TECHNISCHE HOCHSCHULE MITTELHESSEN | THM | CAMPUS FRIEDBERG | MuK Management und Kommunikation

# Mercedes-Benz Cars Supply Chain Resilience Index

Engineering a visualized solution for measuring the resilience of Mercedes Benz-Cars supply chain based on scientific research

Study Course – Logistics Management, B.Sc.

**Portfolio**

Subject - Project Management

submitted by


**Alexander Crvendakic**

Matriculation number: 5333138

**Zacharie Malela**

Matriculation number: 5325049

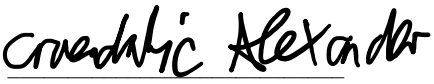
**Abraham Shodiya**

Matriculation number: 5448559

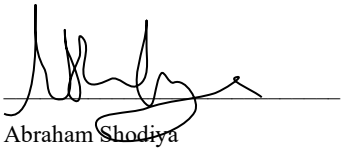
I declare that I completed the Portfolio independently and used only the listed materials. All materials from published and unpublished sources, whether directly quoted or paraphrased, are duly reported. Furthermore, I declare that the Portfolio, or any abridgment of it, was not used for any other degree-seeking purpose.

Friedberg, the 30 June 2023

Zacharie Malela



Alexander Crvendakic



Abraham Shodiya

TABLE OF CONTENTS

LIST OF FIGURES

# Introduction

**Project Background:**

The project *MBC Supply Chain Resilience Index* was introduced to the project management team by one of the main stakeholders, Prof. Dr. Herrmann. During the introduction, the focus was primarily laid on the concept of resilience in a supply chain. Prof. Dr. Herrmann provided valuable insights into the common understanding of "Supply Chain Resilience" and emphasized the significance of considering resilience aspects within companies.

The discussion highlighted the importance of proactively addressing potential risks and disruptions in a supply chain, as these can have a significant impact on revenue and overall business performance. Prof. Dr. Herrmann underscored the motivation for prioritizing supply chain resilience by outlining the negative factors that can affect supply chain operations, such as unforeseen events and natural disasters, which could consequently lead to supply chain disruptions and a halt in production.

For instance, Ponis, S.T. and Spanos. (cited in Ponis, 2012) state, that modern supply chains are, similar to world-class competing athletes, constantly asked to run faster, jump higher and throw further, implying the pressure exerted by customers and competitors, to be more efficient. Especially, performing efficiently and customer-oriented in volatile environments of financial instability and ongoing crisis underline the importance of supply chain resilience.

One crucial element of the project involves understanding the two main vulnerability factors that contribute to supply chain resilience: the sources of risks. When examining potential disruptions and risks within a supply chain, one can direct their attention to two primary areas: internal factors within the company and external factors, particularly related to suppliers and the market. This distinction between internal and external sources of risk is a key element to the project team's development and will be further explored in the discussions.

Following the profound presentation by Prof. Dr. Herrmann, the project team acquired a deeper

comprehension of the concept of supply chain resilience and recognized the importance of implementing measures to strengthen the resilience of the supply chain.

Subsequently, the team was introduced to the project itself, which includes a research collaboration between Mercedes-Benz Cars and THM. The objective of this project is to develop a supply chain resilience index that serves as an indicator of the supply chain's ability to withstand anticipated changes. It was communicated that the deadline for presenting the results is July 11th.

**Objective of the Project:**

Now that the project management team has acquired knowledge about the definition and significance of supply chain resilience management, they were prepared to establish an objective for the project. Since understanding the importance of this topic now present, as underlined by Ponomarov & Holocomb (cited in Ponis, 2012); who declared that supply chain resilience is a critical yet mostly unexplored component of Supply Chain Risk Management, the project team felt emotions of thrill and excitement which subsequently influenced their objective of the project. The shared vision was to create an effective, usable, interactive tool, which will be in use by Mercedes Benz Car's employees and helps identify areas of improvement in Supply Chain Resilience. As a realization of this vision, the goal was set to develop a dashboard that quantitatively visualizes the resilience index and incorporates elements based on the criteria communicated by the main stakeholders.

**Delegation of Roles**

To apply a theoretical framework, one can consider Tuckman's model: Stages of Group Development. When discussing the introduction and role delegation within the project, the authors identify this phase as the forming stage. In this stage, individuals are introduced to the project for the first time. A leader must provide the team with structure, and guidance, and establish an atmosphere of acceptance by setting ground rules and assigning roles (Sebastian Vaida & Dan Serban, 2021). Since the project manager's team hasn't been delegated to anyone yet, Prof. Dr. Herrmann played the vital role of the leader at the initial start.

Prof. Dr. Herrmann presented the six roles, each with its specific responsibilities, which have to be filled by the students:

- Project Management
    - Initiating, planning, executing, and closing the project
- Research on internal risks
    - Process risks, e.g. failure of an operating resource
    - Steering risks, e.g. incorrectly planned batch size
- Research on supply risks
    - e.g. unreliability of supplier, global/local sourcing concepts, supply chain complexity
- Research on demand risks
    - e.g. seasonal demand fluctuation
- Developing a supply chain resilience index
    - Degree of robustness (and agility)
    - Reliable and/or redundant resources
- Visualization
    - Development of a dashboard concept (ppt demo version)

The requirement was, that every team must consist of 2 members minimum, since 6 roles were presented to match, Prof. Dr. Herrmann eventually combined the tasks of the team Visualization and Developing a supply chain resilience index. Furthermore, it was agreed on canceling the research on demand risk from the project's scope.

The roles were delegated as follows:

- Team Project Management:
    - Zacharie
    - Abraham
    - Alex
- Team Index & Visualization
    - Hilal
    - Sinem
    - Esma
- Team Research on Internal Risks
    - Hilary
    - Barbara
- Team Research on Supply Risks
    - Hasret
    - Henok

# Project Manager Overview

## Definition of Project Management

As project managers responsible for overseeing this project, we must clearly understand project management principles.

While the definition of a project may vary depending on individual perspectives, there is an internationally recognized standard for project management that provides valuable guidance. According to ISO 21500 (2012), a widely accepted guidebook for project management, a project is characterized by a distinct combination of processes. These processes involve coordinated activities with defined start and end dates, all established to achieve specific project objectives.

As defined by ISO 21500 (2012), project management involves applying methods, tools, techniques, and competencies to a project. It includes integrating different phases of the project life cycle and ensuring that each phase results in specific deliverables. These deliverables are regularly reviewed to meet the requirements of project stakeholders.

The project life cycle, as described in ISO 21500 (2012), spans the period from the start of the project to its end, whereby the project span is split into different phases that are determined by the project managers. These phases follow a logical sequence, with a defined start and end, and utilize resources to deliver project progress. Within each phase, a set of activities is performed to ensure efficient project management, such as task coordination and monitoring or planning and goal setting. By the end of the final phase, all deliverables should have been provided.

**Project Life Cycle**

With established definitions of project, project management, and project life cycle, translation of the theories and application to the Supply Chain Resilience project can start.

To effectively manage the project, it is important to understand its main phases. Prof. Dr. Herrmann provided a pre-made project outline that serves as an example for defining the project phases.

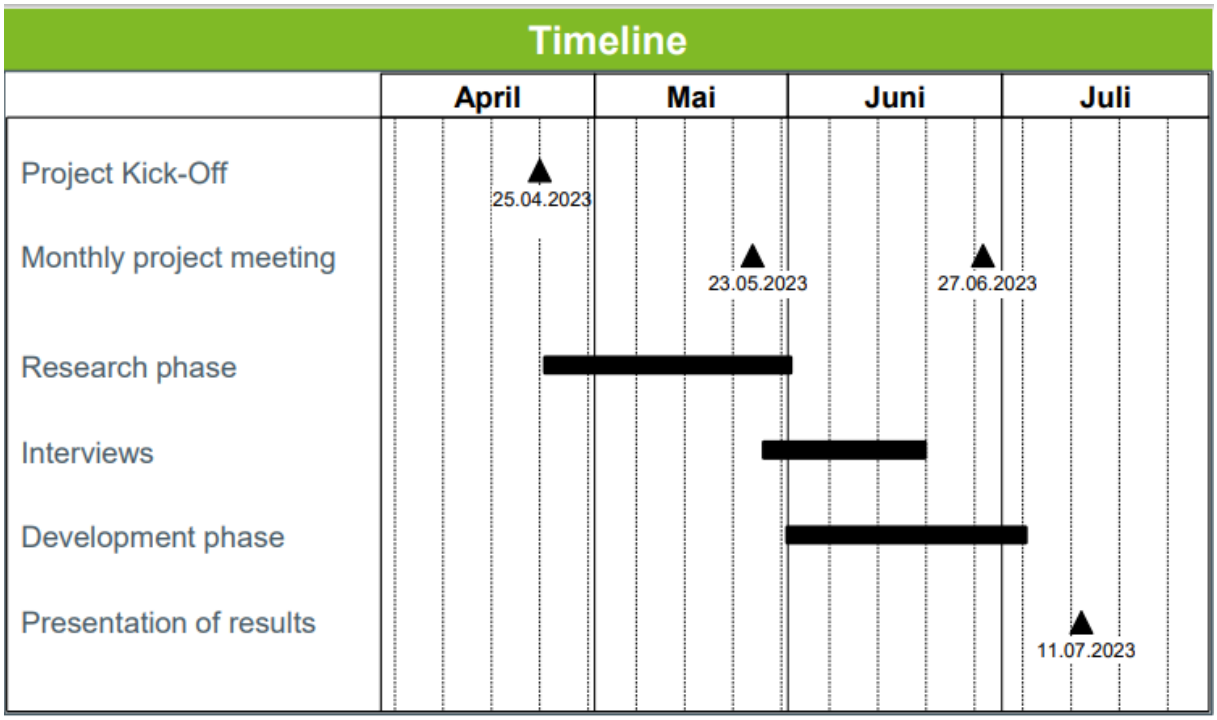



Figure 1: Example of a project outline provided by Prof. Dr. Herrmann Source: Project Management PowerPoint, "0 Introduction", slide 25

The project life cycle consists of various phases, including research, development, and interview phases. These phases align with the requirements of the project life cycle, such as a logical sequence with defined start and end dates.

The project managers adhere to the ISO21500 definition of project management and utilize tools and methods, such as the timeline introduced by Prof. Dr. Herrmann. The authors have created their timeline (see Figure 2) with clearly defined project phases, including a detailed project planning phase and a closing/finalizing phase. These phases serve as a roadmap, guiding the team along current progression, future goals, and necessary actions.

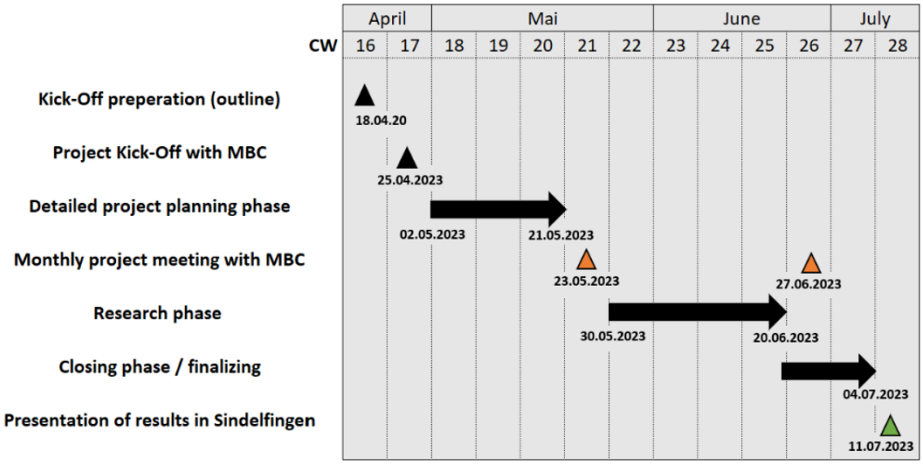



Figure 2: Project Manager's timeline and project phases Source: Project_Outline_MBC_THM.pptx

The next step in the project management process is to identify the specific deliverables for each phase. This will provide a clear understanding of the outcomes the project team needs to achieve throughout the project.

However, it is important to recognize that the established overview so far serves as a strong foundation and initial step towards the successful completion of the project. By defining the project phases, understanding the project life cycle, and applying project management principles, the project managers have set themselves on the right path to effectively manage and execute the project.

**Role of Project Managers**

According to Gasemagha and Kowang (2021), research commonly agreed, that project managers play an important role in project success. We can identify multiple key tasks and responsibilities, the project manager has to take on.

- Project Planning and Budgeting
    - The project manager is responsible for scheduling a project plan and budget. Since this project does not concern itself with budgeting, this responsibility was not taken into consideration.
- Team Management
    - Project managers oversee and manage the project team, ensuring that team members are assigned tasks, their skills are evaluated, and work is distributed effectively.

- Time and Quality Management
    - Project managers are responsible for managing factors, such as time and quality. They act as time watchers and ensure that the project is completed within the defined timeframe simultaneously meeting quality standards.

- Application of Project Management Tools and Techniques
    - The Project Management Institute (2013) suggests that project management involves the application of various tools and techniques, such as Work Breakdown Structure or Gantt charts to manage project activities to meet the project goals and stakeholder's expectations.

- Communication and Stakeholder Management
    - Project managers play a crucial role in facilitating effective communication among project stakeholders, including team members, clients, and other relevant parties.
- Monitoring and Control
    - According to Shahibi et al. (2019), project managers have the responsibility to monitor and control activities across all phases of the project life cycle. This emphasis on monitoring activities plays a crucial role in ensuring the timely delivery of deliverables in each phase.
- Risk Management
    - Project managers are responsible for identifying potential risks, such as delay or exceeding budget, and developing strategies to mitigate them.

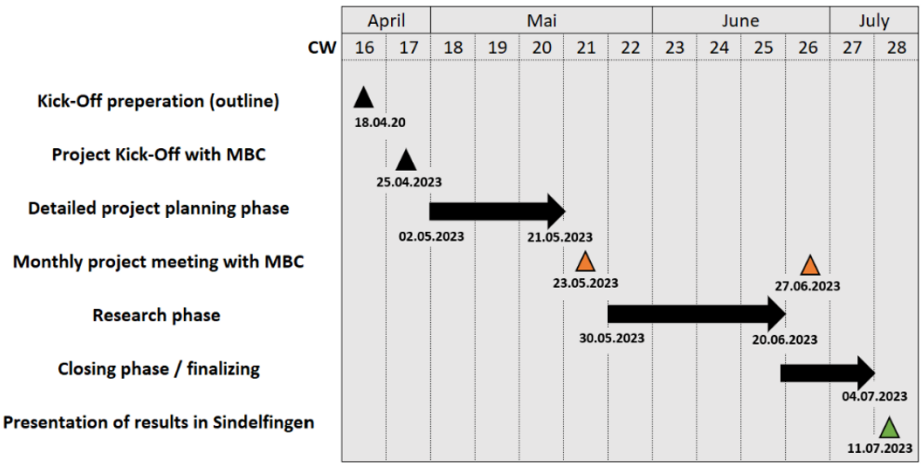
- Project Closure
    - Finally, project managers are involved in the closure phase of the project, ensuring that all deliverables are completed, project documentation is finalized, and lessons learned are captured for future projects.

      In section 5.1, detailed insights will be provided into how and to what extent the roles and responsibilities listed above were implemented. The authors will address questions regarding the practical application of these roles and highlight specific strategies and techniques utilized to ensure their successful execution.

# Project Planning

## Developing a Project Schedule

Building upon the input received from Prof. Dr. Herrmann, as outlined in section 2.2, the project managers proceeded to define the project schedule. This section will provide a deeper look into the schedule, examining its key components and phases. Analyzing the schedule will provide a comprehensive understanding of the timeline and milestones that shape the project's progression. To create a comprehensive, realistic project schedule, the involvement of different elements was necessary, starting with the kick-off meeting, several interviews with the key stakeholder Mercedes Benz Cars, where an update on the status of the project is being provided, a planning, execution (research) and closing phases and of course, the delivery of the project results. One key aspect was to estimate the durations of each phase by breaking them down into timely increments.




Project Manager's Timeline and project phases Source: Project_Outline_MBC_THM.pptx

To initiate the project, the first step involved the preparation of the kick-off presentation with the project's stakeholder, Mercedes Benz Cars. The purpose of the kick-off meeting was to provide an overview of the project and introduce it to the Mercedes colleagues and one key representative and stakeholder: Clemens Imser. During this meeting, the project managers highlighted the project scope, outlined the specific requirements and expectations, and communicated the projected project completion date. The kick-off meeting served as a crucial platform for aligning all stakeholders and establishing a shared understanding of the project's objectives and timeline. The authors factored in one week for the creation and preparation of the project outline presentation.

Following the kick-off presentation, the project managers allocated approximately three weeks, starting from May 2nd, for a detailed project planning phase. To ensure effective communication and progress tracking, predefined project meetings with Mr. Imser and Prof. Dr. Herrmann were planned for May 23rd and June 27th. These meetings served as checkpoints to present the project status, discuss any challenges or concerns, and gather valuable feedback crucial for the project's advancement.

Given the significance of research in the project, the project managers allocated the largest time increment, approximately 3 and a half weeks, to the research phase. Research serves as the primary execution phase where the two research teams conducted data collection and analysis.

At present, the team finds itself in the closing phase of the project. This phase involves finalizing the project deliverables, preparing for the final presentation of the project results, and composing project documentation in the form of a portfolio. The presentation of the team's efforts will take place on July 11th at the THM, where a presentation on the findings and outcomes will be held for Mr. Imser and Prof. Dr. Herrmann. A more in-depth examination of each phase will be covered in section 4.1.

**Defining Project Goals and Objectives**

Earlier, it was already mentioned that the team shared the vision of creating a usable tool/dashboard for Mercedes Benz Car's employees to support the analysis and comprehension of the resilience of their supply chain, but what does this mean for the project team? How are they conducting research? How are they moving forward to achieve this vision? This was one of the first challenging tasks, where the team thought about the possibilities of implementing their vision into tangible short-term objectives.

To convert the understanding of supply chain resilience into the creation of a dashboard, the team first started with a thorough examination of the term supply chain resilience. Therefore, the project managers delegated their first real task to the research teams: Research the term 'supply chain resilience'. This task was imperative to create a common understanding in the project team of the topic of the research.

After having a profound basis of knowledge regarding the termination and topic of the project, the team collectively started to brainstorm about ways to provide the necessary deliverables to this project, which will satisfy the criteria of the stakeholders.

In this regard, one of the project managers brought up the idea of creating a tailored questionnaire, that would be filled out by the Mercedes Benz Car's employees which results in a dashboard with quantitative visualization of the index.

This idea fostered the whole course of this project, since from now on, the team had a commonly accepted idea of an end goal in mind and they could start adapting their processes to reach this end goal.

The authors knew, that to achieve the end goal, they must create incremental short-term goals. In this regard, they turned to the model proposed by Locke and Latham (Locke, 1968; Locke and Latham, 1990, 2002) as a guiding framework. Their model provided valuable insights for defining these goals and ensuring team members' motivation and task completion. Subsequently, the project managers followed the following four guidelines while creating specific task goals.

- Difficult but Attainable
    - The task goals should be challenging rather than simple to increase performance.
    - However, the task should not be perceived as impossible as it would lead to decreased motivation
- Specific
    - The task goals be formulated specifically as it is easier to adjust behavior when we know exactly what the objective is.
- Participation
    - Participation of team members in formulating the task improves motivation and commitment to those tasks.
- Knowledge of results of past performance
    - Receiving or giving feedback is important to help attain the goals of the task.

Following these principles, they formulated specific tasks for the research teams and visualization/index teams. These tasks included identifying risk categories for the questionnaire, conducting research to develop a calculation method for the index, and exploring visualization techniques. Project management aimed to support the teams wherever help is needed and researched the topic of effectively applying tools, such as the following Kanbo to manifest project success.

**Establishing Task Monitoring and Documentation**

Given that project management involves monitoring and controlling activities throughout the project life cycle, as mentioned in the "Role of Project Managers," it became evident that the team needed to discover a practical and transparent approach to document tasks and display real-time updates on their current status.

Thankfully, Prof. Dr. Herrmann provided profound insights into possible tools and options for documenting and monitoring project tasks transparently.

The class was introduced to different options of graphical representations for task documentation, such as

- Work Breakdown Structure
- Network Diagram
- List of Open Points (LOP)
- Kanban

All these tools listed above follow the goal of creating a visualization of incremental work packages necessary to fulfill the project goals.

After inspecting each tool for the possibility of implementation in the project process, the team, agreed on using the Kanban method, since as logistics management students, they were all familiar with the term Kanban and had a common understanding of the function Kanban will provide.

Kanban stems from the Japanese Toyota Production System (TPS) and is a key element of lean management, a management philosophy, which aims to reduce or eliminate any activities, that do not foster and increase value. Furthermore, the term “Kanban” is the Japanese word for “card”, and is usually used in production and inbound logistics as a “pull system” where the card indicates that new material has to be produced and delivered.

If one transfers the Kanban system from logistics into project management, a framework is formed, which can look something like this:

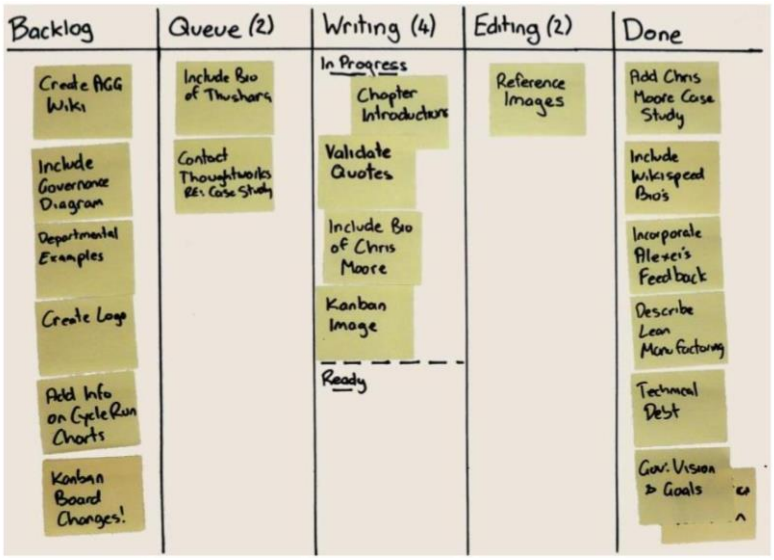



Figure 3: Example of a physical Kanban board in software project management
Source: INTENSIF. (2020). INTENSIF: Jurnal Ilmiah Penelitian dan Penerapan Teknologi Sistem Informasi, Vol.4(2), p.217. DOI: https://doi.org/10.29407/intensif.v4i2.14320

Figure 1 shows how the Kanban system is being applied in monitoring certain tasks of a project or process. Each column is labeled with a specific name or role. The last column named “done” indicates, that the single tasks have been completed and perhaps also approved by the project managers. The yellow cards as seen in the figure are the defined tasks, where a certain context is required in advance so that a single sentence can be understood as a whole task for the project members. What makes this approach to monitoring tasks especially attractive is, that the project tasks and the status (e.g. done or ongoing) are transparent. Additionally, it assigns responsibility to project members for tracking and progressing the tasks and cards, fostering member participation.

According to Marko Ikonen et al., the Kanban method can increase motivation and control over project activities. It happens because the advantage of using Kanban is to visualize the project's entire development at one time.

As implementation and utilization of a physical Kanban board was not an option due to distances between the team members, the decision was made to use a digital form of Kanban, which was also introduced by Prof. Dr. Herrmann, called Trello.

Trello is a digital, web-based project management tool that allows teams to organize and track their tasks using the Kanban approach. It provides a virtual board with columns and cards, replicating the visual representation of a physical Kanban board, as seen in Figure 1. With Trello, team members can create, assign, and move cards representing tasks, allowing real-time tracking of progress, with remote access from anywhere. It offers features like due dates, description boxes, comments, and labels, enhancing task management and task status communication among team members.

In Trello, the project managers defined 7 different columns.

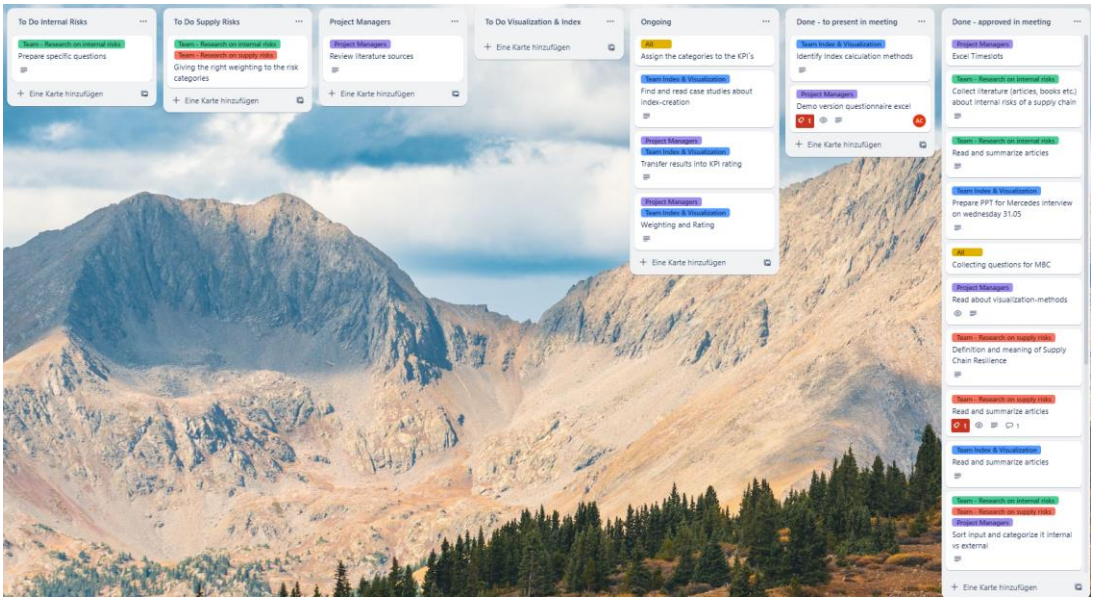



Figure 4: Our project management Trello Kanban board.
Source: Trello, https://trello.com/b/Fy2y8jNh/project-tasks

As seen in Figure 4, one column was defined for each team, with each column representing and documenting the tasks that have to be completed by the single teams.

Additionally, the project managers established one column for the sole purpose of documenting, which tasks are being worked on currently. This column was named “ongoing”.
Furthermore, the last two columns were implemented, which serve the purpose of an approval process and final storage of the Kanban task cards.

The cycle for creating tasks looks like this:
First, the project managers would consider their short-term project goals for example researching risk categories, and then address this topic directly to the respective research team to fulfill Locke’s and Latham’s third Step of Goal-Setting Theory, which is the participation of the team member. Together with the research team, they would then define feasible tasks and create a Trello card in their column with a headline, for example: “Identify risk categories”.

After creation, the card could be opened and descriptions could be added. Here they specified the task and entered a due date, as well as the responsible person from each team to foster a commitment to the realization of the task.

After the collaborative creation of the task board, the team member could; when beginning to work on the task, move the card from their team column to the ongoing column. This would serve as an indication for the project managers but also for the rest of the team, that work on the task has begun or is currently still undergoing.

When the team eventually completes the task, the members move the card into the column “Done – to present in meeting”, where they would present their findings and deliverables in the weekly meeting, which will be discussed in the next section.

If approval of their results was given, they can finish the task and document it by moving the card to the “Done – approved in meeting” column.

In conclusion, Trello’s efficient task monitoring and documentation process ensures effective and transparent collaboration, enabling the tracking of progress, promoting accountability, and achieving successful completion of project objectives.

**Establishing Communication Channels**

In the chapter "Role of Project Manager," it is emphasized that project managers have a critical role in facilitating effective communication among stakeholders. Peter Landau (2022) defines stakeholders as individuals, groups, or organizations who are affected by the project's outcome. Under this definition, the project members, are considered stakeholders as well, since they directly experience the impact of the project's results. Consequently, the authors recognized the need to establish effective communication channels to achieve successful outcomes for the project.

For general communication of topics, such as appointments, questions related to the project, and questions related to the course project management, the decision was made to use WhatsApp. Furthermore, the project managers established a regular meeting, every Wednesday evening, where they would meet virtually on Zoom and talk about tasks that have to be presented and approved by the members as well as formulate new tasks and give general status updates on the project.

To handle the storage of project-related documents, the team decided to utilize Google Drive, a digital cloud repository provided by Google.

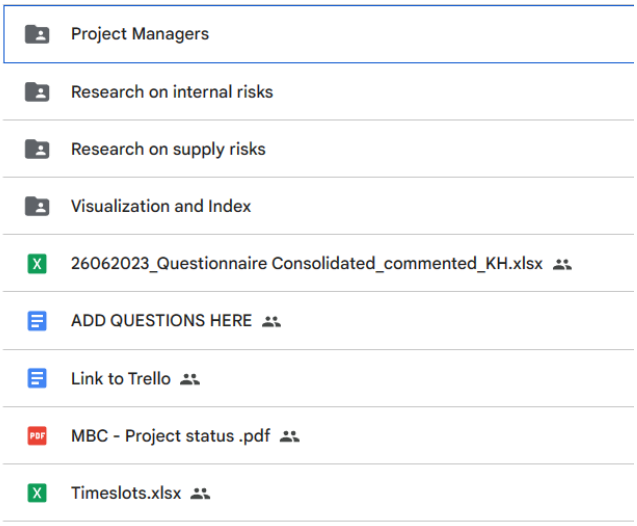



Figure 5: Our project management document repository on Google Drive.
Source: Google Drive, https://drive.google.com/drive/folders/1pDlM0OuKSWUFake8KNViDCoQMYtWH-gG

As depicted in Figure 5, individual folders for each team were created, where the teams could store team-specific documents related to their tasks. In the main folder, general documents were added that affect everyone, such as the Excel sheet with the questionnaire or the link to Trello.

# Project Communication

### Stakeholder Management and Engagement

As mentioned in the previous chapters, the whole project team engaged with two key stakeholders who played crucial roles in this project. The project's internal stakeholder, Prof. Dr. Herrmann, is the lecturer and has worked in Mercedes-Benz-Cars for several years and was therefore bringing valuable experience, expertise, and guidance to the project. On the other hand, Mercedes-Benz-Cars served as an external stakeholder, providing important hints and room for improvement. The contact person within Mercedes-Benz-Cars was Mr.Imser whom the Project Team met on the visit to Factory 51 in Sindelfingen. Every Tuesday the Project Team had their weekly scheduled lecture „Project Management" at 11:30 a.m. in Friedberg where the internal stakeholder Prof. Dr. Herrmann shared her knowledge and expertise with us. Recognizing that not everyone in the team had prior experience in the field of Project Management, Prof. Dr. Herrmann provided scripts to reinforce the student's understanding and bridge any knowledge gaps. In summary, the Project Team had six scripts which were separated into sections. The first one was an introduction script in which the internal stakeholder communicated some requirements regarding the portfolio and the organization of the course.

To give a clear understanding of the project she prepared two important pages which are included in this portfolio to show a definition of the supply chain resilience index to have a better vision throughout the processes which had to be done to succeed.

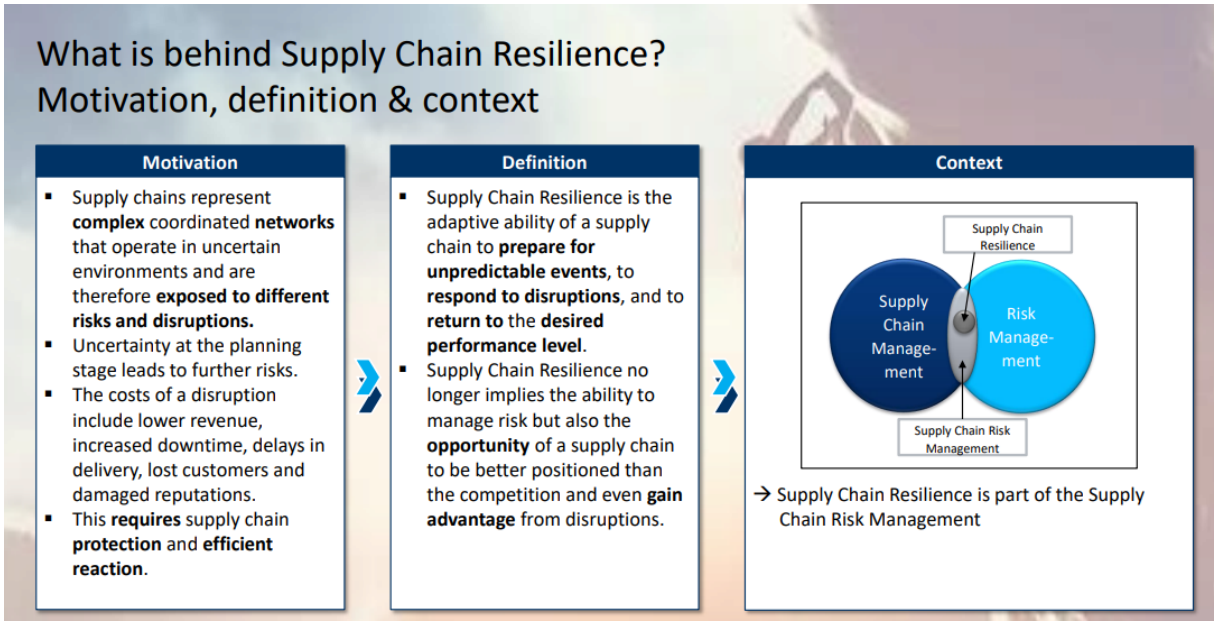



Figure 6: Definition Supply Chain Resilience Source: Project_Management_SoSe2023_0_Introduction .pdf, p.14

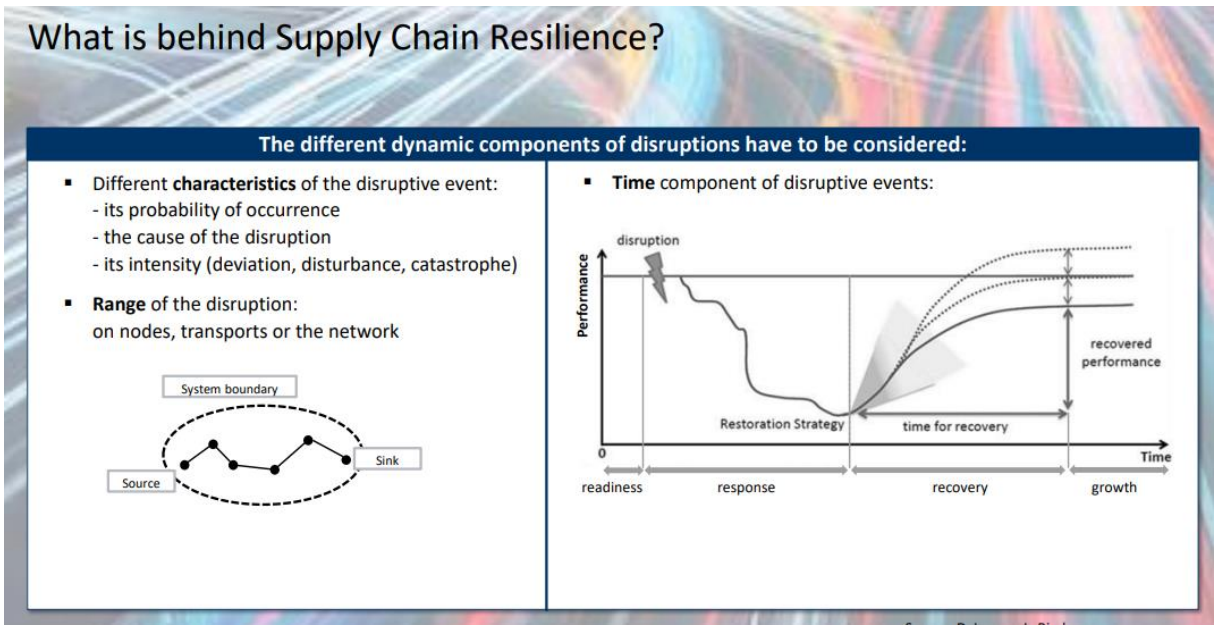



Figure 7: Different characteristics of the disruptive event Source: Project_Management_SoSe2023_0_Introduction.pdf, p.15

After the basics, Prof. Dr. Herrmann introduced the workflow which is common during a project within a company.

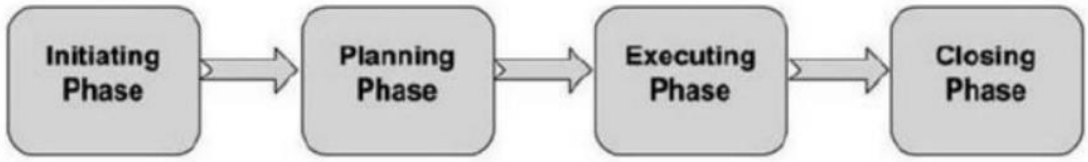



Figure 8: Basic project workflow Source: Project_Management_SoSe2023_2_Project_Mgt_Phases_1.pdf, p.5

It was emphasized that the planning phase was very crucial for the project because Prof. Dr. Herrmann introduced tools in this phase, that intend to help the project managers during the whole project process.

In the next phase, the internal stakeholder introduced the executing phase where the project team learned about holding regular team meetings, how to visualize the progress how problems can occur, and how to get rid of them.

Moving to the next and last phase where the project team currently finds itself is the closing phase. This section discussed which steps are necessary to successfully close a project. Prof. Dr. Herrmann was very determined to help the team through the project. She always offered to send her an e-mail if questions arise or conduct a meeting with her via Zoom.

## The Procedure of Team Meetings

The project team aligned on a weekly meeting on Wednesday at 7 pm. Figuring out the right time was more difficult than expected, because of varying availabilities. First, the project managers, created an Excel Timeslot table using Google Drive in which every team member was able to write down the times when he or she is available.

| | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| | **Name** | **Mo.** | **Tue.** | **Wed.** | **Thur.** | **Fri.** | **Sat.** | **Sund.** |
| | Alex | 15:00 - 21:00 | 15:00 - 21:00 | 18:00 - 21:00 | 18:00 - 21:00 | 15:00 - 21:00 | 12:00 - 21:00 | 12:00 - 21:00 |
| | Abraham | 10:00 - 15:00 | | | 14:00 - 18:00 | 10:00 - 18:00 | | 12:00 - 21:00 |
| | Barbara | | | 14:00-21:00 | | | | |
| | Esma | 10.00-13.00 | 19.00-21.00 | ---- | 19.00-21.00 | 10.00-13.00 | --- | --- |
| | Hasret | 19:30- Open end | 14:00-18:00 | 13:30-17:00 | | 12:00-20:00 | | |
| | Henok | 13:00-21:00 | 14:00-17:00 | 12:00-15:00 | 09:00-12:00 | | | |
| | Hylary | 13:00-21:00 | | 18:00- 21:00 | | 17 | | |
| | Hilal | | 14:30 - 17:00 | 10:00 - 12:30 | | 09:00 - 12:00 | | |
| | Sinem | 14:00-17:00 | 21:00-00:00 | 21:00-00:00 | 18:00-21:00 | | | 20:00-21:00 |
| | Zacharie | 10:00-13:00 | 18:00 - 21:00 | 18:00 - 21:00 | | 18:00 - 21:00 | | 12:00 - 21:00 |

Figure 9: Excel Timeslot sheet Google Docs, 2023. Timeslots [online] Available at: <https://docs.google.com/spreadsheets/d/12g3EAiua3jmYk2ec7RsZDfFiBTTfjxU2/edit?rtpof=true> [Accessed 30 June 2023]

Even after entering the availability of each team member, there were only a few team members at the same time available for a virtual meeting. The project managers could smartly overcome this obstacle by introducing representatives for each team, who will present the team's efforts and results in the weekly meeting and take back feedback to share with the missing members, thus allowing a more flexible scheduling process, because fewer availabilities have to be factored in.

Each Meeting the Project Managers conducted was held on Wednesday via Zoom. On some occasions, the project managers had to wait some minutes because not every team member was able to be punctual due to work or other lectures. During the meetings, one of the Project Managers wrote an agenda to provide the whole project group an option to read again what was discussed on this particular day when e.g. the week was ending or other assignments regarding this project were adding up. It was also a great option to review the agenda to update the Trello board when tasks were accomplished. In each meeting, every team provided a concise status update on their progress and outlined the tasks that needed to be completed in the upcoming days. Our team also talked about problems that were occurring during the execution phase. At times it wasn‘t always easy to find solutions during the meetings. So the group had to address their difficulties in the following lecture or, for urgent issues that required immediate resolution, they would communicate via E-Mail with the project's internal stakeholder, Prof. Dr. Herrmann.

**Project Status**

The following part will describe how the Project Team updated both stakeholders within the project and how the team's progress during the project occurred. The project team was informed in the first lecture on Project Management that the team had to conduct a monthly status meeting with the external stakeholder Mercedes-Benz-Cars using Zoom. The internal stakeholder Prof. Dr. Herrmann, therefore, created for this purpose a Zoom meeting in beforehand. The counterpart within the external stakeholder was Mr.Imser.

In the first month (April) each team member started to get in touch with their assigned group because not everyone had work experience with any projects so far. For this reason, it was decisive for all groups to have a clear understanding of their main tasks within the project. Concerning this matter all groups started to investigate their field by searching for scientific e-books, papers, or journals to assimilate in this new topic using software like Google Scholar, and Business Source Premier, or as an alternative to visit our THM Library to search for matching references. Once they gained confidence in their topics, they dug deeper into research to identify potential risks which were relevant to achieve a result at the end of this project. To have a visualized insight into the project team's progress during each month, the project managers included a diagram, created with Excel and PowerPoint to illustrate the progress the Team gained each month. After completing the research phase, the progress at this time increased to 10%.

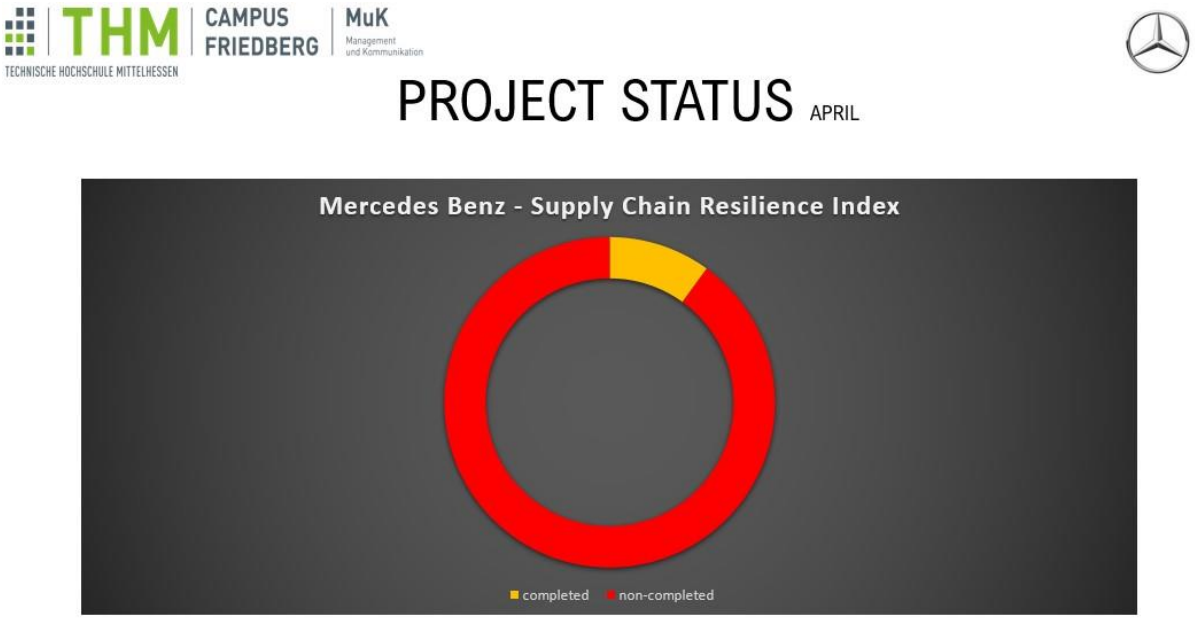



Figure 10: Mercedes-Benz – Supply Chain Resilience Index Project Status April

During May the groups progressed in the project by working on the fulfillment of objectives and reaching the vision, such as identifying risk categories and removing risks categories that the internal stakeholder, Prof. Dr. Herrmann through her time at Mercedes Benz Car, could already define as not fitting for MBC's supply chain. This is also where some problems occurred because the internal risk and the supply risk group had some overlapping risks, and their task was to differentiate them inside their groups. The supply chain resilience index group started to research KPIs that were crucial for the project. The first status meeting during this project took place on the 23rd of May 2023 including Mr. Imser. In the first status meeting the Project Managers introduced Mr.Imser to the Trello board and Google Drive which were essential tools in the project as mentioned in the chapter *Establishing Task Monitoring and Documentation*. Afterward, the groups started to present their tasks, status, and next tasks. With the exception that the supply risk group had to give a short introduction to the supply chain resilience index. After the presentation was done, Mr. Imser offered to exchange his e-mail with us, so our project team was able to contact him for special purposes, such as interviewing one group or discussing specific questions regarding this project. After this status meeting, the progress grew to 40% because every team had a clear plan and knew what to do with the help of both stakeholders.

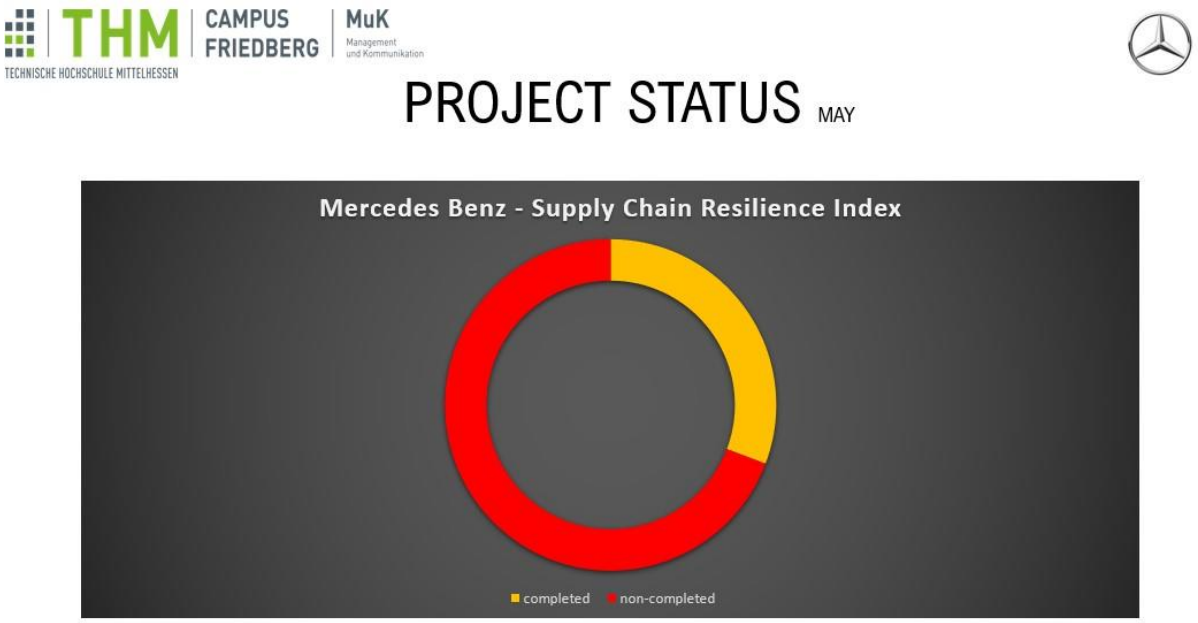



Figure 11: Mercedes-Benz – Supply Chain Resilience Index Project Status May

In June, the Project Team focused on resolving several issues that arose during the project. One, in particular, was faced by the supply chain resilience index group. They interviewed Mr. Imser to determine the appropriate KPIs and rate them. Unfortunately, they encountered some difficulties in defining these KPIs accurately. Prof. Dr. Herrmann grew concerned, because this group played a crucial role in the project, and the absence of well-aligned KPIs could cause the whole project to fail. To address this issue, the Project Managers offered their assistance in finding a solution. The weekly meetings were now focused on the supply chain resilience index group to discuss the difficulties they were facing in defining the appropriate KPIs. After resolving this problem, the project progress experienced a significant increase, overcoming the previous delay. With the issue successfully resolved, the Project Team was able to concentrate on upcoming tasks to provide progress within the project. During this time the internal and supply risk group had also cleared up their overlapping risks and were now focusing on methodically weighting the risk categories which was essential for the project. The index and visualization team supported the authors in matching the KPIs with the risk categories while working on a calculation for the resulting Supply Chain Resilience Index.

The next steps within this project were clearly defined: the project team needed to assimilate the feedback received from both stakeholders to improve the dashboard. Entering the closing phase, the team was confident to start coding and visualizing in Visual Basic for Applications (VBA). All mentioned points were presented and discussed during the second and last status meeting on the 27th of June 2023 with all stakeholders being present. Mr. Imser's constructive criticism towards the Project Managers regarding the Trello board was to show it the next time to better visualize the current status and next steps. The project status progressed during this time from 40% to 80%. Approximately 20% were left and this included the finalization of the results.

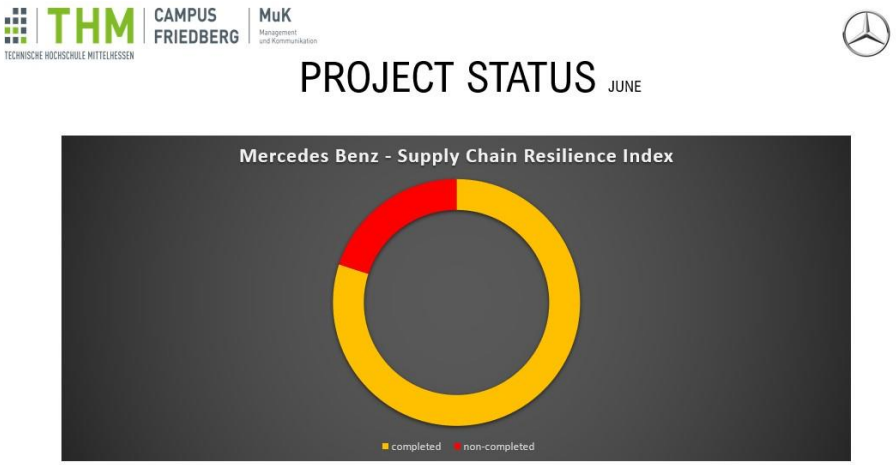



Figure 12: Mercedes-Benz – Supply Chain Resilience Index Project Status June

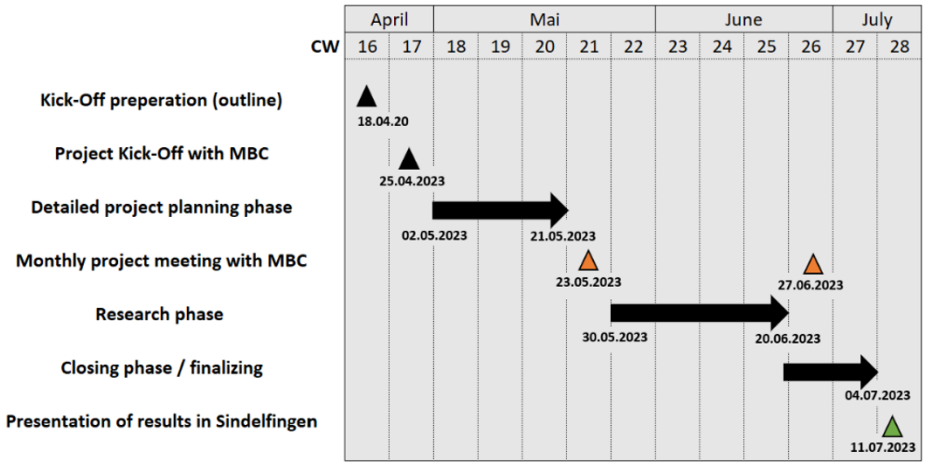
In July, all groups were done with their contribution to this project. The whole Project Team had their final lecture before the presentation and the submission of the portfolio in the module on the 4th of July 2023. In this lecture, the supply chain resilience index group and one of the Project Managers presented their current status regarding the supply chain resilience index. After the first presentation was held, Prof. Dr. Herrmann had some significant questions regarding the calculation of the index in case of understanding for this particular group, but the questions were successfully answered. Subsequently, the Project Manager introduced his version for calculating and explained explicitly how with the help of this calculation, the result was determined and illustrated the visualization concerning the index to give an insight into how a result was visualized in the supply chain index. After the input of the groups, the whole project team was informed by Prof. Dr. Herrmann to rate their performance within this project from one on the left side standing for the best to four on the right side standing for the worst to a number line and also include a critical reflection concerning this project to the portfolio. In the end, the project team was informed that our internal stakeholder was pleased with the two groups and not satisfied with the remaining two groups. The presentation will be held on the 11th of July 2023 in Friedberg at 11:30 am with both stakeholders present. The team worked for three months overall on this project and is now closing the project.


Figure 13: Mercedes-Benz – Supply Chain Resilience Index Project Status July

# Project Execution

## Working through Project Phases

In this section, the authors would like to go through the single project phases as depicted in our chapter“Defining a Project Schedule”.




Project Manager’s Timeline and project phases Source: Project_Outline_MBC_THM.pptx

Figure 2 provides an overview of the project, highlighting three primary phases: the detailed project planning phase, the research phase, and the closing phase as well as incremental events such as the project kick-off with Mercedes or the monthly project meetings.

First: the kick-off preparation. During this phase, the main task was to develop a project outline presentation. This presentation aimed to provide essential information about the project, including its background, timeline, project objectives, and potential risks that may prove as obstacles in completing the project. The project managers also added an organigram with a visual presentation of the allocation of responsibilities for each task.

The creation as well as the presentation, which we held in Sindelfingen at the Mercedes Benz Car plant, was the main objective of the project managers.

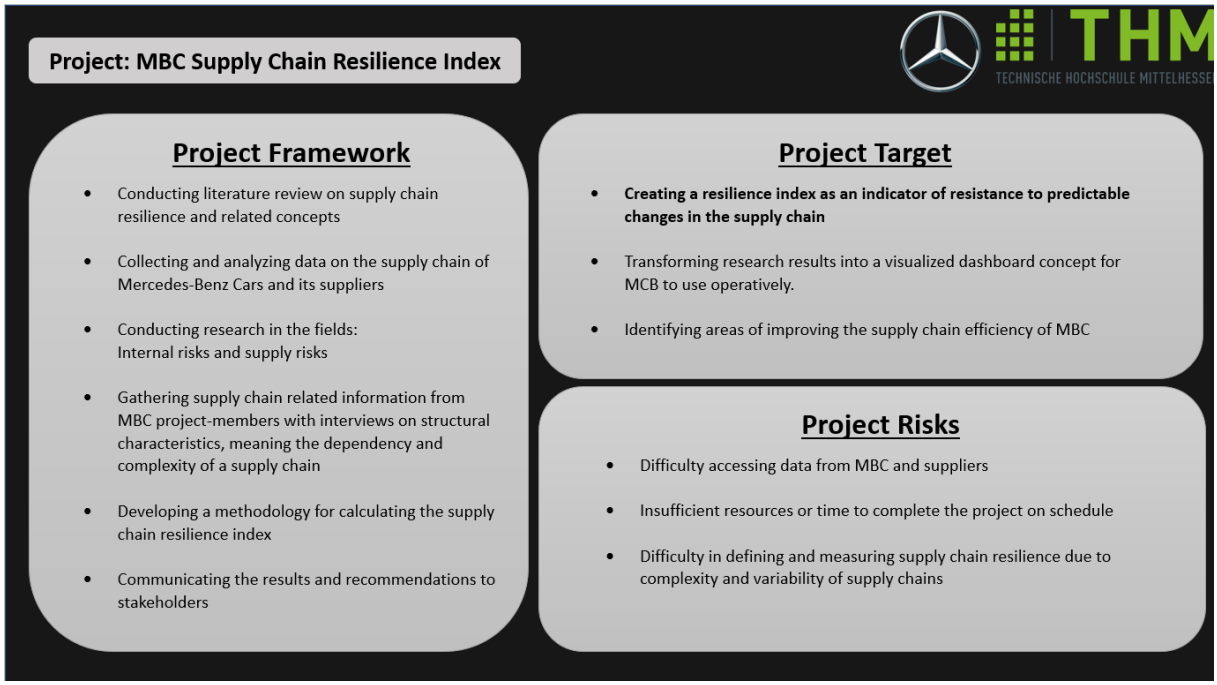



Figure 14: Project outline, show slide two with framework, target, and risks of the project
Source: Project_Outline_MBC_THM.ppt

In the project framework section, the managers tried to convey an overview of the project to the stakeholders in Sindelfingen, for them to gain a first understanding of the project. The project target outlined very broad end goals. The project risks highlight potential disruptions that required discussion with the stakeholders to mitigate any potential obstacles in project completion. By including the project risks in the project outline, they could effectively communicate specific risks that Mercedes could theoretically address, such as challenges in accessing data.

After the successful project kick-off meeting, the project moves into the detailed project planning phase. The goal of the planning phase in project management is to establish a clear roadmap for the project. It involves defining the project objectives, identifying the scope of work, determining the project deliverables, and outlining the tasks, timelines required for successful project execution. The timeline was already created in the project outline.

The planning phase proved to be a highly dynamic process in this project because a clear goal was not manifested early on. The project plan initially consisted of very broad ideas and objectives, for example: conducting research on risk categories and index methods.

However, the planning became more detailed, specific, and fixed with the introduction of the questionnaire concept. From that point forward, the team started with a detailed planning journey, particularly for the execution phase. This involved defining various objectives such as researching risk categories, formulating relevant questions for end-users, exploring calculation methods specific to the questionnaire, identifying key performance indicators (KPIs) relevant to Mercedes' supply chain, and developing a comprehensive dashboard, among other tasks. This approach allowed us to define the scope of work as well as associated objectives and the resulting deliverables.

The detailed planning phase officially ended on the 21st of May but as mentioned, it was a more dynamic approach that accompanied the project a while longer. Subsequently, the first project meeting with the stakeholders Prof. Dr. Herrmann and Mr.Imser was held as mentioned in the chapter *Project Status*.

After receiving approval and feedback from our stakeholders, the project transitioned into the execution/research phase of the project. As noted by Donato (2022), the Project Execution Phase involves the actual implementation of tasks outlined in the project plan. During this phase, the project managers took on responsibilities such as task monitoring, delegation of tasks to team members, providing support, reviewing project timelines to ensure progress, generating status updates for Prof. Dr. Herrmann and Mr. Imser, and conducting team meetings. These activities were essential for maintaining project momentum and ensuring effective collaboration among team members.

The project managers opted to follow a supportive leadership style, which is according to the Path-Goal Theory of Leadership by Robert House (1971), a leadership style based on providing support, guidance, and assistance to our team members, with the ultimate aim of enhancing motivation and increasing the likelihood of achieving our project goals.
This explains why some of the project managers also overtook tasks such as the creation of the questionnaire, matching key performance indicators with risk categories, and formulating coding and visualization in Excel.

During the research phase, the primary focus was to gather extensive and profound knowledge from the research teams. The research phase was marked by extensive research from all teams to create an optimal questionnaire with the right questions, the right rating systems, the right weighting, and the incorporation of key performance indicators. Based on the need for clarification for progressing in the project, multiple individual meetings were arranged between the project teams and the stakeholder Mr. Imser. As mentioned above, the project managers provided research support but also took responsibility for certain tasks.

After the execution phase, the second and last project meeting was held with the stakeholders, where the team presented a crucial monitoring metric that was created in the execution phase: an overall progression chart of the project.

The last final phase is the closing phase of the project. Ray (2022) defines the closing phase as the last phase of the project, where the project managers verify that the stakeholder has accepted the project deliverables. It is also the responsibility of the project managers to review the entire project before closing it. While writing this portfolio, the authors are still in the closing phase of the project. The current tasks revolve around finalizing the deliverable and preparing a presentation for the handover of the results to the stakeholders, which will be presented on the 11$^{th}$ of July.

If stakeholder agreement on the results is obtained, the project work can be seen as completed, and transferring the deliverable to the stakeholders as well as disposing of all project material can be initiated.

**Implementation of Project Manager Roles**

This section intends to examine the practical implementation of the roles outlined in the chapter titled "Role of Project Managers." The authors will inspect how these roles were executed throughout the course of the project. By revisioning the application of these roles, insights can be gained into their impact on project outcomes and identify areas of improvement for future projects.

- **Project Planning**
    - The task of project planning included the creation of a structured project outline as well as structuring a detailed roadmap on which objectives have to be completed in a logical order. These activities were completed not solely by the project managers but also by the help of the other team members. Inclusive open idea-sharing enabled the ability to form a specified roadmap that could be followed and incremated into achievable tasks, such as conducting research on risk categories, researching key performance indicators (KPIs) and obtaining approval from Mr. Imser, adjusting questions of the questionnaire, adjusting the weighting of the questions, etc.

- **Team Management**
    - The project managers always ensured that each team member had assigned tasks, and work was effectively and transparently distributed among the team members using Trello.

- **Time and Quality Management**
    - The project managers, always kept an eye on the initial timeline presented in our project outline. They made necessary adjustments to the due dates on Trello cards based on the remaining time for each phase and the desired buffer time they wanted to incorporate.

- **Application of Project Management Tools and Techniques**
    - In this regard, the authors went beyond the excellent information provided by Prof. Dr. Herrmann but also incorporated valuable knowledge from other courses, such as organizational behavior, which in detail looks into the topic of motivation and good leadership. Additionally, they tried to include many different tools, such as regular, weekly meetings, task monitoring through Trello, stakeholder engagement through direct interviews, etc.

- **Communication and Stakeholder Management**
    - The project managers were responsible for the preparation and presentation of the project status. Besides the status updates, they also initiated meetings with the stakeholders Prof. Dr. Herrmann and Mr. Imser, for instance for discussing the project questionnaire or other open questions.

- **Monitoring and Control**
    - The authors always kept the due dates of the tasks in mind and opened discussions in the meetings, when a due date was exceeded, to find and fight the cause.

- **Risk Management:**
    - The project managers identified possible risks in the project outline. When asked by Mr. Imser in the last project status meeting, they were convinced, that there won't be any risks, that could disrupt the final progress.

- **Project Closure:**
    - Currently in the finalizing phase, open points still have to be worked through, such as finishing the visualization in Excel, which one of the project managers will take over.

# Project Closure and Evaluation

## Project Result

The deliverable will be a profoundly researched set of risk categories, incorporated in a questionnaire with the intent to ask the employee from Mercedes, who for example is working in a supply chain-related function and wants to apply a resilience measurement on a supply chain. The employee will be asked specific, detailed questions, which are weighted according to the importance of the attached risk. Based on the employee's input, an overall Supply Chain Resilience Index will be calculated and displayed in a separate tab in Excel. This whole process will be conducted in Excel and through the help of Visual Basic for Applications (VBA). The main deliverable will be the dashboard which will visualize the input.

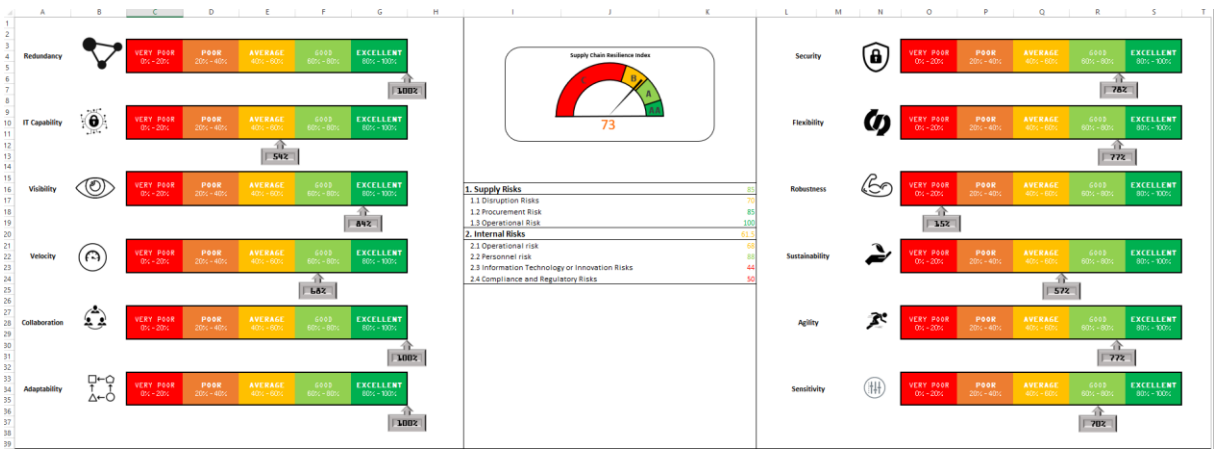



Figure 15: Dashboard solution for visual presentation of supply chain resilience
Source: Questionnaire.xlsm

As seen in Figure 7, the dashboard will include a short overview of the results from internal calculations conducted through VBA with the input gathered from the employee, who filled out the questionnaire, as well as an overview of the measured strength of a fixed set of KPIs. The KPI strength is also measured through a calculation conducted in VBA by using the entries of the employee and factoring in only certain risk categories, that influence the KPI. The matching task was conducted by the index and visualization team with the support of the project managers.

Based on the KPI ratings, an overall rating is calculated and displayed in an Excel gauge diagram. The project managers have also worked on creating an improvement plan, which will

identify KPI's with improvement needs and deliver recommendations on how the KPI can be enhanced. The improvement plan will be displayed on the same.

While facing the closure phase of this project, the team is still considering improving the dashboard by implementing the functionality of generating prefixed recommendations for increasing the KPI score, based on the achieved score in the calculation. For example, if the KPI *Flexibility* is beneath a certain threshold, then the tool will based on this information, generate and display recommendations of improvement for *Flexibility*.

The visual dashboard creation, as seen in Figure 7 was the sole responsibility of the author while data such as the resulting resilience index was provided by the index and visualization team. The project managers were also responsible for the creation of the above described improvement plan.

**Project Retrospective**

When looking back at the project, the authors want to point out several success factors but also challenges they have faced in project management.

One of the primary challenges, as mentioned in the chapter *The Procedure of Team Meetings*, was scheduling team meetings due to the varying availability of team members. Unlike in a traditional 9-to-5 job, every team member had different schedules, making it challenging to find a common time slot for regular meetings. To remedy this problem, the project managers implemented the concept of team responsible persons within each team. These individuals were responsible for representing their team's efforts, providing updates on task progress, and sharing results during the weekly meetings.

By having designated team representatives, the need to coordinate with all team members individually was eliminated, which eased the scheduling process. This approach made it easier to find a suitable date and time for the meetings, as the team responsible persons could coordinate and communicate with their respective team members on behalf of the entire team.

This solution helped to overcome the initial scheduling difficulties and ensured effective communication and collaboration within the project in our weekly meetings.

The authors consider that a great success factor of this project was cohesiveness in the team. While there was a risk of encountering the phenomenon known as "Groupthink" coined by

Irving L. Janis (1972), it is important to understand its implications. Janis defines this as a psychological phenomenon that occurs within a very cohesive group. The desire for harmony inside the group results in irrational decision-making outcomes. Individuals want to minimize conflicts and reach a consensus without critically evaluating alternative viewpoints, which can lead to absurd outcomes. It proves very difficult to confirm, that groupthink was absent in the project. In general, very little friction and critical thinking about suggested objectives or ideas could be seen both as a positive and a negative factor.

The authors consider participation and commitment as negative aspects in the final point. Motivation plays a significant role in project management. When talking about why participation and commitment regarding this project were not up to par, one could try to answer the question using personality theories such as trait theory (conscientiousness), self-efficacy, or lack of leadership qualities. This is not a critique against the project members, on the contrary, this realization is directed towards ourselves, the project managers. We as project managers take the responsibility of leadership and one crucial part of leadership is the ability to motivate the team members toward collective goals (Shamir, Zakay, Breinin, & Popper 1998:390) and that is where we should seek improvement when going into the future projects.
We already applied techniques like the Goal-Setting Theory to our task-creation process, but the authors think it should have been more direct in underlining the importance of timely and conscientious handling of the assigned tasks.

To end this section on a positive note, one last positive aspect to mention is the autonomy of the index team, who on their own scheduled and conducted interviews with Mr. Imser to proceed in their assigned tasks.

I. Donato, H., 2022, ‘5 Phases of Project Management Life Cycle You Need to Know’, project-management.com, URL: https://project-management.com/project-management-phases/#execution [Accessed 30 June 2023]

II. Gasemagha, A. A., & Kowang, T. O. (2021). Project Manager Role in Project Management Success. International Journal of Academic Research in Business and Social Sciences, 11(3), 1345-1355.

III. Herrmann, K., 2023. *Project_Management_SoSe2023_0_Introduction.* [pdf] Available at: <https://moodle.thm.de/pluginfile.php/963513/mod_resource/content/1/Project_Management_SoSe2023_0_Introduction.pdf> [Accessed 30 June 2023]

IV. Herrmann, K., 2023. *Project_Mgt_Phases_1*. [pdf] Available at: <https://moodle.thm.de/pluginfile.php/963515/mod_resource/content/1/Project_Management_SoSe2023_2_Project_Mgt_Phases_1.pdf> [Accessed 30 June 2023]

V. M. Ikonen, E. Pirinen, F. Fagerholm, P. Kettunen, and P. Abrahamsson, “On the impact of Kanban on software project work: An empirical case study investigation,” Proc. – 2011 16th IEEE Int. Conf. Eng. Complex Comput. Syst. ICECCS 2011, no. April, pp. 305–314, 2011

VI. ISO. (2012). Guidance on project management (ISO 21500)

VII. Janis, I. L. (1972). Victims of groupthink: A psychological study of foreign-policy decisions and fiascoes. Houghton Mifflin.

VIII. Locke, E.A. and Latham, G.P. (1990), A Theory of Goal Setting and Task Performance, Prentice-Hall, Englewood Cliffs, NJ.

IX. Locke, E.A. and Latham, G.P. (2002), ‘Building a practically useful theory of goal setting and task motivation- A 35-year odyssey’, American Psychologist, vol. 57, no. 9, pp. 705-17.

X. Ponis, S.T. 2012, 'Supply Chain Resilience? Definition of concept and its formative elements', University of Forward Thinking Westminster, vol. 28, no. 5, pp. 924

XI. Ponomarov, S. & Holcomb, M.C. 2009, 'Understanding the concept of supply chain resilience', The International Journal of Logistics Management, vol. 20, no. 1, pp. 124-143

XII. Project Management Institute (2013). A Guide to Project Management Body of Knowledge (PMBOK); 4th Edition.

XIII. Ray, S., 2022, ‘5 Steps to Project Closure (Checklist Included)’, projectmanager.com, URL: https://www.projectmanager.com/blog/project-closure [Accessed 30 June 2023]

XIV. Shahibi et al., 2019, retrieved from http://eprints.utm.my/id/eprint/96768/1/TanOweeKowang2021_ProjectManagerRoleinProjectManagementSuccess.pdf

XV. Vaida, S., Serban, D., 2021, ‘Group Development Stages. A Brief Comparative Analysis of Various Models’, Studia UBB Psychol.-PAED p. 93