Quality Management 2024
Project B - Improving RU's Traffic Problem

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December 9, 2024

1 Introduction

Traffic congestion during morning and afternoon peak hours near the university is an issue that affects students, staff, and the surrounding community. This report aims to address this issue with a structured and collaborative approach that both identifies the root causes and provides an implementation plan for proposed solutions.

The report is structured with A3 technique - a structured problem-solving and continuous improvement method widely used in quality management. The A3 workflow organizes the analysis and proposed solutions into a clear and concise format, focusing on understanding the problem, identifying countermeasures, and finally planning the implementation. The structure of the report is presented in Figure 1.

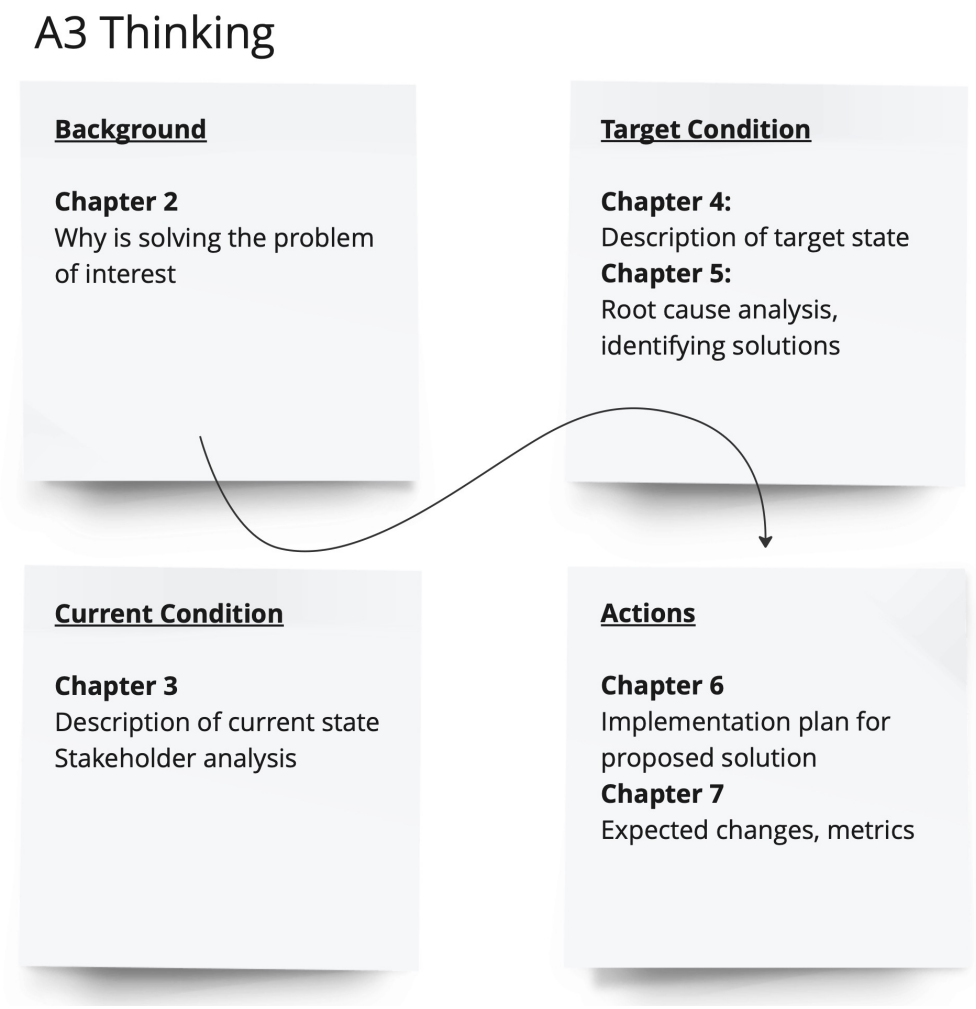

Figure 1: The report is structured around A3 thinking

2 Problem Statement and Motivation

Reykjavík University is currently facing the issue of heavy traffic jams during morning and afternoon peak hours, resulting in frequent delays for both students and teachers, who represent the customers in this case.

Addressing the issue of traffic congestion is essential for several reasons. Firstly, frequent delays disrupt the daily schedules of students and teachers, affecting class attendance, productivity and overall academic performance. Secondly, the traffic jams create stress and frustration for commuters, diminishing their overall well-being.

The problem also extends beyond the university, as the shared roadways are also used by employees of neighboring organizations. This not only compounds the congestion but also affects economic efficiency by increasing travel times for a large number of employees. Finally, prolonged traffic jams contribute to environmental degradation due to increased vehicle emissions.

3 Current State

The problem currently faced at Reykjavík University is the heavy traffic load around 8-9:30 and again around 15:30-17:00. This is due to students and teachers at RU, as well as employees working at nearby organizations, having the objective of going to the same place at the same time. This leads to students and teachers being stuck in traffic bottlenecks for up to an hour, causing them to be late for their lectures. This results in both students having to wait for their teachers, decreasing the time they are learning and students missing out on a lecture.

The problem affects both teachers and students at RU, as well as people working close to the university, like Isavia. It also affects residents that live in the neighborhood of the university.

Several types of waste are evident in this situation. Waiting is a key issue, as traffic congestion causes significant delays, creating a bottleneck in productivity for both students and staff, who are in traffic jam and who are waiting at university for others to show up. Addressing these waits is essential for improving overall efficiency. Transportation waste is another major factor, with single-occupancy vehicles being the norm despite most cars having the capacity to hold 5-7 passengers. This inefficiency increases the number of vehicles on the road and compounds congestion. Parking facilities also face overcrowding, particularly between 10:00 and 14:00, which reflects storage of significant number of personal cars and inefficient use of parking infrastructure. The placement of BSÍ, a major pickup point, is a defect in the process of commuting as it is highly inconvenient for many users outside areas like Reykjavik 101 and Seltjarnarnes. It has poor accessibility which reduces the efficiency of the overall transport system.

4 Target State

The target state is to reduce the travel time for teachers and students traveling to and from Reykjavik University. Currently, commutes often exceed an hour due to traffic congestion. The goal is to halve this time, aiming for a 30-minute maximum. This will be achieved by analyzing and optimizing traffic flow data to identify less congested time slots for travel and by introducing attractive alternatives to car use, such as discounted public transport passes, shuttle services, or carpooling programs.

5 Analysis of the Problem

Traffic congestion at Reykjavík University (RU) during peak hours presents significant challenges, affecting students, staff and nearby residents and workplaces. To address this issue effectively, a systematic analysis was conducted to identify root causes and contributing factors. By utilizing problem-solving techniques such as the **5 Whys method** and the **Fishbone Diagram**, the analysis provided a structured understanding of the problem and its underlying causes.

The **5 Whys method** (Figure 2) was used to trace the root causes of traffic congestion. The process revealed a chain of interconnected issues, starting with the heavy reliance on personal vehicles. This dependency stems from the perception that public transportation is inconvenient and unattractive, due to limited routes, inadequate schedules and the absence of discounted passes. Further questioning highlighted a lack of collaboration between the university and public transport providers to align services with peak commuting times. This lack of coordination is partly due to insufficient data-driven efforts to address the problem systematically. The analysis pinpointed the following key area for intervention: RU classes start and end all at the same time and at the same time as the ones of nearby organizations.

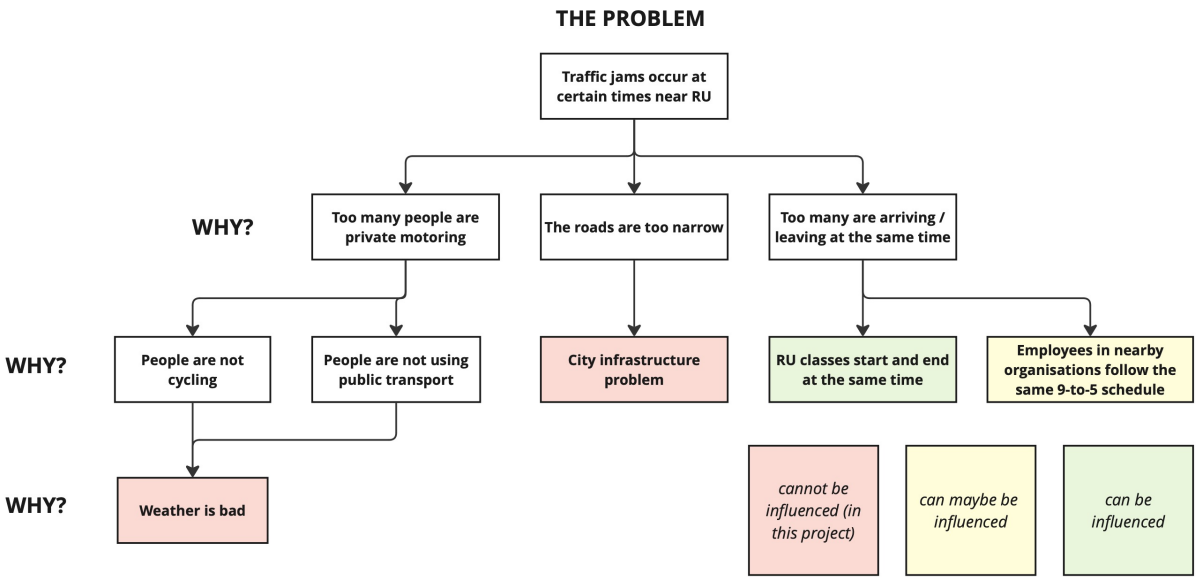

Figure 2: Root cause analysis using a method of Five Whys. The causes are color coded according to the level of control we have over them.

The **Fishbone Diagram** (Figure 3), or Ishikawa Diagram, was used to systematically identify and categorize the root causes of traffic congestion at Reykjavík University. This tool grouped contributing factors into four key domains: *Methods*, *Machines*, *Environment* and *People*, offering a clear view of the complexities involved.

In the *Methods* category, procedural inefficiencies such as simultaneous class schedules at RU and nearby organizations were identified as major contributors to peak-hour traffic. Reliance on single-occupancy vehicles is exacerbated by the lack of carpooling incentives or remote work solutions, while poorly aligned public transport routes, such as those terminating at BSÍ, discourage its use.

The *Machines* domain highlighted resource and infrastructure constraints. No bus availability from other places than BSÍ and poorly timed schedules from other places restrict non-car options, while parking facilities are overwhelmed during peak periods, underscoring the over-reliance on personal vehicles without proportional infrastructure upgrades.

The *Environment* significantly contributes to traffic congestion at Reykjavík University. Geographical constraints, including limited access points and dense urban layout, restrict road and parking expansion. Adverse weather conditions discourage walking and biking, further increasing reliance on cars. Additionally, RU's centralized scheduling and lack of collaboration with neighboring organizations, such as Isavia and local authorities exacerbate congestion. Poor communication and uncoordinated efforts to address shared traffic challenges perpetuate reliance on personal vehicles during peak hours.

The *People* domain reveals a strong preference among RU staff and students for driving alone,

with limited use of carpooling due to a lack of awareness, incentives, or organized systems. Public transport is often seen as inconvenient, further reinforcing reliance on personal vehicles. These behaviors, coupled with insufficient promotion of sustainable commuting options, significantly contribute to traffic congestion.

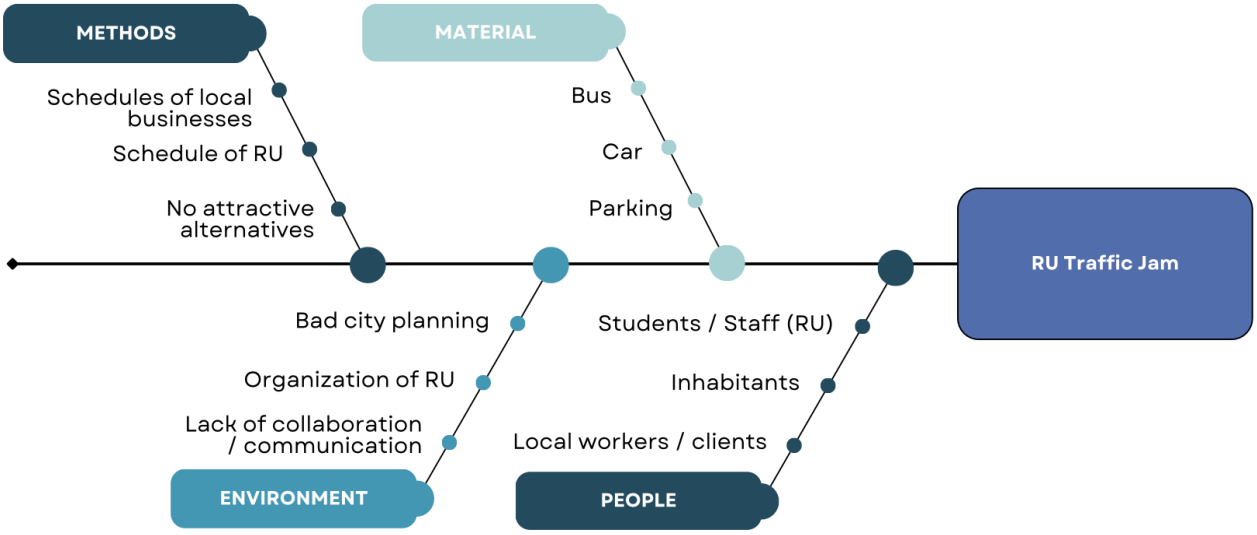

Figure 3: Fishbone diagram of the traffic problem at Reykjavík University

The interconnectedness of these factors became clear through the Fishbone Diagram. For instance, the misalignment between public transport schedules and RU's timetable directly increases reliance on personal vehicles, while the lack of carpooling initiatives reinforces single-occupancy commuting habits. This structured analysis highlights critical areas for intervention, laying a solid foundation for targeted solutions to reduce traffic congestion, improve commute efficiency and promote campus sustainability.

This analysis pinpoints actionable root causes and the areas with the greatest potential for impact. Key issues identified include inadequate public transportation, insufficient infrastructure and incentives for sustainable commuting, misalignment between university schedules and public transit services and limited awareness of alternative options.

6 Proposed Solutions and Implementation Plan

The proposed solutions to address traffic congestion at Reykjavík University encompass both internal adjustments and external collaborations:

- **Flexible Scheduling:** Implementing flexible scheduling based on traffic flow data and class attendance patterns can significantly reduce congestion. By comparing the number of students per class and the distribution of classes across time slots with the road's traffic

capacity, schedules can be optimized. Integration with the IT department or scheduling office should ensure seamless implementation before the start of the semester.

- **Remote Classes During Heavy-Traffic Timeslots:** Classes that are already conducted remotely can be scheduled strategically during peak traffic periods, such as 8:00–10:00 and 15:00–17:00. This approach would alleviate physical traffic while maintaining academic productivity. This could again be delegated to the IT department and scheduling office for implementation before the start of the semester.

- **Improving Public Transport Accessibility:** Enhancing the accessibility of public transport serving Reykjavík University is key. Redirecting buses to a more central and well-connected hub, such as Kringlan, instead of BSÍ, would improve convenience for residents of densely populated areas. Collaborating with the bus company's management to implement this change is essential and could be started as soon as possible.

- **Collaboration with Local Businesses and Institutions:** Establishing partnerships with neighboring businesses and institutions, such as Mjölnir, Icelandair Hotel and Isavia, could lead to coordinated efforts to reduce traffic. Joint initiatives could involve shared transport facilities or staggered schedules. Meetings with these stakeholders would help identify mutually beneficial strategies, which would possibly be best done before the semester of RU so that the appropriate party can react and make scheduling changes, which should be done by Reykjavík University upper management that has the authority to act on the result of the meeting.

- **Carpooling Initiatives:** Encouraging carpooling through dedicated carpool-only parking spots and promoting shared commutes can significantly reduce the number of single-occupancy vehicles on the road. This initiative can be supported by targeted awareness campaigns and incentives to foster participation. This change could be done at any time and would be delegated to whoever is responsible for the parking lot.

We recommend on focusing on *flexible scheduling, remote classes, collaboration with local organizations* and *carpooling initiatives*, because they are more easy to be influenced by RU. To implement these changes, we suggest the university follows the PDCA-cycle (Plan-Do-Check-Act). The *Plan* phase for flexible scheduling needs to begin well before the semester starts. Relevant data needs to be gathered on the schedules of lectures last year, to see the distribution of class starting and ending times. This phase also calls for collaboration with the local organizations. The schedules of courses are then set to achieve balanced starting and ending times and remote classes are added as needed.

In the *Do*, flexible scheduling and remote classes will be implemented as a pilot project. Classes with high enrollment will be rescheduled during peak traffic hours to remote formats, supported by IT systems, with clear communication to faculty and students. Carpooling initiatives will be launched by designating carpool-only parking spots and running a campus-wide campaign using digital platforms to connect participants. Incentives such as discounted parking fees will encourage participation, with feedback gathered to refine the approach. Collaboration with neighboring organizations will involve initial meetings to align schedules and discuss shared

transport solutions. A roadmap for implementation will be developed based on agreements, ensuring alignment before the semester starts. Representatives will monitor and coordinate progress to maintain momentum and track impact.

7 Expected Benefits and Metrics

It is anticipated that implementing the proposed changes will lead to measurable improvements in commuting times for teachers, students and potentially employees in nearby areas. The success of these changes can be evaluated using two primary metrics: the average commute time and the frequency of late arrivals among faculty and students before and after implementation.

This evaluation constitutes the *Check* phase of the PDCA cycle, where the outcomes of the implemented solutions are measured and compared against the initial expectations. To enable this comparison, data must be collected both prior to and following the implementation of the solutions. For instance, a sample group of teachers and students could be asked to record their commute times and instances of tardiness over a defined period. Similar data could also be gathered from other stakeholders, such as Isavia, to provide a broader perspective on the impact of the changes. Moreover, feedback can be gathered from students to see how the carpooling initiative can be improved. Feedback from students and teachers on remote teaching is also important, to monitor for any unwanted effects.

Should the results show no significant improvement in commuting efficiency or punctuality, it will be necessary to revisit the approach and explore alternative solutions. This correction constitutes the *Act* phase of the PDCA cycle. Moreover, the feedback needs to be analyzed and corrective measures taken, if needed. This iterative process ensures a commitment to continuous improvement.

8 Conclusion

Traffic congestion at Reykjavík University impacts students, staff and the community, reducing punctuality, increasing stress and causing environmental harm. Using the A3 problem-solving method, this report identified root causes, such as synchronized schedules with nearby organizations, through tools like the Five Whys and Fishbone Diagram.

Solutions, including flexible scheduling, remote teaching, collaboration with local businesses and carpooling, aim to reduce commute times, improve punctuality and ease congestion. The PDCA cycle will guide implementation, with metrics like commute times and frequency of late arrivals tracking success and driving refinements.

This structured approach enables Reykjavík University to address traffic issues and to establish a foundation for continuous improvement