be utilized by project managers and stakeholders without incurring any expenses.

Gujar et al. [32] examined the function of cloud-based project management software with automation capabilities in the management and optimization of production plans and data. They examined the development of automated and cloud-based project management software, such as Jira and Asana, and explored how they integrated the advantages of classic Gantt charts and work breakdown structures in the context of manufacturing organizations. The survey instrument was specifically developed with the purpose of gathering data from a sample of 100 project managers who are now employed in diverse manufacturing units. The data underwent quantitative analysis through the utilization of both statistical analysis and a test of association. Also, they examined the factors that contribute to the development of automated and cloud-based project management software, as well as the difficulties encountered by project managers when integrating traditional Gantt charts and work breakdown structures into the intricate and time-consuming tasks associated with project management.

O'Connell's et al. [33] comprehensive exploration of project management, a key piece of advice for implementing project management software revolves around ensuring adequate training and support for all stakeholders involved. It is essential to recognize that the successful adoption and utilization of project management software hinge on the competence and familiarity of users with the tool. Therefore, investing in comprehensive training programs tailored to the specific functionalities and features of the software is paramount. Additionally, providing ongoing support and guidance to users, particularly during the initial

stages of implementation, can bolster confidence and proficiency in utilizing the software effectively. By prioritizing training and support initiatives, organizations can enhance user engagement, optimize productivity, and maximize the benefits derived from the project management software implementation.

Table 3: Project Management Software Tools Summarization

Ref	Year	Objectives	PM Tool	Results
[22]	2017	They applied PM tools for monitoring progress, mitigating risks, and fixing issues as they arose during implementation	CPM PERT	The results showed that the using of the PM tools are used for monitoring progress, mitigating risks, and fixing issues as they arose during implementation
[23]	2021	They provided an account of the project management system installation experience at Skyeton, a production company.	Skyeton	The PM tool can boost an organization's production performance by 15-50%.
[24]	2019	They demonstrated to SMEs the key considerations that need to be made both before and during the deployment of a PMS to those who wish to implement or reformulate one.	PMS	They have shown that the using of the PMS can process development and improvement growing awareness of the value of PM.
[25]	2021	They developed a conceptual framework for managing project activities in enterprises	PrimaNad PrimaLib NadProject	The functions of the project management systems are specified. Also, the Project provision management systems' functions are outlined.
[26]	2016	They conducted an analysis of applied project management software implantation on several companies in Russia if this software increasing the company performance or decreased.	Agile software project management	The use of agile software project management approaches resulted in an improvement in quality, as perceived by clients and assessed by internal technical analysts.

[27]	2020	They presented a novel investigation into the application of EVM within the context of state governments in the United States.	EVM	They investigated the acceptance and implementation of EVM within state governments, specifically focusing on its application in significant information technology (IT) and transportation projects.
[28]	2018	They applied project management best practices and lean production processes in order to enhance the overall performance of the organization	BPM Lean principles	Anticipated outcomes included the implementation of a tailored BPM solution within the organization,
[29]	2019	They determined effective strategies for facilitating the adoption and integration of innovations and changes within Slovak firms based on PM tools.	PM tools	The findings indicated that the proficient utilization of tools, particularly throughout the project execution stage and finalization, substantially enhances the achievement of projects.
[30]	2021	They presented an implementation of a mixed-integer nonlinear program (MINLP) and project management tool (PMT) integration, aimed at facilitating sustainable cost-optimal construction scheduling	PMT + MINLP	The integration of these two elements yields further insights and enhanced functionalities in the realm of optimum building schedules.

[31]	2017	They monitored the advancement of a project, including its project timeline, deliverables, the project team members assigned, and other relevant project details	web-based, mobile-responsive project management solution utilizing Platform as a Service (PaaS) cloud technology	Therefore, the researchers reached the conclusion that the system that was designed possesses the capability to be utilized by project managers and stakeholders without incurring any expenses.
[32]	2023	They examined the development of automated and cloud-based project management software, such as Jira and Asana, and explore how they integrate the advantages of classic Gantt charts and work breakdown structures in the context of manufacturing organizations.	loud-based project management software	-

Source : own sources

4 Practical Part

In this part, we provide the advantages and disadvantages for the Bratislava and Tram RNV (Rhein-Neckar-Verkehr) projects based on the interview's responses. We take the disadvantages into account in order to enhance the issues and problems in this project.

4.1 Company Information

4.1.1 Introduction of the company

Table 4 shows the company information in terms of name, residence, ID number, creation date and registration.

Table 4: Company Information

Company Name	Škoda Transportation, a.s.
Residence	Emila Škody 2922/1, Jižní Předměstí, 301 00 Plzeň
ID number	62623753
Date of creation and registration	March 1, 1995

Source: Škoda Transportation, a.s.

4.1.2 Scope of Business

The company Škoda Transportation belongs to Škoda Group, as listed in the Public Register and Collection of Deeds (2023) provides the following services:

- Production, installation, and repair of electrical machines, devices, electronic equipment, and telecommunication equipment.
- Testing of railway vehicles on railways, tramways, and metros routes.
- Machining services.
- Locksmithrery and tool making services.
- Repair and services for road vehicles.
- Repair and services for other means of transport and work machines.

The company offers a wide range of services, including the production, installation, and repair of electrical and electronic equipment, as well as telecommunication devices. They also carry out tests on railway vehicles, perform machining services, and provide locksmithing and tool making services. The company also offers repair services for road vehicles, as well as other means of transport and work machines. Overall, the company has

a diverse range of capabilities, making it a valuable resource for those in need of these services.

Figure 1: Company brand
Source: Škoda Group, a.s. (2023)

Škoda Transportation, a.s., a renowned Czech engineering firm based in Pilsen, upholds the legacy of Škoda racing and is recognized as the primary successor to Škoda Plzeň. With a workforce of over 5,500 employees, the company benefits from the skilled expertise of more than 700 engineers, planners, and designers. Through annual investments of hundreds of millions of crowns in research and development, ŠT continually introduces new and innovative products that conform to current European standards and effectively global markets. Its core product line includes: Low-floor trams, Train units, Electric locomotives, Metro sets, Electric motors, and Complete drives for transport systems.

Škoda Transportation, a.s. is a part of the Škoda Group, where it serves as the parent company. The group is also home to several subsidiaries and joint ventures that focus on engineering and electronics, not only in the Czech Republic but also in Finland, Hungary, and Germany. The company is involved in the development of digitalization, IT, and technologies for transport vehicles and other industries. Modern products bearing the Škoda logo are created across the Czech Republic and Europe. During its existence, its products have reached more than 50 countries worldwide, and many modes of transport sporting the iconic "Škoda" brand can be found not only throughout the Czech Republic but also worldwide.

The Škoda Group offers comprehensive transport solutions, both within and outside of cities. The company continues to work towards making journeys faster, more comfortable, safer, and more environmentally friendly. Its subsidiaries include:

- ŠKODA ELECTRIC a.s.
- ŠKODA VAGONKA a.s.
- ŠKODA PARS a.s.
- ŠKODA CITY SERVICE s.r.o.
- ŠKODA TVC s.r.o
- ŠKODA EKOVA a.s.
- ŠKODA DIGITAL s.r.o.
- Škoda Transportation a.s.
- POLL, s.r.o.
- ŠKODA Transportation Deutschland GmbH - Germany
- Škoda Transtech Oy - Finland
- Ganz-Škoda Electric Ltd. - Hungary
- Škoda Polska Sp. z o.o.- Poland

In summary, the Škoda Group is committed to providing comprehensive transport solutions, both within cities and beyond. The company is continuously striving to make journeys faster, more comfortable, safer, and more environmentally friendly. (Škoda Group, a.s., 2023).

4.2 Reason for acquiring the system

The primary motivation behind the company's decision to adopt the system is the delays in their internal activities and project deadlines, which result in substantial penalties for late delivery to clients. The company believes that these expenses are unnecessary and could be avoided by implementing the system more efficiently. Furthermore, the organization intends to eliminate multitasking across all levels, as it can cause a delay in completing tasks due to the need to return to postponed activities, potentially affecting output quality. The company also lacks a consistent approach to project management, clear project priorities, and a comprehensive overview of project status, all of which contribute to a lack of multi-project and multi-company perspective in project management. (Škoda Transportation, a.s., 2023).

4.3 Description of the Concerto system

Concerto is a Management Execution System (MES) software that streamlines project management in complex environments with multiple projects and resources. Its primary goal is to provide ongoing monitoring of project progress, serving as an early warning system that highlights potential project issues before they impact performance, such as delivery deadlines or project costs.

The system is based on the CCPM methodology, which is a project planning and management approach that utilizes the theory of constraints. CCPM considers resource utilization in addition to time, which is the primary focus of the CPM. A key differentiator of CCPM from traditional critical path planning is the allocation of buffers. Buffers represent the accumulated time reserve and resource utilization required to manage project uncertainty. When a project faces challenges, it consumes a portion of its buffer. For each project phase, it is possible to evaluate the percentage of project completion and the amount of buffer consumed. If the buffer consumption is lower than expected, the project is progressing well. If the buffer is consumed more than expected, the project is facing challenges. Buffers are displayed on a graph, and project status is color-coded for easy identification. Green indicates that no action is needed, yellow means that corrective action is required, and red means that immediate action is necessary.

The graph mentioned earlier is displayed below as Figure 2. The horizontal axis represents the completeness of the project as a percentage, while the vertical axis indicates the buffer consumption. Each black dot on the graph represents a separate project.

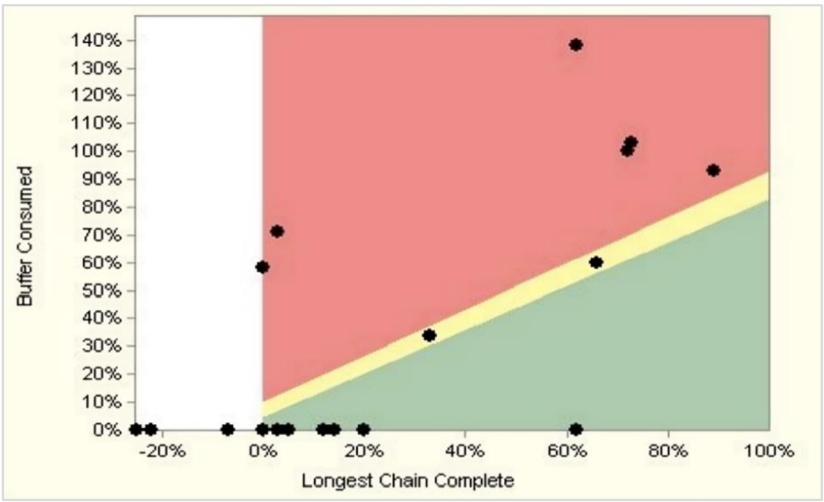

Figure 2: Chart in the Concerto system
Source: Škoda Transportation, a.s. (2023)

While the position of the project on the graph is important, the trend of the consumed buffer is even more critical and should trigger corrective action. The Penetrating Chain (critical chain) in the project (see Figure 3 below) is where corrective actions can be found. Any activity on this chain must be done faster or smarter to get the project back on track. These actions are then reflected in master reports or screens accessible to all project participants, showing all the tasks that a particular task manager should perform in the correct order, with more important tasks first and less important tasks later. The same colour highlighting used to indicate the consumed buffer (red, yellow, and green) helps to prioritize tasks. Red tasks should be addressed first, followed by yellow and finally green tasks.

Figure 3: Penetrating Chain

Source: Škoda Transportation, a.s., (2023)

Using the system offers several advantages, including improved timeliness of projects, better flow, increased speed, prioritization, and reduced data overload. These benefits translate into reduced operating costs and a competitive edge in the market, leading to sales growth. By implementing multiple projects with the same resources, revenue can be increased without proportionally increasing operating costs. Faster project progress allows for a larger market share and reduces changes and rework in ongoing projects due to more accurate specifications. The system's unified metric for prioritizing project activities ensures that critical delays are addressed promptly. Finally, the system provides managers with important information for quick and effective decision-making, avoiding data overload and facilitating efficient resource and project management in a multi-project environment.

4.4 Projects Advantages

There are a lot of advantages to the two projects, as shown in the following points:

- The Admin role of these projects is assigned to experts who are often responsible for the look and feel of screens and reports, and maintaining user access and permissions based on roles.
- A user in these projects is a person or role with an account created by an Administrator and defined by a username, a password, and assigned permissions and privileges which define the boundaries of the roles the user may fulfill. Figure 4 shows the screen shot of the managing users that are created by the admin.

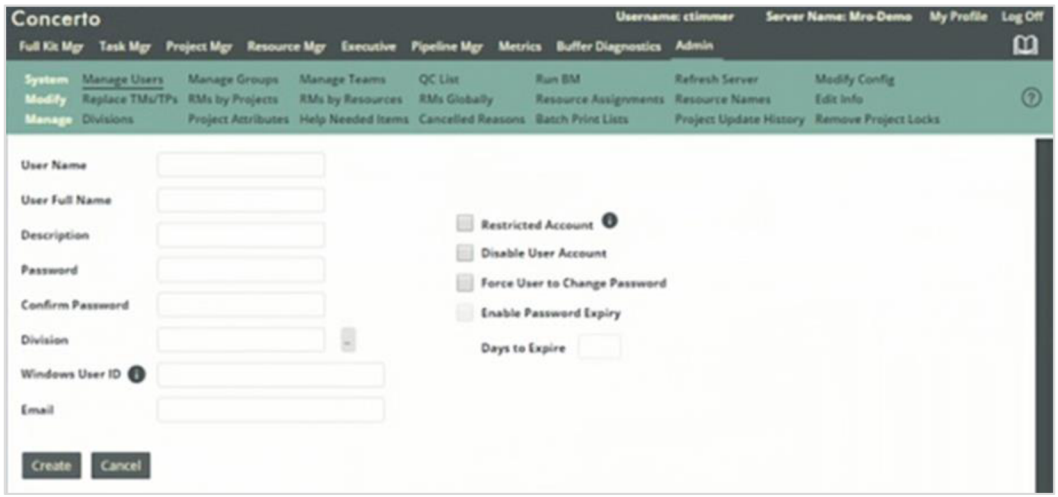

Figure 4: Managing Users Screen
Source: Škoda Transportation, a.s. (2023)

- There are a number of default groups whose privileges are pre-defined. Individuals are assigned Group priveledges based on their role. Figure 5 shows the screen shot of the managing groups that are created by the admin.

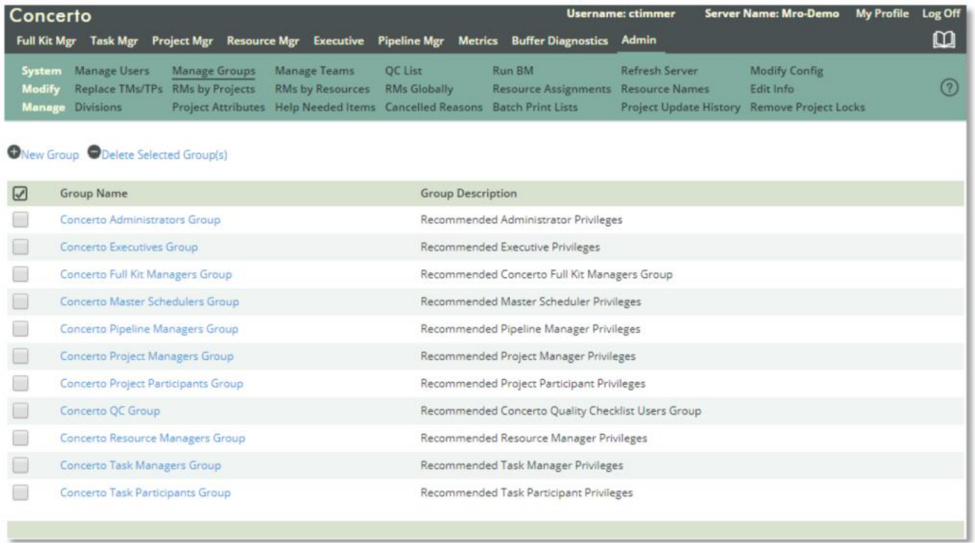

Figure 5: Managing Groups Screen
Source: Škoda Transportation, a.s. (2023)

- Teams can be useful, especially in shift work where a task manager for a task may be shared between the day shift supervisor and the off shift supervisor. Both supervisors can be assigned to a team that is assigned as the task manager for the project. Privileges still depend on which group the user is assigned to. The Manage Team dialogue is used to create teams and add individuals to those teams. Figure 6 depicts a screen shot of the managing teams that the admin has created.

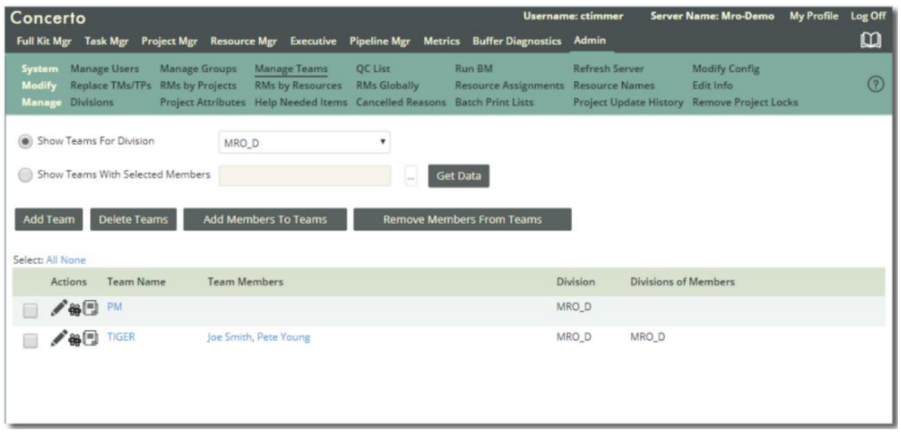

Figure 6: Managing Teams Screen
Source: Škoda Transportation, a.s. (2023)

- Reports and screens can be configured for your environment. From the Admin tab, select Modify config. Figure 7 shows a screen shot of the managing configurations that are created by the admin.

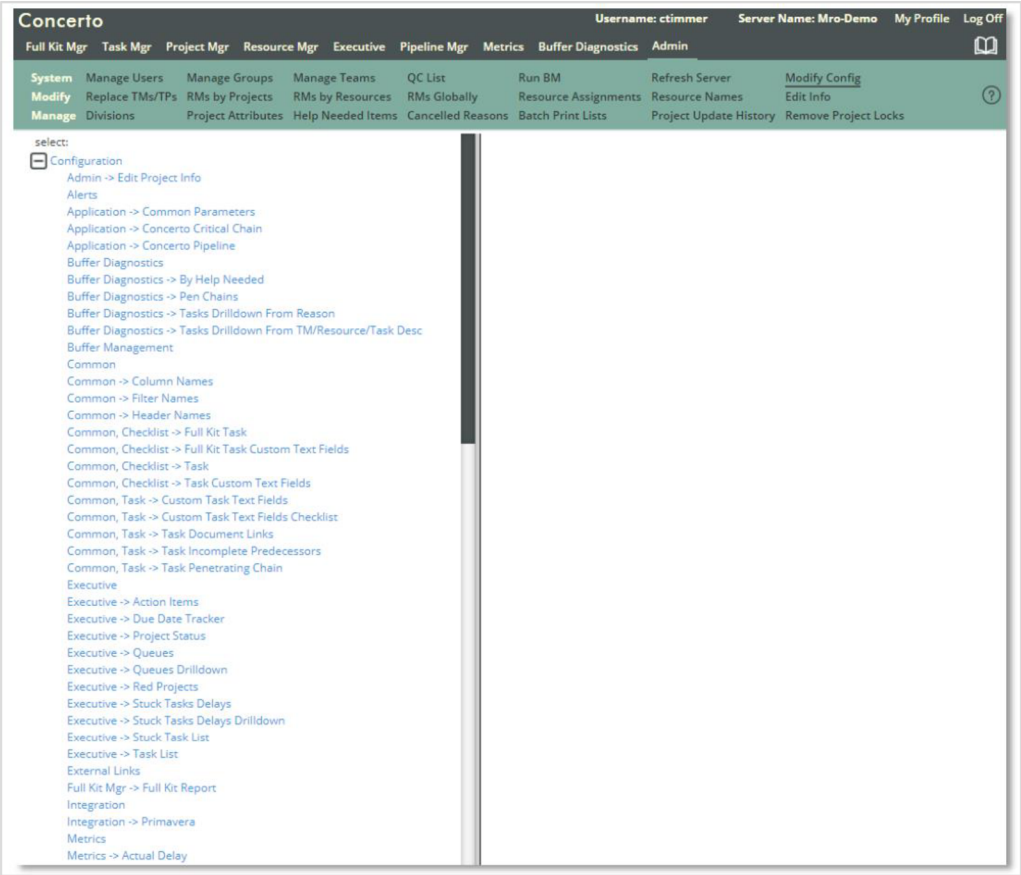

Figure 7: Managing Concerto Configuration Screen
Source: Škoda Transportation, a.s. (2023)

The Projects have an Executive's dashboard that is designed to provide, at a glance, information on the overall health of the organization with a clear grasp of performance and potential problem areas. There are many view in this dashboard:

Project Status and Red Projects- What is the status and overall health of the organization?

To understand the overall health of the organization, start with Project Status. Every dot in the chart represents an In-Process project. Dots in the red region represent projects where the buffer consumption exceeds the progress; these projects require your attention. The project name will appear when you mouse over the dot. (see Figure 8).

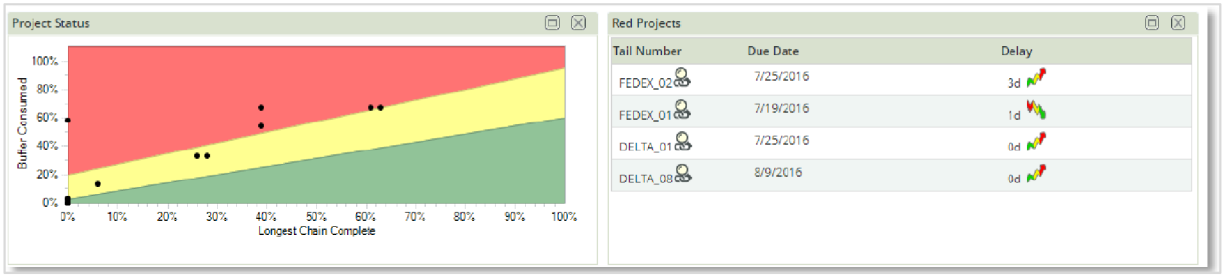

Figure 8: Project Status Screen

Source: Škoda Transportation, a.s. (2023)

To view the vital details of the project, such as the due date, projected date, and penetrating task, click on the expand icon (upper right of the box) under Red Projects (see Figure 9).

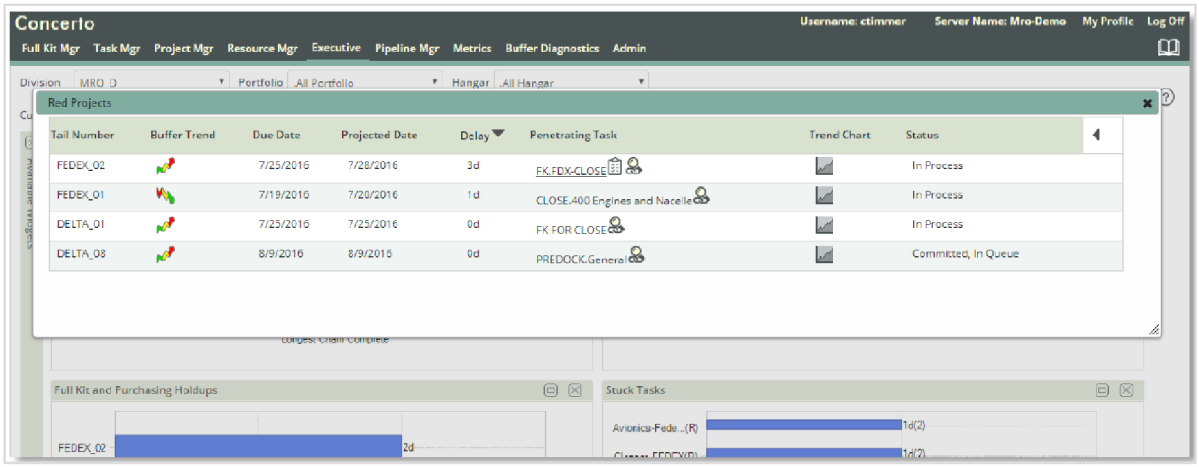

Figure 9: Red Projects Screen

Source: Škoda Transportation, a.s. (2023)

Stuck Task List - Who Needs Help and For What Reason?

There are two stuck tasks report. The first is a quick link and filters for the escalated task report. This is the quickest and simplest way to review the tasks that need attention today. A filter at the top allows for quick filtering for a specific project or task manager (see Figure 10).

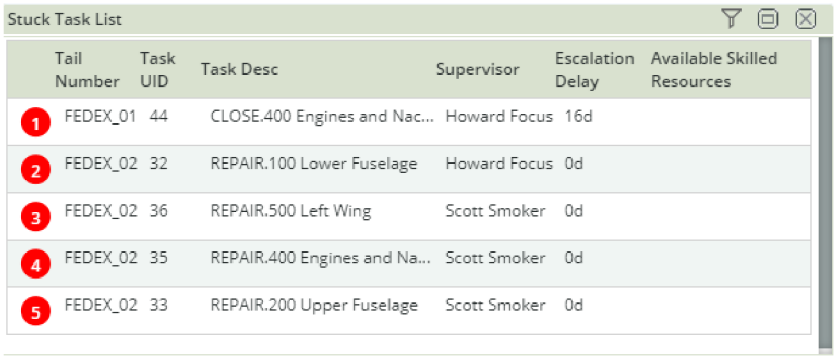

Figure 10: Stuck Task List Screen

Source: Škoda Transportation, a.s. (2023)

Queues Report: Providing Pre-emptive Warning before Buffer Consumption Actually Happens

See Figure 11.

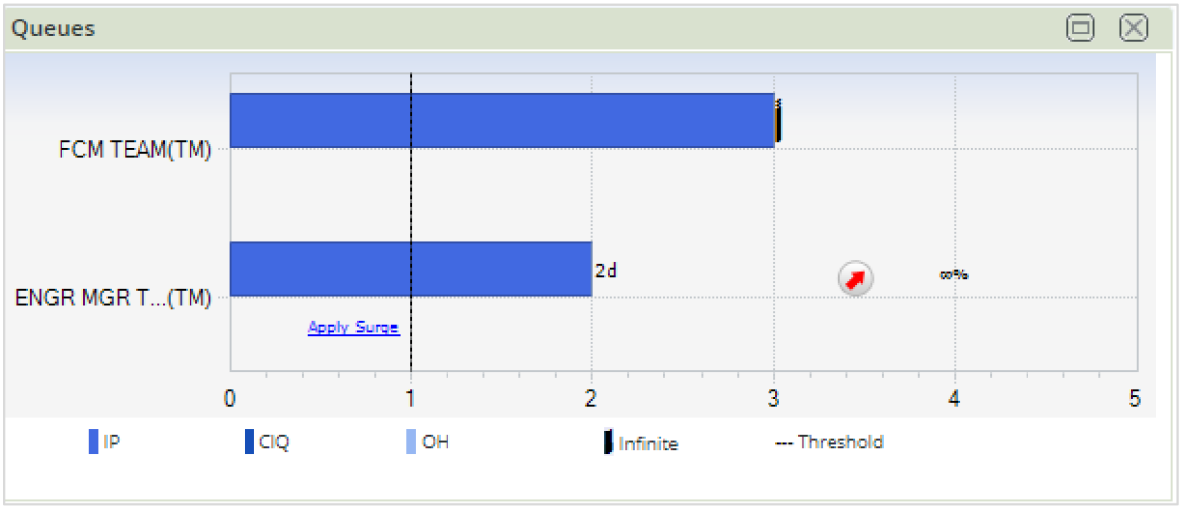

Figure 11: Queues Report Screen

Source: Škoda Transportation, a.s. (2023)

Due Date Tracker: Monitor Due Date Changes Across the portfolio

Alerting when project due dates have been changed may be helpful. Projects need to be tracked on time to the correct date. A project may not be healthy if the target date has been moved without permission. It's crucial to restrict who can adjust these dates and to establish a reliable process that will only permit adjustments when necessary and approved by the portfolio managers. Another widget you can use is the Due Date Tracker. This widget lists recent date changes. A widget window opens, listing the changes. This window can also be expanded to show the change details (see Figure 12).

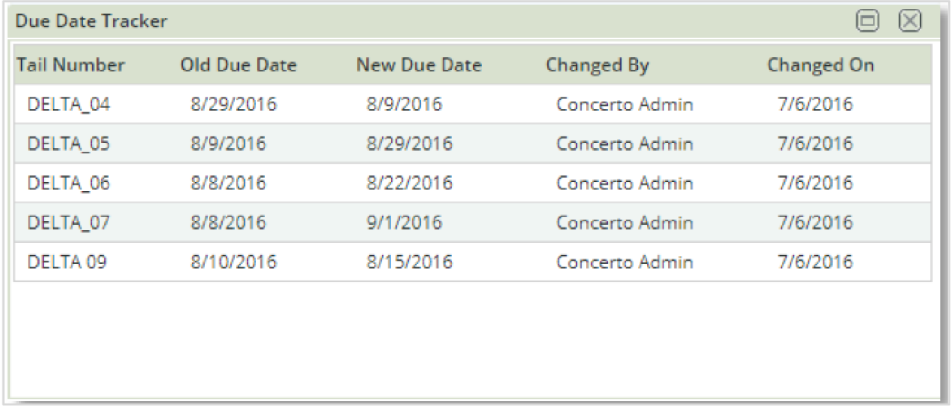

Figure 12: Due Date Tracker Screen

Source: Škoda Transportation, a.s. (2023)

Task List: View the Priority of Tasks Across the Portfolio or for a Single Project

When questions around priorities come up, open the task list. Like the escalated task widget, users can quickly filter for a project or task manager. Expanding the view provides the detailed task list that is visible from the Task Manager tab (see Figure 13).

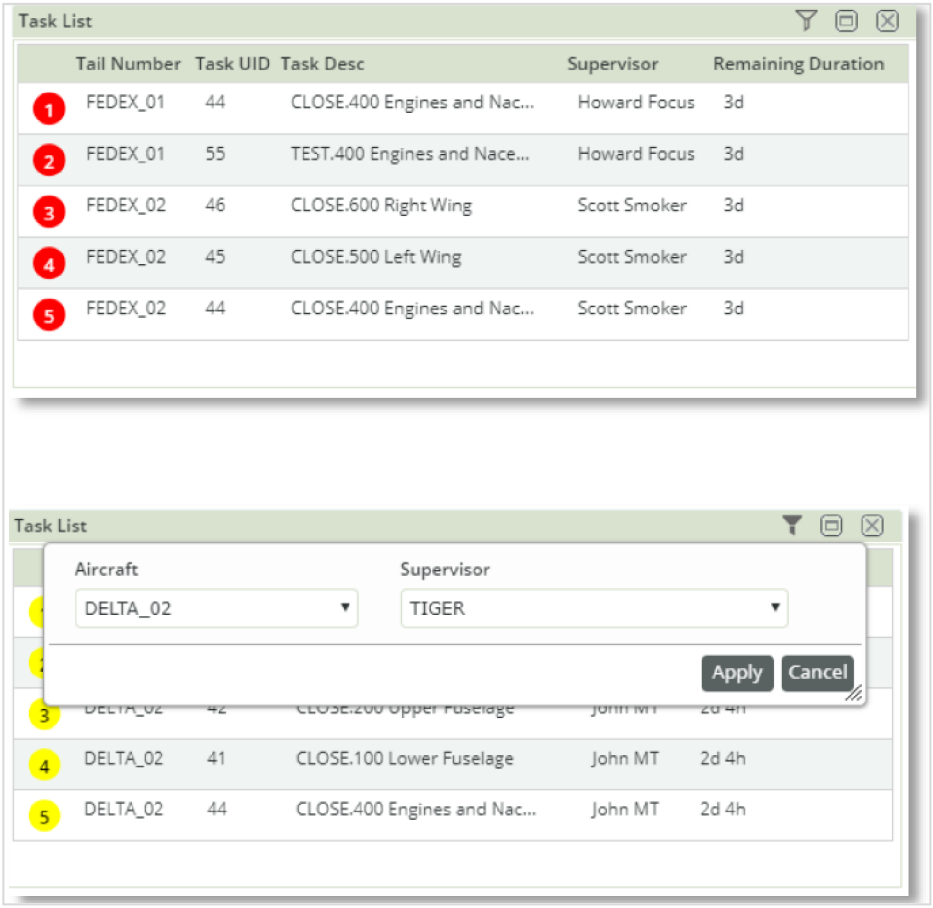

Figure 13: Task List Screen

Source: Škoda Transportation, a.s. (2023)

The projects provide the Full Kit task to model work that is done by external non-project resources or parts or materials that need to be delivered by a certain date (see Figure 14).

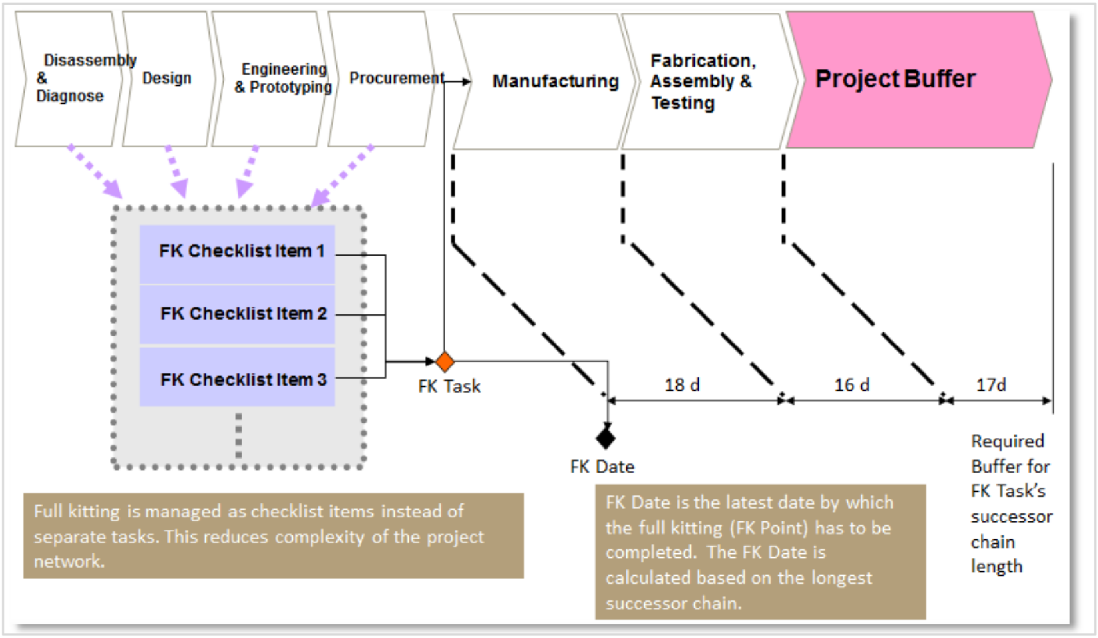

Figure 14: Full Kit task Screen

Source: Škoda Transportation, a.s. (2023)

The projects provide resource managers that use the Resource Mgr module to identify capacity shortages and take corrective actions. Also, Resource Managers may review the Resource Needs to drill into the details of what is upcoming (see Figure 15).

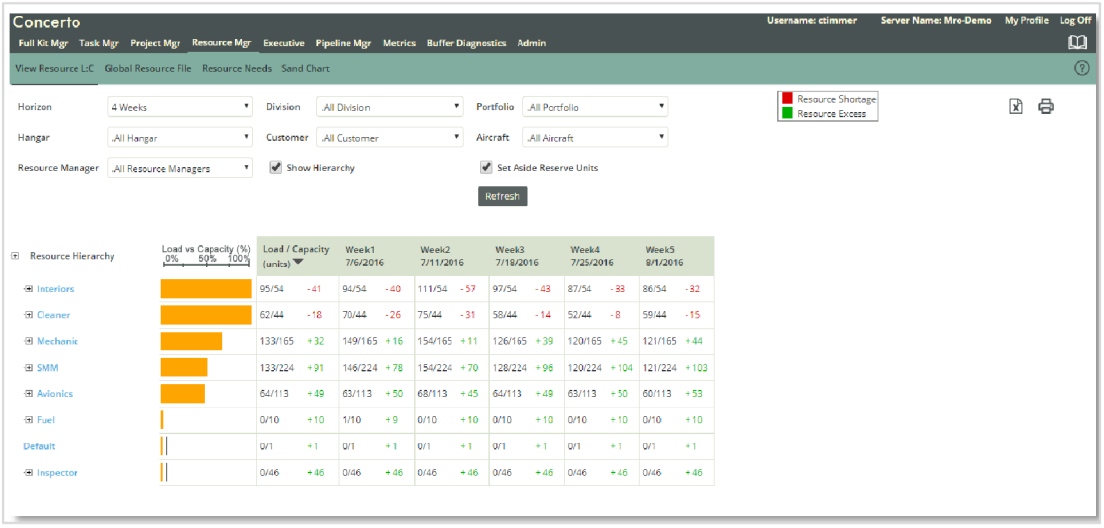

Figure 15: Resource Managers Screen

Source: Škoda Transportation, a.s. (2023)

4.5 Implementation Process

This part outlines the step-by-step process of implementing the Concerto software within Škoda Transportation. The implementation journey starts with initial planning and progresses all the way to launching the system for live operation.

1. **Getting Started:**

- A Kick-Off Meeting brings together stakeholders to introduce project goals, establish communication channels, and assign responsibilities.
- A detailed workshop follows, focusing on identifying required functionalities, data migration strategies, and user access controls.

2. **Software Acquisition and Set-Up**

- Acquiring necessary software licenses and installing Concerto on designated servers.
- Configuring the system with predefined parameters and user access controls.

3. **Understanding the Current Workflow**

- Analyzing the existing data flow to identify bottlenecks and areas for improvement.
- Envisioning the ideal future state for data management within Concerto

4. **Preparing for User Adoption**

- Developing a detailed project schedule and providing comprehensive training sessions for users at various levels.
- Establishing project and subproject structures within Concerto for effective data organization.Testing and Refining

5. **Testing and Refining**

- Conducting a pilot phase with the TRAM RNV project to evaluate functionality and user experience
- Hosting management workshops to gather feedback and refine procedures.

6. **Building a Dedicated Team and Finalizing Preparations**

- Establishing a dedicated team to manage and support Concerto implementation.
- Configuring Concerto system with a trained administrator to ensure optimal performance.

7. **Project Planning and Data Flow Optimization**

- Documenting detailed procedures for managing and utilizing Concerto effectively.
- Providing Master Scheduler training for efficient planning and management within the system.

8. Finalizing Plans and Launching the System

- Reviewing and finalizing project plans to ensure alignment with Concerto's capabilities.
- Conducting training sessions and preparing for the Executive phase rollout.

Overall, this structured approach ensures a smooth implementation process and maximizes the benefits derived from using Concerto within Škoda Transportation.

The implementation project for Concerto software commenced in March 2019.
The TRAM RNV (Rhine-Neckar tram network) expansion project was chosen as the pilot initiative to test the new system, it was critical that the program was managed efficiently on the new platform.

The implementation process entailed various key activities:

1. **Weekly Steering Committee Meetings**: These meetings were held to review progress, flag issues, and receive guidance from management.
2. **Fortnightly Core Team Working Sessions**: Core team members convened fortnightly to analyze processes, configure the system, and develop templates and workflows.
3. **Monthly User Group Meetings**: These meetings provided forums for gathering feedback, addressing training needs, and resolving adoption-related queries.
4. **Quarterly Reporting to Leadership**: Quarterly reports were presented to leadership, providing updates on timelines, budget, risks, and benefits realization.

Efforts to train users on complex program and project management concepts also took longer than anticipated. To address this, the team developed interactive online tutorials and videos.
By end of 2022, the RNV pilot was successfully launched within Concerto, enabling the validation of system design and refinement of features such as reporting and dashboarding. Following the resolution of outstanding issues, the TRAM implementation was rolled out across the portfolio by end of 2022, as planned.

Implementation Challenges

Based on the provided information, several significant problems were encountered during the implementation of the software:

1. **Technical Issues and Optimization Challenges:**

- Concerto software faced optimization challenges for handling large volumes of data, leading to performance issues such as slow system response and memory overflow problems.
- Technical problems persisted, including errors during data entry, application instability, and difficulties in setting database sizes.

2. **Access and Connectivity Problems:**

- Challenges arose in setting up access to Concerto on the Transtech side, resulting in delays and the need for ICT intervention to resolve user access issues.
- Connectivity and functionality issues persisted on the Transtech network, hampering the smooth operation of Concerto.

3. **User Resistance and Negative Attitudes:**

- Potential negative attitudes among users in Transtech and ŠELC were noted, which could have impacted user adoption and collaboration.

4. **Communication and Support Issues:**

- Inadequate support and communication from Goldratt CZ and Realization were observed, affecting the timely resolution of technical problems and communication with Škoda ICT.

5. **Data Import and Preparation Challenges:**

- Issues related to data import, preparation, and completeness were reported, leading to confusion and the need for thorough data checks before implementation.

6. **Training and User Access Delays:**

- Delays in training and access setup for Transtech users resulted in postponed access to Concerto, potentially affecting trial operations and feedback gathering.

7. **Functionality Requests and Streamlining Needs:**

- Requests for additional filters, sorting options, and stream name changes highlighted the need for further functionality enhancements and streamlining of processes within Concerto.

These problems hindered the smooth implementation and operation of Concerto software, necessitating prompt resolution and proactive measures to ensure successful adoption and utilization. Addressing these challenges effectively is crucial for maximizing the benefits and achieving the desired outcomes of the software implementation project.

4.6 Projects Disadvantages

Each interviewer presents some problems in the two projects from point of your view.

Interview #1 Responses

The responses to the first interview, as summarised in Figure 16, are shown in the below points:

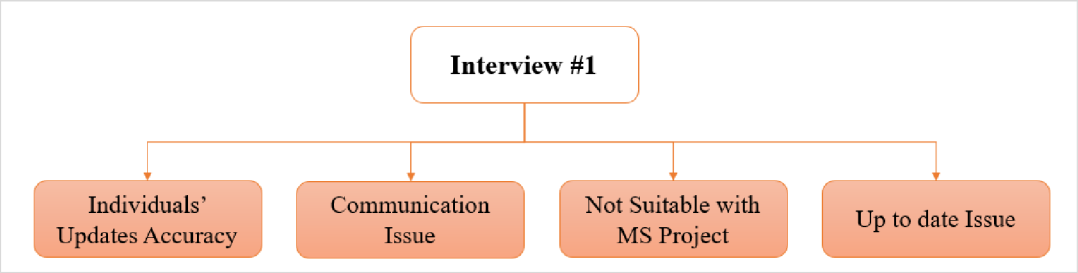

Figure 16: Interview #1 Responses
Source: own sources

The most unfavorable situation is to guarantee the accuracy of individuals' updates. The task managers find Concerto unnecessary for keeping the project up to date, thus unwilling to complete it. You must persistently contact them via phone or text to obtain updates, and even then, certain updates are executed foolishly, with huge margins of error. The consistency and standard of the network structure's depreciation do not align with the MS Project.

Interview #2 Responses

The responses to the second interview, as summarised in Figure 17, are shown in the below points:

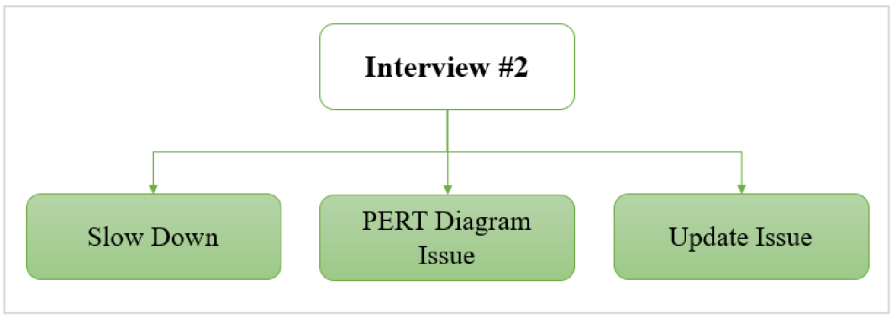

Figure 17: Interview #2 Responses

Source: own sources

Slowed Down. Instead of employing a Gantt Chart, it utilises a PERT diagram, which can be perplexing. It is not possible to update the data all at once. Ensuring frequent and timely updates with other departments to address communication challenges, with a minimum frequency of once every 4 days.

Interview #3 Responses

The responses to the third interview, as summarised in Figure 18, are shown in the below points:

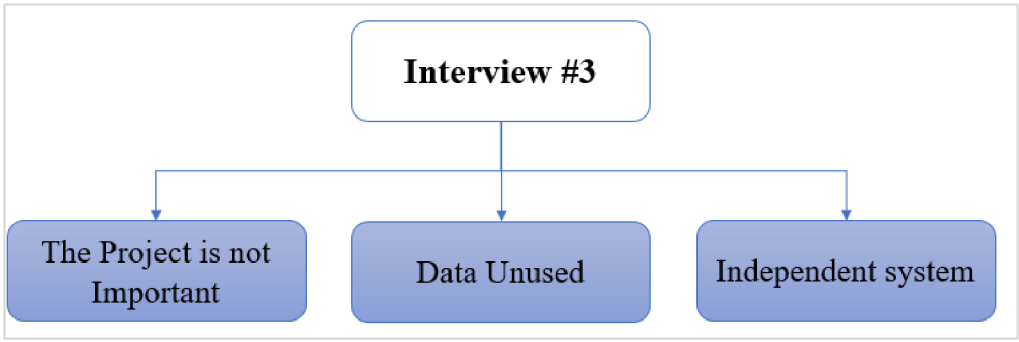

Figure 18: Interview #3 Responses

Source: own sources

Other departments employ their own instruments and perceive Concerto as superfluous. The data from other departments is exclusively replicated into Concerto. This data remains unused, with no utilisation even by the planning department. Concerto is an independent system that operates parallel to MS Project.

5 Results and Discussion

This chapter presented the results and provided some discussion about what are the solutions for the disadvantages for each interview.

5.1 Solutions of Interview #1 Responses

The first interview provides four problems that are related to the updates as shown in followings points. We suggested some solutions for each problem. Table 5 shows Problems, Suggested Solutions, and if these solutions can be implemented in real life or not of Interview 1 Responses.

Individuals' Updates Accuracy: Verifying the accuracy of persons' updates in software can be challenging, particularly in situations when a high level of dependability is essential. Here are several solutions to tackle this issue:

- **Automated Testing:** Create thorough automated testing suites that encompass different areas of the software's functionality. This encompasses unit tests, integration tests, and regression tests. Automated tests ensure the precision of updates and detect any inconsistencies at an early stage of development.
- **Documentation:** Ensure comprehensive and current documentation for the software. This involves recording modifications produced by persons and offering standards and optimal methods to guarantee precision and uniformity in updates.
- **Continuous monitoring:** involves consistently overseeing the software's performance and accuracy, even following the implementation of upgrades. This aids in identifying any irregularities or declines that may occur over time, enabling preventive management.
- **Feedback Mechanisms:** Create avenues for consumers to give input on the software's precision and functionality. This may involve bug reporting tools, user forums, or customer support channels to swiftly identify and address issues.
- **Implement access restrictions** to restrict those who can modify the software. Only qualified persons with the required skills and training should have permission to alter crucial elements of the software.
- **Training and Education:** Allocate resources to training initiatives aimed at instructing developers on optimal methods for software updates. Topics covered include coding standards, testing procedures, and version control usage.

Concerto unnecessary: the solution for this problem is to use another software that does not has the problems in same field.

Contact Process: To address a situation where consistent communication is needed to get updates, and when some updates are poorly handled with substantial margins of error, a comprehensive strategy is necessary to enhance the process and reduce risks. Here are some steps to resolve this issue:

- **Establish clear communication routes** with the personnel responsible for providing updates. This may involve establishing specialized communication platforms like project management software, instant messaging apps, or email threads to enhance efficiency.
- **Update methods and Standards** refer to the creation of standardized methods and rules for delivering updates. This involves detailing the structure, substance, and frequency of updates to maintain consistency and clarity in communication.
- **Deliver training sessions** or workshops to educate individuals on the significance of precise updates and the correct processes for carrying them out. Offer continuous assistance and provide resources to resolve any inquiries or issues they may have.
- **Implement Automated Update Requests**: Use automated systems or software solutions to deliver update requests and reminders periodically. This minimizes the necessity for manual follow-ups and assists in maintaining the process on schedule.
- **Implement quality assurance checks** to assess updates before implementation. This may include peer reviews, code inspections, or validation tests to guarantee that updates adhere to the necessary standards and specifications.
- **Perform risk assessments** to pinpoint potential causes of mistake or failure in the updating process and implement mitigation strategies. Create mitigation techniques to tackle these hazards, such incorporating fail-safe systems or contingency plans.
- **Promote Open Communication:** Cultivate an environment of open communication and transparency where individuals are at ease sharing concerns or addressing issues about updates. Promote constructive criticism and open communication to tackle any issues that may occur.

- **Continuous Improvement:** Continuously assess and enhance the update process using insights gained and comments received. Continuously refine the process to include top practices and enhance efficiency and effectiveness.

Not consistency with MS Project: the following points show some suggested solutions for this problem.

- **Verify for Updates:** Confirm that your software and Microsoft Project are current. Outdated software versions might lead to inconsistencies owing to compatibility difficulties.
- **Check compatibility:** Ensure that your software is compatible with the version of Microsoft Project you are using. Occasionally, updated Project versions may include alterations that could impact compatibility with third-party applications.
- **Contact Support:** Contact the support teams for your software and Microsoft Project for help. They can offer customized insights or solutions for your particular circumstances.
- **Explore alternate software** alternatives that better interact with Microsoft Project or provide the necessary features without compromising consistency if compatibility difficulties remain.
- **Testing and Validation**: Perform comprehensive testing to pinpoint particular areas of discrepancies. This can aid in identifying the main cause and informing potential solutions more efficiently.
- **Utilize various file formats** such as XML or CSV to transport data between platforms if your software supports exporting or importing project files. At times, specific formats maintain data with greater precision than others.
- **Customize fields**, formatting, and project-specific options carefully. Make sure these settings are set uniformly in both your program and Microsoft Project to prevent inconsistencies.
- **Ensure that the data mapping** between your program and Microsoft Project is configured accurately. Ensure precise mapping of fields to avoid data loss or misinterpretation during transfer.

Table 5: Problems and Suggested Solutions of Interview 1 Responses

Problem	**Suggested Solution**	**Solution Implemented**
Individuals' Updates Accuracy	Automated Testing	No
	Documentation	Yes
	Continuous Monitoring	No
	Feedback Mechanisms	Yes
	Implement Access Restrictions	Yes
	Training and Education	Yes
Concerto unnecessary	Using another Software	Yes
Contact Process	Establish Clear Communication Routes	No
	Update Methods and Standards	Yes
	Deliver Training Sessions	Yes
	Implement Automated Update Requests	No
	Implement Quality Assurance Checks	No
	Perform Risk Assessments	Yes
	Promote Open Communication	Yes
	Continuous Improvement	Yes
Not consistency with MS Project	Verify for Updates	Yes
	Check Compatibility	Yes
	Contact Support	Yes
	Explore Alternate Software	Yes
	Testing and Validation	Yes
	Utilize Various File Formats	Yes
	Customize Fields	Yes
	Ensure Data Mapping	Yes

Source: own sources

5.2 Solutions of Interview #2 Responses

The second interview provides four disadvantages that are related to the website in slow, using PERT diagram, and updates. Table 6 shows Problems, Suggested Solutions, and if these solutions can be implemented in real life or not of Interview 2 Responses.

Slowed Down: When encountering a software issue that is experiencing reduced speed, it is important to explore several potential reasons and corresponding solutions.

- **Optimize Code:** Analyze the software to uncover areas where performance is significantly hindered. Enhance the performance of crucial code portions and algorithms for improved efficiency.
- **Upgrade Software:** Ensure that the program is current by installing the most recent patches and updates. Updates may occasionally incorporate enhancements to performance or rectification of software defects.
- **Hardware Upgrades:** If the CPU, RAM, or storage do not meet the software's requirements, it is advisable to upgrade these hardware components. Also, Verify that the hardware is operating well and not encountering any problems that could affect its performance.
- **Database Optimization:** To enhance performance, optimize database queries and indexes if the software has interactions with a database. If the database is causing a bottleneck, it is advisable to explore database scaling methods such as sharding or replication.
- **Network latency** can be improved by minimizing the number of queries or optimizing data transmission methods. Verify that the network infrastructure is correctly set up.

PERT diagram Problem: They used the PERT diagram in inner working but this tool has several disadvantages:

- May contain untrustworthy information or impractical approximations
- May not provide a comprehensive depiction of the project's financial status
- Requires significant time, effort, and strategic project placement

In order to solve these disadvantages, we can use the Gantt Chart that has multiple benefits in project management and scheduling.

- Gantt charts visually display project tasks, timeframes, and dependencies, facilitating quick comprehension of the project's status for project managers and team members.
- Task Dependencies assist identify relationships between tasks, determining which activities need to be finished before others can begin, aiding with scheduling and resource allocation.
- Gantt charts aid in resource management by clearly indicating the allocation of resources to specific tasks, therefore avoiding overallocation or underutilization of resources.
- Timeline Clarity: They offer clear information about project timeframes, such as start dates, end dates, and task durations, aiding stakeholders in understanding when each work should be finished.
- Gantt charts facilitate progress tracking by comparing anticipated progress with actual progress. This aids in detecting delays or divergences from the initial timetable and implementing corrective measures.
- Gantt charts function as a communication tool for project stakeholders, enabling project managers to efficiently disseminate project status updates and plans to team members, clients, and other stakeholders.
- Decision Making: They aid in informed decision-making by offering a thorough project overview, allowing stakeholders to prioritize activities, allocate resources efficiently, and make necessary revisions.
- Gantt charts are adaptable and may be effortlessly modified to adjust to alterations in project scope, deadlines, or resource availability, guaranteeing that the project stays on course even in the face of unforeseen circumstances.
- Gantt charts are essential tools in project management, providing a structured method to efficiently plan, monitor, and control projects.

Update the data all at once: to solve this problem, we can suggest some solutions as followings:

- **Incremental updates**, which means it is updating data gradually instead of all at once. This involves making incremental updates to data, which helps alleviate pressure on the system and decrease downtime.

- **Batch Processing** involves dividing the data into batches and updating them in sequence. This method enables methodical updates without causing the system to become overloaded.
- **Schedule data** updates during off-peak hours or when website traffic is minimal. This reduces the effect on users and guarantees seamless upgrades without interrupting normal website functions.
- **Rolling Updates** include updating data incrementally in stages or segments instead of all at once. This guarantees that the website stays partially functional while the upgrade is being carried out.
- **Database Optimization** Enhance database searches and indexing to boost the effectiveness of data updates. This can expedite the process of updating substantial amounts of data.
- **Load Balancing** involves distributing the update workload among different servers or resources to avoid overloading any single component.

Timely updates with another department: Regular and timely communication with different departments in software development is essential for ensuring alignment, addressing issues swiftly, and keeping stakeholders informed. Here are some strategies to overcome communication obstacles and ensure updates are sent at least every four days:

- **Schedule periodic update** meetings or stand-ups with representatives from each department participating in the software development process. Meetings should be held every four days to review progress, address obstacles, and synchronize activities.
- **Establish precise expectations** and timeframes to ensure that departments comprehend the need of timely communication for updates. Set precise targets and deliverables that must be achieved during the four-day period.
- **Appoint Communication Liaisons**: Assign individuals or teams in each department as communication liaisons to manage updates and communication channels. These connections can operate as contact points for sharing information and solving problems.
- **Implement Automated Reporting Systems**: Use automated reporting systems to create and send changes periodically. The systems may gather data from several sources, organize it into detailed reports, and share it with important parties.

- **Promote proactive communication** by fostering a culture where team members are empowered to communicate updates, ideas, and concerns without the need to wait for scheduled meetings. Promote a setting that values and encourages open communication.

Table 6: Problems and Suggested Solutions of Interview 2 Responses

Problem	**Suggested Solution**	**Solution Implemented**
Slowed Down	Optimize Code	Yes
	Upgrade Software	Yes
	Hardware Upgrades	Yes
	Database Optimization	Yes
	Network latency	Yes
PERT diagram Problem	Using Gantt Chart	Yes
Update the data all at once	Incremental Updates	No
	Batch Processing	No
	Schedule Data	Yes
	Rolling Updates	No
	Database Optimization	Yes
	Load Balancing	No
Timely updates with another department	Schedule Periodic Update	Yes
	Establish Precise Expectations	No
	Appoint Communication Liaisons	Yes
	Implement Automated Reporting Systems	Yes
	Promote Proactive Communication	No

Source: own sources

5.3 Solutions of Interview #3 Responses

The third interview provides three disadvantages that are related to the Concerto Project is not needed due to the many issues occurred in it. Table 7 shows Problems, Suggested Solutions, and if these solutions can be implemented in real life or not of Interview 3 Responses.

Concerto is not necessary: the solution for this problem is to use another software that does not has the problems in same field

Data unused: The solution to the data from other departments that has been unused is not replicated but must be on demand. If the planning department requires the data, the programming team must implement an option in the software in the planning department account to enable them to obtain the data on demand.

discrepancy in dates between Concerto and MS Project activities: the following points show some suggested solutions for this problem

- **Data Synchronization:** Establish a robust data synchronization process between Concerto and MS Project to ensure consistency in activity dates. Regular checks and updates should be conducted to align the dates accurately in both systems.
- **Date Standardization:** Implement a standardized date format across Concerto and MS Project, accompanied by clear guidelines for entering and interpreting dates. This standardization will help avoid discrepancies and maintain consistency.
- **Automated Date Verification:** Develop automated scripts or tools to verify activity dates between Concerto and MS Project. These tools can identify inconsistencies and prompt users to reconcile the dates to ensure accuracy.
- **Explore alternate software** alternatives that better interact with Microsoft Project or provide the necessary features without compromising consistency if compatibility difficulties remain**.**
- **Testing and Validation:** Perform comprehensive testing to pinpoint particular areas of discrepancies. This can aid in identifying the main cause and informing potential solutions more efficiently.
- **Regular Data Audits:** Conduct regular audits of activity dates in both Concerto and MS Project to identify and resolve any discrepancies promptly. This proactive approach will ensure ongoing data accuracy and consistency.

- **Customize fields, formatting,** and project-specific options carefully. Make sure these settings are set uniformly in both your program and Microsoft Project to prevent inconsistencies**.**
- **Ensure that the data mapping** between your program and Microsoft Project is configured accurately. Ensure precise mapping of fields to avoid data loss or misinterpretation during transfer.

Table 7: Problems and Suggested Solutions of Interview 3 Responses

Problem	**Suggested Solution**	**Solution Implemented**
Concerto is not necessary	Using another software	Yes
Data unused	The data unused must be on demand	Yes
discrepancy in dates between Concerto and MS Project activities	Data Synchronization	Yes
	Date Standardization	Yes
	Automated Date Verification	Yes
	Explore Alternate Software	Yes
	Testing and Validation	Yes
	Regular Data Audits	Yes
	Customize Fields	Yes
	Ensure Data Mapping	Yes

Source: own sources

5.4 Summary

As we mentioned in the previous sections, we presented some suggested solutions for the problems in the three interview responses. Also, we mentioned if these solutions can be implemented or not, which leads to enhancing the inner working of the software with all the projects and saving the cost. It's important to recognize that the software itself may be perfect, but its effectiveness ultimately depends on how it is utilized. With proper implementation and adherence to best practices, the software can indeed be highly beneficial.

6 Conclusion and Future Work

This chapter provides the conclusion of this thesis, and suggests the future works.

This thesis focused on analysing the implementation of the Concerto software by identifying its benefits, assessing any drawbacks or issues, and proposing potential solutions. Two projects, 29T3_Bratislava and Tram RNV (Rhein-Neckar-Verkehr), are selected for the implementation task using this software. The data is gathered from the factory through interviews. An interview was conducted with three individuals from the planning specialist and project management divisions in the organization. The interviewees will respond to the following question: What are the pros and cons of the provided projects? The primary drawbacks of these projects include individuals' updates. Inaccuracy, Communication problem, Incompatibility with MS Project, Outdated information, Deceleration, PERT diagram problem, Lack of updates, and Unused data. Here are some proposed solutions for each issue: enforce access restrictions, switch to different software, conduct risk assessments, validate updates, assess compatibility, reduce http requests, improve code efficiency, utilize Gantt charts, organize data scheduling, implement load balancing, set clear expectations, designate communication liaisons, and ensure that unused data is not duplicated but is available on demand.

The implementation process of the Concerto software for managing data within organization underwent a meticulous journey from initial planning to system launch. This chapter outlined the systematic approach undertaken, starting with the Kick-Off Meeting and progressing through software acquisition, workflow analysis, user adoption preparation, testing, team building, and final system launch.

However, despite careful planning and execution, several challenges emerged during the implementation phase. These challenges ranged from technical issues and optimization hurdles to access and connectivity problems, user resistance, communication and support deficiencies, data import challenges, training delays, and functionality requests.

In conclusion, while the implementation journey encountered obstacles, it provided valuable insights and opportunities for improvement. Overcoming these challenges strengthened our understanding of the software, refined our processes, and ultimately contributed to the successful deployment of Concerto for managing data within organization. The goal of the work was fulfilled.

It's important to recognize that the software itself may be perfect, but its effectiveness ultimately depends on how it is utilized. With proper implementation and adherence to best practices, the software can indeed be highly beneficial.

As a Future Work, we plan to use more than two projects from the company. Also, we implement the suggested solution in real work to know the effectiveness for each of them.

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List of abbreviations

Abbreviations	Description
Pmg	Project Manager
PM	Project Management
CPM	Critical Path Method
CCPM	Critical Chain Project Management
PMI	Project Management Institute
ICT	Information and Communication Technology
PJMM	Project Management Methodology
PMS	Project Management Software
TAM	Technology Acceptance Model
RTA	Road and Transport Authority
AI	Artificial Intelligence
DHA	Dubai Health Authority
PMM	Performance Measurement And Management
PERT	Program Evaluation And Review Technique
EVM	Earned Value Management
IT	Information Technology
BPM	Business Process Management
MINLP	Mixed-Integer Nonlinear Program
DTT	Data Transformation Tool
PMTL	Project Management Tool
PaaS	Platform as a Service
PMT	Process Modeling And Optimization Tools